Macquarie River Re-regulating Storage

Scoping Report

January 2020

Contents

SCOPING REPORT

WaterNSW is proposing the construction of a new re-regulating storage on the Macquarie River (the project) on behalf of the Department of Planning, Industry & Environment for the NSW Government. The new re-regulating storage will improve water security, reliability and delivery efficiency in the Macquarie River valley. The re-regulating storage will be located downstream of Burrendong Dam, between the townships of Narromine and Warren.

The State Infrastructure Strategy 2018-2038 (Infrastructure NSW 2018) and WaterNSW's 20 Year Infrastructure Options Study (WaterNSW 2018) identified the Macquarie River valley as a priority for improved water management and critical water infrastructure projects. The project is required to meet the following water security challenges that face the Macquarie River valley:

- Low drought security and reliability
- Low delivery efficiency
- High water transmission and distribution losses.

The development of the proposed re-regulating storage is State significant infrastructure (SSI) and the Minister for Planning is the approval authority. An environmental impact statement (EIS) is required to accompany the application for approval to the development.

This Scoping Report identifies the scale and nature of the likely impacts of the project. It has been prepared to be submitted as part of a request for the Department of Planning, Industry and Environment to issue the Secretary's Environmental Assessment Requirements (SEARs) for the EIS. This report identifies the key issues that will require assessment in the EIS.

This Scoping Report describes the:

- its strategic context and location
- project's statutory context
- scale and nature of the likely impacts of the project
- results of recent engagement with the community about the project
- proposed approach to assessment and community engagement in preparing the EIS.

1. Introduction

1.1 Project Background and Objectives

The Macquarie River is located in the Murray-Darling Basin with its headwaters near Oberon, NSW. The Wiradjuri People are the traditional owners and custodians of the lands surrounding the project site.

The Wiradjuri Nation is geographically the largest Indigenous Nation within NSW. The boundary of the Wiradjuri Nation extends from Coonabarabran in the north, straddling the Great Dividing Range down to the Murray River and out to western NSW.

The Macquarie River passes through the towns of Bathurst, Wellington, Dubbo, Narromine and Warren before joining the Barwon River near Brewarrina. West of Dubbo the land flattens and the Macquarie River provides flows to distributary creeks, wetlands and rich alluvial river flats associated with braided channels. The Macquarie Marshes are located in these lower reaches of the Macquarie River. Two major storages, Windamere Dam on the Cudgegong River, and Burrendong Dam on the Macquarie River, regulate catchment water supplies.

The catchment includes the Macquarie Marshes complex on the lower reaches of the Macquarie River. Parts of the Marshes are listed as a Wetland of International Importance under the Ramsar Convention. The Macquarie Marshes are recognised under the Ramsar Convention for being a unique example of a wetland type in the region in terms of their size and their diversity of wetland types, supporting species of conservation significance and biological diversity, providing refuge during adverse conditions, and regularly supporting large numbers of waterbirds. The Ramsar site contains a range of habitats including core areas of semi-permanent wetlands, including forests and woodlands, reed beds, marshes, rushlands and open lagoons, which provide habitat for migratory bird species and large numbers of waterbirds, including colonial nesting birds (Commonwealth Environmental Water Office, 2018).

Key features of the catchment are shown in Figure 1.

WaterNSW is Australia's largest supplier of raw water, delivering water from 42 dams, state rivers and pipelines to NSW irrigators, licenced authorities, retail suppliers and councils. WaterNSW develops infrastructure solutions to ensure water supply security and contributes to the protection of the environment and catchments.

The Macquarie River is regulated to mitigate flooding and supply water to cities and towns that include Dubbo, Wellington, Narromine, Warren, Nyngan and Cobar. The main water storages in the

catchment are Lake Burrendong on the Macquarie River, upstream of Wellington, and Lake Windamere on the Cudgegong River upstream of Mudgee (refer to Figure 1). The figure also shows the water users in the Macquarie River valley, which include major urban centres, permanent plantings, stock and domestic water supply schemes, industry, and other uses such as the Western Plains Zoo at Dubbo.

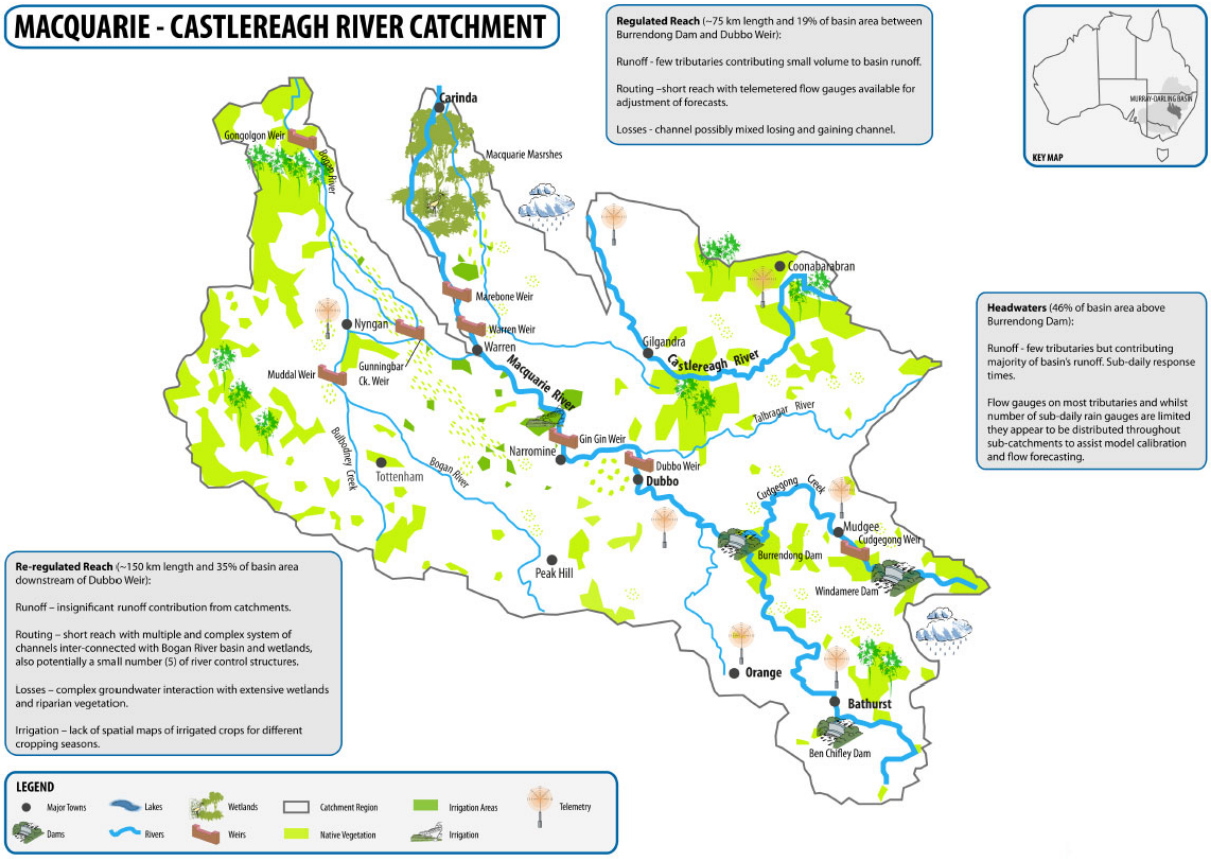

Figure 1 Macquarie-Castlereagh River Catchment (*WaterNSW, 2012)*

Water to the town of Nyngan is supplied from the Bogan River, which flows intermittently, and from water transferred from the Macquarie River via the 67 kilometre long Albert Priest Channel. Cobar is supplied largely from the Macquarie River via the Albert Priest Channel. Water is piped to Cobar from the Bogan River weir pool at Nyngan. The Albert Priest Channel has its offtake at the Gunningbar Creek, which is an effluent stream of the Macquarie River at Warren.

The Macquarie River valley experiences relatively low water reliability and security compared to other water systems in NSW, particularly arising from distribution difficulties and operational inefficiencies. The purpose of the project is to increase the security of the supply of water, to realise

the full potential of water intensive agricultural operations and improve town water security in the region.

In response to the water security challenges facing the Macquarie River valley the project's objectives are to:

- Achieve long-term water security strategic objectives in the Macquarie River catchment
- Improve delivery efficiency to water customers downstream of Gin Gin Weir
- Reduce transmission losses when transferring and delivering water through the river system on an annual basis
- Maximise available water for general security water customers within the sustainable diversion limits set under the Murray-Darling Basin Plan.

The objective of the project is to respond to these water security challenges by delivering a solution that will be effective in supporting the Macquarie River valley and its productivity over the longer term.

Recent investigations into water security for the Macquarie River included the analysis of a new re-regulating storage with a capacity of up to 9,500 megalitres (ML) of water between the towns of Narromine and Warren, which is in the mid-section of the catchment. The purpose of the re-regulating storage is to temporarily store part of operational surplus flow events and regulate them as required, and thus reduce operational losses. A re-regulating storage will also provide operational flexibility to more efficiently deliver water to water users. No such storage is currently available on the Macquarie River downstream of the major upper catchment dams.

1.2 Strategic context and need for the project

The State Infrastructure Strategy 2018-2038 (Infrastructure NSW 2018) identified the Macquarie River catchment as one of the three highest priority inland river catchments facing the most significant water management challenges in NSW. The catchment has low drought security due to low/ variable rainfall, high evaporation and limited storages. The Strategy illustrates how the combination of climate, topography and existing asset performance indicates the potential need for augmentation of, or investment in, additional storage capacity to improve water security. In addition for the Macquarie River catchment, delivery efficiency is also a priority due to distribution losses and operational inefficiencies. Also, climate modelling suggests that, in the absence of a material response, reliability is forecast to continue to decrease in the face of a changing climate. Water availability is critical for the urban centres with growing populations as well as for the high security licence holders, environment and cultural values of the region.

Further detailed analysis by WaterNSW supported this assessment, with low reliability of water supply causing a substantial proportion of the irrigated agricultural production capacity to be underutilised, with negative economic and social impacts for communities. A number of feasible options were identified for further assessment, of which a new re-regulating storage on the Macquarie River, was one.

A mid-river re-regulating storage was considered a prospective solution to assist with mitigating operational inefficiencies in the regulated system. A new re-regulating storage, in the vicinity of the existing Gin Gin Weir, was considered worthy of further assessment because it would improve operational flexibility and reduce losses of allocated water released from distant headwater dams. Irrigation water orders could be delivered more timely and effectively, as could meeting minimum water flow targets along the system.

1.3 Environment of the Macquarie River

The Macquarie River catchment covers more than 75,000 square kilometres in the state's northwest and extends from the Blue Mountains to the Barwon River Plains. The Macquarie and Castlereagh catchments are home to the Macquarie Marshes which is one of the largest remaining semi-permanent wetland systems in inland Australia, and has hosted some of the largest-scale waterbird breeding ever recorded on the continent.

The breeding is assisted by targeted delivery of water for the environment to the creeks, rivers, lagoons and wetlands that make up the unique Macquarie River ecosystem. The Macquarie and Cudgegong Regulated Water Sharing Plan establishes a total allowance for water for the environment of 160,000ML.

While water for the environment in the Macquarie plays a vital role in supporting the Macquarie Marshes and the River, the flows are insufficient to meet the needs of all the water-dependent ecosystems in the catchment. Flows from tributary streams downstream of Burrendong Dam, such as the Bell, Little and Talbragar Rivers, as well as spills from Burrendong Dam, are critical in sustaining the health of the catchment.

Along with the Marshes, flows are targeted to sites, such as the Cudgegong and Macquarie River channels, and the lower Macquarie River downstream of the Marshes, with potential for the unregulated distributary systems of the lower Crooked and Marra Creeks.

Water for the environment in the Macquarie River valley is mainly used to:

- Support riverine and wetland ecosystems along the river system, including river red gum forests, reed beds and water couch meadows
- Support critical water-needs of colonies of nesting waterbird species in the marshes, including egrets, ibis, cormorants and herons
- Provide feeding and breeding habitat for a range of waterbirds including ducks, herons, bitterns, magpie geese and brolgas
- Provide opportunities for breeding and movement of native fish, including Murray cod and Golden perch
- Provide a harbour for several species of international migratory shorebirds that visit the catchment each summer from the northern hemisphere.

1.4 Project location

The project site for the re-regulating storage has been identified on the Macquarie River downstream of the existing Gin Gin Weir, approximately 6km upstream of Gin Gin and 18km north east of Trangie, and within the Orana Region of NSW. Refer to Figure 2 for the project site in its regional setting.

The locality is dominated by agriculture and Gin Gin Weir Reserve, surrounding the Weir, as illustrated in Figure 2.

The Macquarie River at Gin Gin Weir, and its channel form and riparian vegetation, are illustrated in Figure 3 and Figure 4.

Figure 2 Regional setting and local environment

Figure 3 Existing Gin Gin Weir

Figure 4 Macquarie River at Gin Gin Weir

1.5 Project background

Gin Gin Weir, built in 1896, was constructed for the conservation of water for irrigation, stock and domestic supply in the Macquarie River, and to divert water down Ewenmar Cutting into Crooked and Ewenmar Creeks. The weir does not currently back up water far enough for the diversion of water into these creeks. A concrete weir was built but cut down to its present height of 4-5 metres after being damaged by the floods of 1903. It is approximately 120 metres long. There is no regulating infrastructure associated with the weir, and there is no fishway. A 0.9m diameter cast iron scour outlet pipe was located in the main crest near the base of the weir but has been dislodged leaving a substantial hole in the weir structure. WaterNSW is proposing to install a new gate valve to the scour outlet to control this leakage.

The Weir is owned and operated by WaterNSW and its pool facilitates water extraction for numerous irrigation farms, including the larger Trangie-Nevertire Irrigation and Tenandra Irrigation schemes. The location is also a popular recreation, picnicking, boating, fishing and bushwalking spot with a sandy river beach.

In 2019, a comprehensive list of build and non-build options was developed by WaterNSW, for further consultation with community and stakeholders, to address the key water supply and security issues in the Macquarie River valley. Multiple options were also assessed by WaterNSW to improve regional water security and delivery efficiency in the Macquarie River valley as part of the 20 Year Infrastructure Options Study (WaterNSW 2018). Nine options were subject to further investigation.

Amongst these options was the construction of a re-regulating storage on the Macquarie River. Further assessment of water security options for the whole Macquarie River valley was undertaken by WaterNSW and identified two potential options for the storage as described in Table 1.

Table 1 – Macquarie re-regulating storage location options

Option	Description
Gin Gin	Construction of a new gated re-regulating storage at the existing Gin Gin Weir
Rocky Point	Construction of a new gated re-regulating storage 15km upstream of the existing Gin Gin Weir at Rocky Point

In 2019, WaterNSW commenced further investigations into the sites at Rocky Point and Gin Gin Weir to identify a preferred location. The investigations included preliminary consideration of factors including:

- Engineering
- Environment
- Landholder and stakeholder
- Construction
- Operation and maintenance
- The regional water strategy.

Both sites were found to be feasible for a re-regulating storage. Preliminary analysis indicated that the size of the re-regulating storage could also be reduced from 9,000-9,500ML to around 6,000ML.

The preferred re-regulating storage option has been identified as a new 6,000ML re-regulating storage around 200m downstream of the existing Gin Gin Weir. This was assessed as a superior option for the following key factors:

- Lower potential effect on fish habitat than Rocky Point due to a lesser overall length of re-regulating storage pool being created in this part of the River
- Feasibility and accessibility for construction
- Project cost.

1.6 Related development

WaterNSW is considering a range of strategic build and non-build options for the Macquarie River valley to further secure water in the long-term and offer drought relief. However, there is no other development to be separately assessed that is required for the project.

2. The project

The project involves constructing, operating and maintaining a re-regulating storage on the Macquarie River downstream of Narromine. The new structure for the re-regulating storage will be located approximately 200m downstream of Gin Gin Weir.

2.1 Overview

2.1.1 Storage purpose and operation

The proposed re-regulating storage would function as a storage that is capable of capturing surplus flow events and regulating them, as required, to reduce operational losses. The intent of the storage is to capture operational releases from Burrendong Dam that are surplus to operational need and to store them temporarily until required to supply subsequent water orders. Releases identified as surplus within approximately 6 days' travel time from Burrendong Dam may potentially be captured.

The source of operational surplus flows released from Burrendong Dam can include the following:

- Customer orders that are subsequently cancelled due to, for example, rainfall events occurring which negate the need for irrigation
- Orders subsequently met by useful tributary contributory inflows
- Releases in excess of those required to cover delivery losses.

2.1.2 Storage concept

The new re-regulating storage would comprise a gated structure with both overshot and radial gates with a full capacity of approximately 6,000ML. The re-regulating storage pool will be approximately 10m deep at this point at its full supply level. The full supply level of the new structure will be approximately 1m higher than the storage at Gin Gin Weir, prior to its failure. A section of the undamaged weir wall adjacent to the left abutment of the weir illustrates the height of the original weir.

It is proposed to construct the new structure in the River. The preliminary concept for the re-regulating storage (shown in Figure 5) would incorporate:

- An ogee weir with two lay flat over shot gates for regulated flow
- An adjacent set of radial gates for flood passage and passage of flows during unregulated conditions

- A fish passage structure to allow fish to move upstream and downstream of the re-regulating storage.

A temporary bypass channel would be required to divert the flow from the River during construction so that the re-regulating storage can be constructed across the River in dry conditions. Key features of the conceptual re-regulating storage layout are shown in Figure 5.

The new re-regulating storage will create a storage pool at full supply level that extends approximately 30km upstream to near Mumble Peg Road, as shown Figure 6.

At full supply level much of the existing Gin Gin Weir will be inundated by the new re-regulating storage pool. It will be partially demolished to provide fish passage at low storage levels. The extent of this demolition will be determined by the operating range of the proposed fish passage at the new re-regulating storage, the heritage assessment of the partial demolition, public safety and the continued structural integrity of the partially demolished structure.

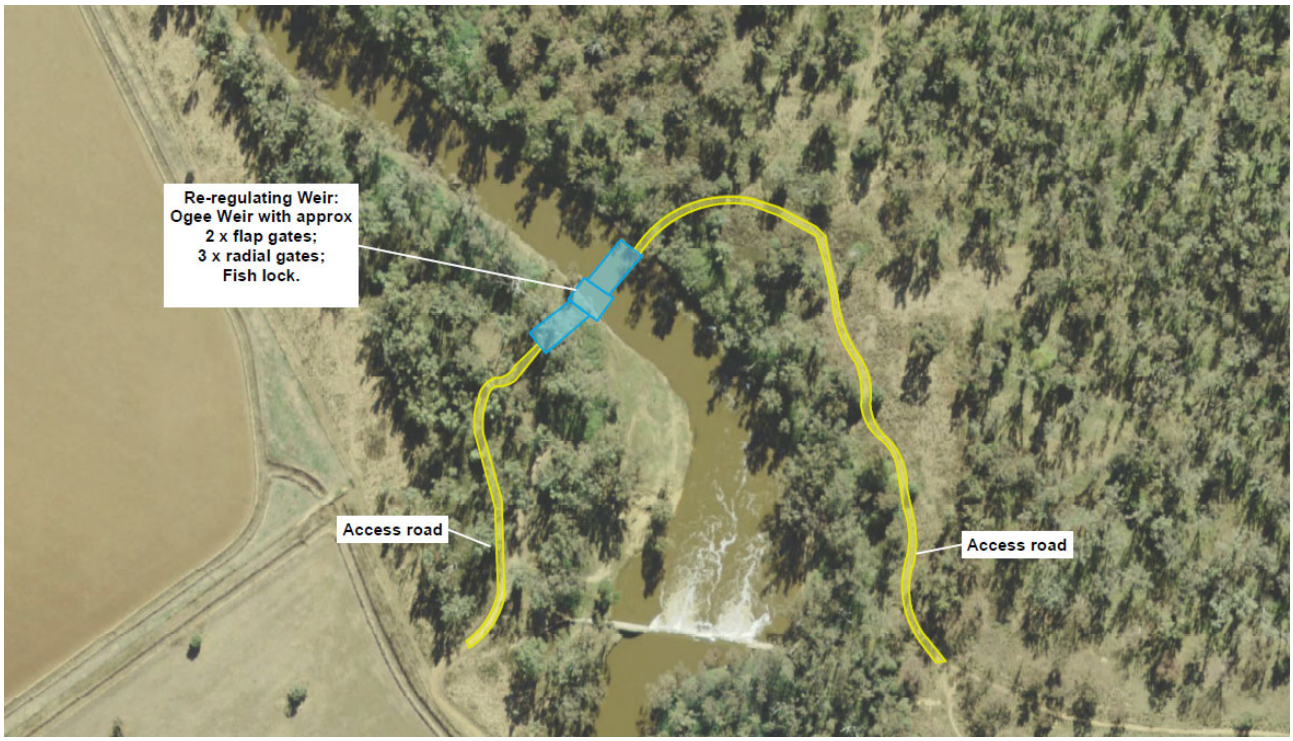

Figure 5 Conceptual Re-regulating Storage Layout

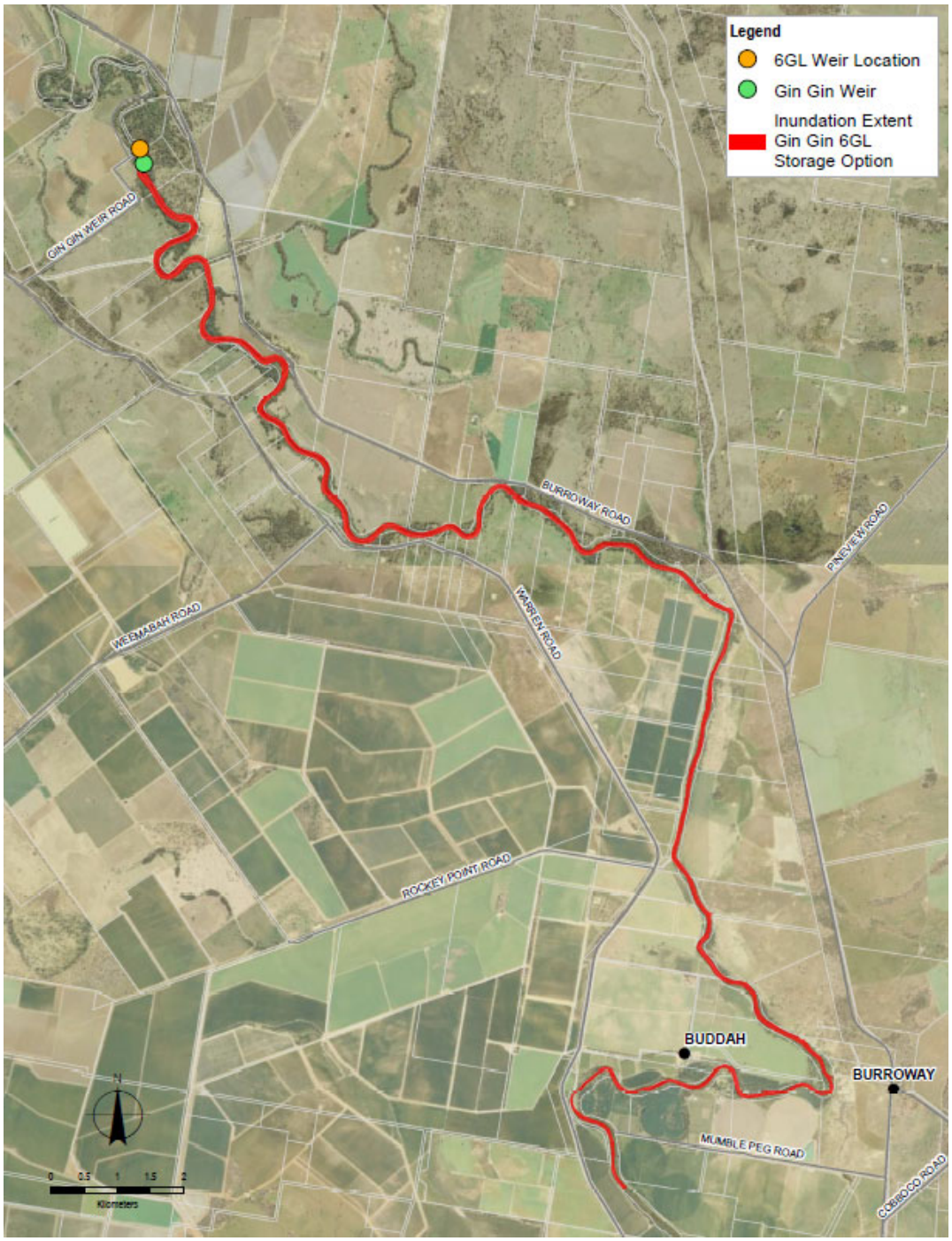

Figure 6 Potential storage pool inundation at full supply level

2.2 Key design features

Table 2 provides an indicative description of the main project components which are shown on Figure 5 and Figure 7. The project will be refined during development of the design and preparation of the EIS and this is likely to result in some amendments to these components.

Table 2 – Main project components, preliminary

Component	Description
Re-regulating structure	A combined structure expected to consist of a mass concrete ogee weir with overshot gates, radial gates for flood passage and a fish passage structure. River widening would be required at the location of the re-regulating storage to accommodate the structure, including its wing walls. The new radial gates will be approximately 10m high, and the overall structure approximately 14m high. The gated structure will be approximately 60m long across the River with wing walls extending to the River banks on either side. The overall structure will be of a similar length to Gin Gin Weir (which is approximately 120m) and the wing walls will be a similar height to the abutments on Gin Gin Weir.
Temporary Diversion Channel	Construction in the dry will require a temporary diversion channel on the western bank of the River around 20m wide at the invert level to divert river flows around the construction site.
Cofferdams	Temporary cofferdams would be required to dam across the existing river both upstream and downstream of the proposed re-regulating storage structure to prevent river flows entering the construction site, and to direct flows into the temporary diversion channel.
Storage Pool	When full, the re-regulating storage pool would be about 2 - 3m below the bank level and would contain an estimated 6,000ML of water, with the normal operating range likely to be less.
Bank Protection	Armouring using rock rip rap would potentially be required at scour points.

Component	Description
Fish Passage	Upstream and downstream fish passage would be provided at the re-regulating storage.
Access	Construction access would likely be required to both river banks from Gin Gin Weir Road and Burroway Road. Permanent access is likely to be from both roads.
Power Supply	Permanent power supply would be required to operate gates, fishway and associated operational and communications equipment. Power connection details would be developed during the design phase.
Construction Zone	Site sheds, parking, lay-down areas, temporary access around the site, equipment storage, material stockpiles, temporary fencing, power supply (or generator).
Site Management	Erosion and sediment control works, dewatering operations, flood protection works.
Site Rehabilitation	Revegetation of disturbed construction zone.
Groundwater Control	A geophysical investigation, comprising Electrical Resistivity Imaging (ERI) and Seismic Refraction Tomography (SRT), was completed in September 2019 in the general vicinity of Gin Gin Weir and areas downstream. The results suggest three main stratigraphies are present up to a depth of 30m below ground level. This comprises an upper layer with a thickness of between 0 and 6m, of a likely unsaturated clay. Below this is a layer is a likely saturated soil with relatively high permeability. The inferred bottom layer, which extends to below 25m under the River bed, is indicated to be either bedrock or very dense gravels. The results indicate that groundwater control may be required if construction requires excavation below groundwater level.

Fish passage will be provided by two main elements of the re-regulating storage. The preliminary concept design is for an ogee overshot weir to be the main regulation structure with a form sympathetic to the safe passage of fish travelling downstream. A suitable fish lock would be provided near the river bank for the effective movement of fish moving upstream. The designs will be further developed in consultation with the Department of Planning, Industry and Environment (Regions, Industry, Agriculture & Resources).

2.3 Construction

Indicative construction activities and methodologies include:

- Site set up and preparation
- Clearing vegetation where required
- Earthworks and river diversion works
- Building of the new re-regulating storage and fish passage, and permanent access routes
- Removing part of the existing Gin Gin Weir for fish passage
- Installing power supply and communication services
- Testing and commissioning the new works
- Site rehabilitation, landscaping and revegetation of disturbed areas
- Finishing work, including installing fencing and signage
- Demobilisation activities, including removing construction equipment and compounds.

Ancillary facilities, which will not form a permanent part of the project, are required to construct the re-regulating storage. These include site compounds, erosion control measures, sedimentation basins, temporary lay down areas and stockpile sites. In addition, there will be a need for spoil and materials handling areas, worker facilities and vehicle parking. These facilities will be located as close as possible to work areas and avoiding sensitive environmental locations. The location and size of ancillary facilities will be confirmed as the design and construction planning progresses. An indicative layout is illustrated in Figure 7.

It is proposed to commence construction in early 2021 and the project would take 18-24 months to complete.

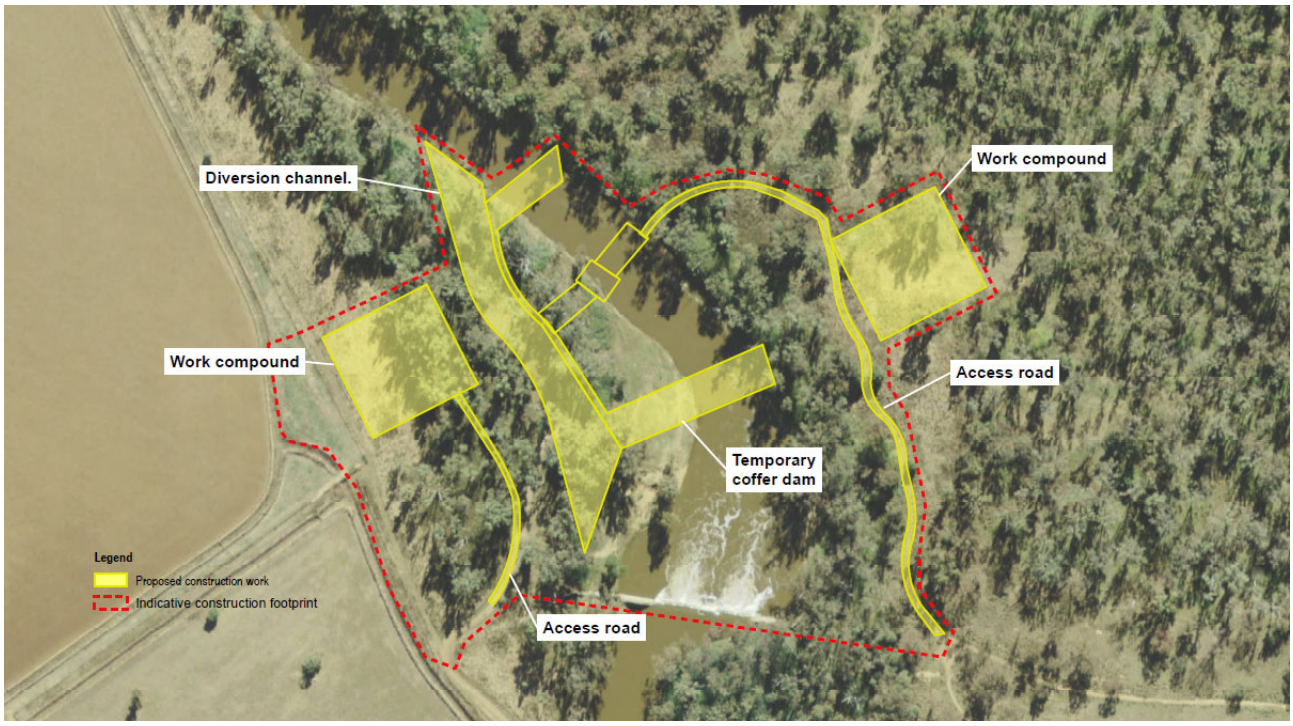

Figure 7 Likely construction footprint and compounds

2.4 Environment of the project site

2.4.1 Features of the environment

The site of the proposed control structure for the re-regulating storage is approximately 200m downstream of the existing Gin Gin Weir. The riverbanks are vegetated with large trees and, on the right bank of the River, the riverbank vegetation connects with a larger vegetated area that comprises the Gin Gin Weir Reserve. Public access to the River and its sandy beaches is available through the Reserve. On the left bank of the River, the riparian vegetation gives way to cultivated land across the floodplain. Figure 8 shows the riparian vegetation and river channel immediately downstream of Gin Gin Weir, looking towards the site.

The River upstream and downstream of the proposed re-regulating storage, is characterised by a band of riparian vegetation with both dryland and irrigated farmland across the floodplain. Homesteads and farm buildings are dotted across the landscape.

Narromine is the largest town near the project site with a population of some 6,500, and nearby Trangie has a population of around 1,200.

Figure 8 Downstream of Gin Gin Weir, looking towards the project site

2.4.2 Features important to the community

Feedback from the community (see Section 4.1) about the project included the identification of the following features of the environment as important:

- The Gin Gin Weir pool offers a pumping pool for irrigators
- Recreational opportunities offered by Gin Gin Weir Reserve and the re-regulating storage pool
- Culturally important sites near the River
- The River's ecology including the Macquarie Marshes and the riparian vegetation.

2.4.3 Hazards and risks

Flooding along the Macquarie River in the vicinity of the site is characterised by much of the flow of large flood events location in the several shallow lakes and natural depressions on the adjacent floodplain. Near Gin Gin, flood waters tend to be returning to the River on the left (western) bank via the Gin Gin Creek tributary and leaving the River to the north-east across a broad front. The recorded floods in the Macquarie River at Narromine suggest that the area experienced its largest flood in 1955, followed by 1990, 2010, 1971, 2000, 1998 and 1976 (Welsh and others 2014).

Major fire seasons have occurred around Narromine in 1957, 1964, 1979, 1987 and 2001. These years have generally reflected periods of healthy vegetation growth after good winter and spring rainfall followed by a very hot summer. However, severe fires were also experienced during the recent droughts. Recent experience shows that major fires are now occurring much more frequently (Orana Bush Fire Management Committee 2011).

2.4.4 Land ownership

The table below shows the land parcels potentially affected by the construction of the project.

Table 3 – Land parcels potentially affected by the construction of the project

Lot	DP	Owner
7310	1160283	NSW Department of Planning, Industry and Environment (Housing and Property)
53	41552	Private Landholder
7010	1020351	NSW Department of Planning, Industry and Environment (Housing and Property)
1	1163113	NSW Department of Planning, Industry and Environment (Housing and Property)

3. Statutory context

3.1 NSW Planning Framework

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the planning and approvals process in NSW. The EP&A Act provides for the making of Environmental Planning Instruments (EPIs) including Local Environmental Plans (LEPs) and State Environmental Planning Policies (SEPPs), which set out requirements for particular localities and/or particular types of development. The applicable EPIs and the Regulations made under the EP&A Act determine the relevant planning approval pathway and the associated environmental assessment requirements for proposed development activities.

Planning approval for the project is subject to Part 5, Division 5.2 of the EP&A Act, and the basis for this approval pathway is set out below.

State Environmental Planning Policy (Infrastructure) 2007

Under Clause 125 (2) of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP), development for the purpose of water storage facilities, may be carried out by or behalf of a public authority without consent on land in Zone RU1 Primary Production, Zone RU2 Rural Landscape, Zone SP1 Special Activities, Zone SP2 Infrastructure or an equivalent land use zone. A water storage facility means *a dam, weir or reservoir for the collection and storage of water, and includes associated monitoring or gauging equipment* (*Standard Instrument—Principal Local Environmental Plan*).

The project would be undertaken by WaterNSW (a public authority) on land zoned RU1 Primary Production under the *Narromine Local Environmental Plan 2011* and is therefore permissible without development consent.

State Environmental Planning Policy (State and Regional Development) 2011

Under the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP), development is considered to be State significant Infrastructure (SSI) if it is permissible without consent and specified in Schedule 3.

Under Clause 14(1) of *State Environmental Planning Policy (State and Regional Development) 2011*, development is declared to be State significant infrastructure for the purposes of the Act if:

(a) the development on the land concerned is, by the operation of an environmental planning policy, permissible without development consent under Part 4 of the Act, and

(b) The development is specified in Schedule 3.

As indicted above, the project is permissible without development under clause 125(2) of ISEPP.

Clause 4(1) of Schedule 3 of SEPP SRD defines water storage or water treatment facilities that are State significant infrastructure as: *Development for the purposes of water storage or water treatment facilities (not including desalination plants) that has a capital investment value of more than $30 million.*

As the project would have a capital investment value of over $30 million and is permissible without development consent, it is State significant infrastructure as defined under clause 14(1) of SEPP SRD.

Planning approval for the project is therefore subject to Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979*.

Other relevant NSW legislation

Table 4 provides a list of the other likely authorisations that are likely to be required for the project.

Table 4 – Other authorisations

Authorisation	Legislation
Provision of fish passage	s.218 of *Fisheries Management Act 1994*
Grant of interest over Crown Land	s.2.18 of *Crown Lands Management Act 2016*
Requirement of a proposed dam to be declared	Dams Safety Regulation 2019, under Dams Safety Act 2015

Planning approval for State significant infrastructure under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* provides that:

- certain authorisations under other Acts are not required (s.5.23). The following authorisations that would otherwise have been required for the project are not required due to the application of this section:
  - permit for works that block fish passage - s.219, *Fisheries Management Act 1994*
  - excavation permit – s.139, *Heritage Act 1977*
  - Aboriginal heritage impact permit – s.90, *National Parks and Wildlife Act 1974*
  - water management works approvals – s.90, *Water Management Act 2000.*

- certain authorisations under other Acts cannot be refused and are to be consistent with the approval (s.5.24). The following authorisation that would otherwise have been required for the project is not required due to the application of this section:
    - consent related to public roads – s.138, *Roads Act 1993*.

The following notices are likely to be required:

- Notice to the landowner - cl.193(4), *Environmental Planning and Assessment Regulation 2000*
- Notice of dredging or reclamation – s.199, *Fisheries Management Act 1994*
- Notice to Narromine Shire Council – cl.13 (infrastructure) and cl.15 (flood liable land), *State Environmental Planning Policy (Infrastructure) 2007*
- Notice to State Emergency Service (flood liable land) – cl.15AA, *State Environmental Planning Policy (Infrastructure) 2007*
- Notice to Roads and Maritime Services (navigable waters) – cl.16, *State Environmental Planning Policy (Infrastructure) 2007*.

For the purposes of section 5(2) of the *NSW Dams Safety Act 2015*, a dam or proposed dam in the following types or classes may be declared to be a declared dam-

(a) a dam having a dam wall that is more than 15 metres high

(b) a dam that Dams Safety NSW is reasonably satisfied would result in a major or catastrophic level of severity of damage or loss were there to be a failure of a dam

(c) a proposed dam that Dams Safety NSW is reasonably satisfied will become a dam referred in paragraph (a) or (b)

(d) a proposed dam that is a prescribed dam within the meaning of the *Dams Safety Act 1978* immediately before the repeal of that Act.

In assessing whether a failure of a dam would result in major or catastrophic level of severity of damage or loss, Dams Safety NSW is to have regard to the Consequence Category Methodology.

Dams Safety NSW may direct the owner of a dam or a proposed dam to conduct a preliminary assessment of the dam to determine whether it is of a class that may be declared to be a declared dam.

3.2 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth legislation relating to the environment. Under Part 3 of the EPBC Act, approval from the Australian Minister for the Environment is required for a controlled action being an action that:

- Has, will have, or is likely to have a significant impact on a matter of national environmental significance
- Is undertaken on Commonwealth land and has, will have, or is likely to have a significant impact on the environment
- Is undertaken outside Commonwealth land and has, will have or is likely to have a significant impact on the environment of Commonwealth land, or
- Is undertaken by the Commonwealth and has, will have or is likely to have a significant impact on the environment.

A significant impact under the EPBC Act is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. Matters of national environmental significance (MNES) include:

- World heritage properties
- National heritage places
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

WaterNSW will refer the project to the Minister for the Environment to determine whether or not the project is an action that will need formal assessment and approval under the EPBC Act.

Native Title Act

There are no current or active Native Title Claims impacting on Crown Lands associated with the project.

4. Stakeholder Engagement

4.1 Engagement during scoping

Community engagement began in mid-2018 with the development of the strategic business case addressing water security in the Macquarie valley. This considered a range of options across the valley including a new re-regulating storage on the Macquarie River. As part of that process, WaterNSW formed a stakeholder reference group and held briefings and meetings with a range of stakeholders from industry, service and utility providers, local councils, Federal and State government, and traditional land owners.

WaterNSW maintains ongoing engagement with its customers and community in the Macquarie River valley through the following:

- Macquarie-Cudgegong Customer Advisory Group (CAG)[1]
- Macquarie Valley River Operations Stakeholder Consultative Committee (ROSCCo)[2]

[1] Members of WaterNSW's Customer Advisory Group (CAG) include:

- Macquarie River Food and Fibre
- Environment, Energy and Science Group of the Department of Planning, Industry and Environment (DPIE)
- Mid-Western Regional Council
- Lower Bogan Water Utilities Alliance
- NSW Farmers Association
- Commonwealth Environmental Water Office
- Macquarie Marshes Environmental Landholders Association
- NSW Minerals Council

[2] Members of WaterNSW's River Operating Stakeholder Consultative Committee (ROSCCo) include:

- Commonwealth Environmental Water Office
- Department of Planning, Industry and Environment (DPIE) (Regions, Industry, Agriculture & Resources)
- Environment, Energy and Science Group, DPIE
- Department of Planning, Industry and Environment (DPIE) (Water)
- Warren Council
- Dubbo Regional Council
- Macquarie Marshes Environmental Landholders Association
- Macquarie Food and Fibre
- Inland Waterways Rejuvenation
- Macquarie Effluent Creeks Association
- Trangie Agricultural Research Centre
- Fletcher International

Building on the engagement to date, community, targeted stakeholder and landowner views were sought during the preparation of the Scoping Report about the project, the issues to be addressed in the EIS, and opportunities and ongoing involvement during the assessment of the impacts of the project.

The following stakeholders were engaged with during the preparation of the Scoping Report:

- Landholders affected by investigations, construction and the re-regulating storage pool
- Aboriginal community: Narromine Local Aboriginal Land Council, Warren-Macquarie Local Aboriginal Land Council, and Trangie Local Aboriginal Land Council
- NSW Department of Planning, Industry & Environment (DPIE) including representatives from Planning & Assessment; Water; Regions, Industry, Agriculture and Resources; and, Environment, Energy and Science
- Commonwealth Environmental Water Office, Department of Environment and Energy (DoEE) including representatives from Northern NSW Assessments, Wetlands and Northern Basin sections
- Narromine Shire Council and Warren Shire Council
- Orana Water Utilities Alliance[3] (OWUA)
- Irrigators/water users in the Macquarie River valley
- Inland Rivers Network
- Macquarie Cudgegong Environmental Water Advisory Group (EWAG)[4]
- Various community groups, environmental groups, angler groups and recreation groups.

- Tritton/Aurelia/ Cobar/ CSA/ Endeavour mines
- Bogan Shire Council
- Cobar Shire Council
- Nyngan Shire Council
- Dubbo Zoo

[3] Members of the Orana Water Utilities Alliance (OWUA):

- Bogan Shire Council
- Cobar Shire Council
- Walgett Shire Council
- Bourke Shire Council
- Gilgandra Shire Council
- Warren Shire Council
- Brewarrina Shire Council
- Mid-Western Regional Council
- Warrumbungle Shire Council
- Narromine Shire Council
- Central Darling Shire Council

[4] Members of the EWAG include:

- Representatives from the Aboriginal community
- Nature Conservation Council
- Macquarie River Food and Fibre
- NSW Local Land Services
- Inland Rivers Network
- Environment, Energy and Science Group, DPIE
- Cudgegong Valley Water Users
- Macquarie Effluent Creeks Association
- Commonwealth Environmental Water Office
- Department of Planning, Industry and Environment (DPIE) (Water)
- Macquarie Marshes Environmental Landholders Association

The following stakeholders were also contacted during the preparation of the Scoping Report, but were unable to attend an information forum and did not provide any specific feedback about the project at this stage including: Central West Local Land Services; NSW Minerals Council; NSW Farmers Association; NSW Waterwatch; NSW Irrigators Council Trangie Agricultural Research Centre; Floodplain Management Australia; Nature Conservation Council; Dubbo RiverCare Group Inc: Orana Joint Organisation of Councils[5]; NSW Council of Freshwater Anglers.

With the current drought conditions, our engagement approach encompassed the timeliness of meetings, identifying established stakeholder groups and associations in the Macquarie Valley and requesting to join their already scheduled meeting program. Most groups welcomed this approach and included our project introduction presentation into their already full agenda. This also proved an effective way to capture collective issues, how stakeholders would like to be involved with the process and how to best engage with their membership moving forward ie email distribution lists, display boards, newsletters, next board meetings.

4.1.1 Engagement approach

During the preparation of the Scoping Report, the following approaches were employed to provide information about the project and to obtain views on the issues to be addressed in the EIS and their ongoing involvement in the assessment:

- Phone, email or letter contact with stakeholders
- Initial briefings of stakeholders, individually or in stakeholder forum groups
- Direct contact and meetings with affected landholders and also surrounding properties
- Joining stakeholder group meetings to present and discuss the project to their membership
- Project update in the form of a newsletter
- Community information and updates at WaterNSW's project webpage
- All day community information sessions (Community Forums) for landowners within 50km upstream of the project site, displaying maps and being available to discuss individual properties.

Activities undertaken during this period are summarised in Table 5.

[5] Members of Orana Joint Organisation of Councils include:

- Bogan Shire Council
- Gilgandra Shire Council
- Mid-Western Regional Council
- Narromine Shire Council
- Warren Shire Council
- Warrumbungle Shire Council
- Department of Premier and Cabinet

Table 5 – Engagement activities undertaken to date

Activity	Timing	Detail
Contact with directly impacted landowners at Gin Gin and Rocky Point	July 2019 - ongoing	Briefings to provide information on potential land impacts and establish relationship for ongoing communications
Project notifications	September 2019	Project notifications to members of the Stakeholder Reference Group for the strategic business case to inform them of the project's progression to the detailed business case
Initial project briefings	September – December 2019	A number of stakeholder and agency briefings to introduce the project, discuss potential impacts and concerns and how to be involved in the EIS and business case process.
WaterNSW customer helpdesk phone number, project email address and webpage	Ongoing	Contact mechanisms to enable community members to contact the project team: Phone: 1300 662 077 Email: MRRRS@waternsw.com.au Webpage: waternsw.com.au/mrrrs
Phone calls to stakeholder groups	October – November 2019	Contact established with community and environmental groups to gauge interest and availability to attend community forums
Stakeholder forums	November 2019	Three stakeholder forums were held with identified community, angler, recreational, irrigator and environmental groups to inform the development of the detailed business case
Mail out to landowners within 50 km upstream of the project site	November 2019	Project letter to landowners identified as being within the study area inviting them to attend a project meeting with the project team
Project meetings with landowners within 50	December 2019	Project meetings with potentially impacted landowners identified as being within the study area

Activity	Timing	Detail
km upstream of the project site		
Project newsletter	December 2019	Project newsletter with latest update on the project issued to all previously consulted stakeholders and directly affected landowners
EPBC Act pre-referral meeting	December 2019	Pre-referral meeting about the project with Department of the Environment and Energy

4.1.2 Community feedback received

Feedback received during this early phase of engagement has been collated and categorised into a series of key themes. A detailed summary of all feedback obtained during this phase can be seen in Appendix B, Table B4. A total of around 30 organisations were approached and more than a dozen attended the various forums held. The following provides an overview of the themes of the feedback about the project received to date:

- Potential impacts to aquatic ecology as a direct result of the construction and implementation of a re-regulating structure on the Macquarie River
- Potential impacts to river banks and vegetation along the Macquarie River and the Macquarie Marshes
- Operation of re-regulating storage and the process to determine the operating rules
- General enquiries about the project, the proposed timeline, project funding, and requests for further information (e.g. modelling)
- Social and cultural matters, particularly those regarding recreational use and community ownership of the re-regulating storage, as well as the importance of behavioural change regarding water usage
- Potential changes to river flows, impacts to river front landowners and water availability for WaterNSW's customers
- Understanding of government approval processes
- Feedback on consultation activities and information to date, including suggestions on consultation methods and clarification about terminology.

4.2 Stakeholder engagement proposed during preparation of the EIS

Community and stakeholder engagement and regular communication are important parts of the development of the project. WaterNSW will proactively engage, inform and involve the stakeholders and the community about the project and provide opportunities for feedback. Issues raised during the engagement will be provided to the project team to inform project development, environmental assessment and the preparation of the EIS. This section is a summary of WaterNSW's proposed community engagement strategy and full details are contained in Appendix B.

4.2.1 Principles of engagement

WaterNSW will lead all community engagement and communication for the project with the support of its delivery partner, GHD. WaterNSW has developed a clear and comprehensive approach to engaging with the community and stakeholders for the project. This approach is based around the principles of regular communication, being responsive to all stakeholders, providing information about the project and its impacts, explaining how community feedback is used and providing ongoing opportunities for feedback.

WaterNSW encourages feedback and we will continue to seek input as the project progresses.

4.2.2 Communication and engagement approach

WaterNSW has developed a communication and engagement approach for the project that builds on initial contact with stakeholders and relationships during the scoping phase. This engagement will continue, providing information about the project and seeking feedback on issues, impacts and opportunities. This commenced in July 2019 with targeted engagement and, with a preferred option determined, a broader level of communications and engagement with stakeholders has continued since September 2019, which has included landowner information sessions and a series of targeted stakeholder forums.

4.2.3 Engagement during the EIS

A range of communication and engagement activities will occur whilst the EIS is prepared and exhibited. WaterNSW will provide further information about the project, the assessment of the project's environmental impact and opportunity for formal submissions during the EIS exhibition.

Community and stakeholder engagement will provide:

- Consistency of information that is written in plain English, easily accessible and relevant
- Direct points of contact with the project team and a robust complaints and enquiry process
- Regular project updates on the webpage, and via newsletters and community updates

- Feedback mechanisms to provide information about the potential impacts of the project and to seek input about how impacts could be avoided, mitigated or managed.

Consultation with approval agencies will involve coordination meetings and provision of timely information.

4.2.4 Engagement during public exhibition of the EIS

The EIS will be placed on public exhibition for at least 28 days.

At a minimum, advertisements will be placed in local newspapers to advise of the exhibition, provide details of where the EIS can be viewed and information about other consultation activities during the exhibition period.

During the exhibition period any stakeholder can make a formal submission regarding the project. Submissions will be collated into a report and will be considered in the assessment of the EIS and further development of the project.

Communication and engagement to support the exhibition will include:

- Media releases and social media reach
- Community information sessions and stakeholder forums
- Community update and newsletter
- Digital engagement tools
- EIS summary document
- Community displays at local councils, libraries and land council offices
- Project webpage and FAQs
- Stakeholder briefings
- Landowner meetings
- Government agency engagement
- Project email and phone number for enquires.

4.2.5 Engagement following the exhibition of the EIS

Following the exhibition period WaterNSW will respond to submissions received during the exhibition of the EIS. WaterNSW may undertake further engagement to respond to issues raised. If this process extends over a long period of time WaterNSW will provide regular updates on the project's status.

If the project receives planning approval, WaterNSW will continue to engage with the stakeholders and the community during the construction phase. WaterNSW will develop and lead a construction

community engagement program. The construction program will respond to community and stakeholder expectations on ongoing involvement, the details of the approved project and the terms of its approval. WaterNSW will continue to be the single point of contact about the project for all stages of the project.

5. Proposed assessment

5.1 Overview

Key issues are defined as issues where there is the potential for a high or moderate impact and where detailed assessment is required to determine the level of the potential impact and the measures required to mitigate and/or manage the impact. The outcomes of preliminary environmental investigations and feedback received from the community and other stakeholders identified the following key environmental issues for the project:

- Hydrology, geomorphology and water quality
- Terrestrial and aquatic biodiversity
- Aboriginal and non-Aboriginal heritage
- Social and economic
- Soils and land
- Hazards
- Visual
- Air and noise
- Access.

Further information on these issues is provided in sections 5.2 to 5.10.

5.2 Hydrology, geomorphology and water quality

5.2.1 Overview

The two major storages in the Macquarie River catchment are Windamere Dam (capacity 368,000 megalitres (ML) built in 1984) on the Cudgegong River, and Burrendong Dam on the Macquarie River (storage capacity of 1,188,000ML, with additional storage capacity of 489,000ML in the flood mitigation zone, built in 1967). The volume and pattern of flows in the Macquarie River have been significantly altered by the construction of Burrendong Dam and extraction of water. Regulating

structures downstream of the dams are used to manage the diversion of water into distributary creeks.

West of Narromine, the Macquarie River provides flows to distributary creeks, wetlands and alluvial river flats associated with braided channels. There is a complex system of anabranches and effluent creeks that connect the Macquarie, Darling and Bogan Rivers. The Macquarie Marshes are located toward the end of the catchment and are seasonally wet. The Macquarie River is joined by the Castlereagh River downstream of the Macquarie Marshes and then flows into the Barwon River near Brewarrina.

The project and its operation will interact with the hydrology of the River, including the pattern of flooding and the flow regimes downstream of the re-regulating storage, the interaction between surface water and groundwater, and potential changes to water quality. The project will contribute benefits to improved water management within the River, as follows:

- Achieving long-term water security strategic objectives in the Macquarie River valley
- Improving delivery efficiency to water customers downstream of Gin Gin Weir
- Reducing transmission losses when transferring and delivering water through the river system on an annual basis
- Maximising available water for general security water customers within the Sustainable Diversion Limits set under the Murray-Darling Basin Plan.

The surface and ground waters of the valley are subject of the Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016 and the Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012. Water resource plans are in preparation for the Macquarie-Castlereagh surface water and the Macquarie-Castlereagh Alluvium.

The *Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016* provides for planned environmental water and stock and domestic (replenishment) flows. The NSW Government also manages licenced water for the environment. The Commonwealth also has environmental water holdings in the Macquarie River. These holdings offer opportunities to align Commonwealth environmental water deliveries to increase the potential for environmental objectives to be achieved jointly and assist with delivery efficiency and effectiveness (Commonwealth Environmental Water Office, 2018).

The Lower Macquarie Alluvium extends from upstream of Narromine and downstream to Warren, and spans the area between the Macquarie and Bogan rivers. Alluvial aquifers extend to depths of

up to 160m below the lower Macquarie River downstream of Narromine. Recharge is seasonal and episodic, and is dominated by flood recharge. Discharge typically occurs into drainages and where properties of the overlying materials change significantly. Connectivity between groundwater and surface water largely occurs via alluvial aquifers. The Macquarie River has a combination of gaining and losing reaches that changes with flood recharge and drought events. Around Narromine is identified as a losing reach. Significant flow losses from the Macquarie River in the reach between Narromine and Warren have been consistently recorded (Welsh and others 2014).

The very low resistivity found in the locality of the proposed re-regulating storage suggests that the soils are extremely permeable. The results indicate that groundwater control during construction and seepage control measures may be required to limit the amount of seepage losses occurring at this site.

The effects of flow through the re-regulating storage structure on downstream river geomorphology and the upstream effects on the river banks from wetting and drying due to fluctuating storage pool levels have the potential to impact on river morphology.

5.2.2 Summary of potential impacts

5.2.2.1 Construction

During the construction period flows in the River will be diverted temporarily around the site of the new re-regulating storage, and no substantial impact to river flows are anticipated.

Works within the waterway pose the following risks to water quality:

- Fuel spills entering the waterway
- Sediment (soil, gravel, concrete washings) entering the waterway and increasing turbidity
- Disturbance of the river bed resulting in adverse impacts to water quality
- Management of water at the site, including dewatering of the construction site.

Mitigation measures will be put in place to manage these risks including minimising removal of vegetation, stabilising of disturbed soils, locating stockpiles and wash-down areas away from waterways, providing bunding and spill management equipment, and implementing contingencies during high river flows.

5.2.2.2 Operation

The proposed re-regulating storage is likely to have a number of impacts on the form of the River and flows in the River, including:

- Removing diverse flowing river habitats and replacing them with pool habitats
- Operating regime of the storage will impact riparian vegetation and its establishment
- The proposal will modify existing river regulation in this locality and result in changes to the regulation of flow in the Macquarie River upstream and downstream of the proposed re-regulating storage
- The proposal will not impact on the delivery of environmental water to downstream environments including to the Macquarie Marshes
- Storage pool interaction with the groundwater/aquifer.

The re-regulating storage is not anticipated to impede the passage of sediment along the River. Periodic adverse water quality impacts may arise within the storage in periods of low flow, as already occur along the River. The storage may be subject to thermal stratification with potential for cold water releases to the River downstream.

Mitigation measures include selecting a re-regulating storage location that encompasses the existing Gin Gin Weir pool, operating in accordance with requirements for the passage of environmental water and the water sharing plans, generally releasing surface water to avoid the effects of any stratification of the storage pool.

5.2.3 Proposed further assessment

Further assessment will be completed of the existing hydrological regime for any surface and groundwater resource (including reliance by users and for ecological purposes) likely to be impacted by the project. Full details of the proposed operation of the re-regulating storage and changes to river flows and tributary flow management, including surplus flows, will be presented and assessed in the EIS. Consistency of the operations with the Sustainable Diversion Limits of the Murray-Darling Basin Plan will also be assessed.

An assessment will be completed (and modelled) of the impact of the construction and operation of the project on surface and groundwater hydrology, including:

- Describing and analysing natural processes within rivers, wetlands and floodplains that affect the health of the fluvial, riparian and landscape health, aquatic connectivity and access to habitat for spawning and refuge. This will include impacts of any changes to river flows (including volume, timing and seasonality, and changes to surplus flows and planned environmental water) on the Macquarie Marshes, including the Ramsar site.

- Assessing impacts from any permanent and temporary interruption of groundwater flow, implications for groundwater dependent surface flows ecosystems and species and groundwater users.
- Predicting and assessing the potential impacts of changes to environmental water availability and flows in the River.
- Identifying direct or indirect increases in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.
- Identifying any water take from surface or groundwater sources during construction
- Identifying mitigation measures.

An assessment will be completed (and modelled, if required) of the impacts on water quality, including:

- Identifying the ambient NSW Water Quality Objectives and environmental values for the Macquarie River impacted by the project, including the indicators and associated trigger values or criteria for the identified environmental values
- Identifying and estimating the quality and quantity of all pollutants that may be introduced into the water cycle by source and discharge point, and describe the nature and degree of impact on the receiving environment
- Identifying the rainfall and river flow event to define the basis for the design of water quality protection measures
- Assessing the significance of any identified impacts including consideration of the relevant ambient water quality outcomes
- Identifying mitigation measures.

5.3 Biodiversity

5.3.1 Overview

The landscape is part of the Upper Darling Plains bioregion and river channels support red gum communities, with coolibah and black box communities on floodplains, see Figure 9.

Most of the regulated Macquarie River has high to very high ecological values due to a number of factors including the presence of a Ramsar site, the presence of threatened fish species, the presence of endangered ecological communities and large tracts of riparian vegetation and relatively undisturbed river reaches that provide habitat and contribute to primary production (NSW Department of Industry 2018a).

Loss and degradation of habitat are key threatening processes in the region. The largest remaining blocks of native vegetation are in national parks, state forests or travelling stock routes.

5.3.1.1 Threatened plant and animal species and Threatened Ecological Communities

High level searches based on the Narromine local government area of NSW Wildlife Atlas Bionet and of Protected Matters under the Commonwealth *Environmental Protection & Biodiversity Conservation Act 1999* (EPBC Act) were completed. These are indicative of the potential scale of listed matters that may be affected by the re-regulating storage and the likelihood that some impact will occur.

A search of the NSW Wildlife Atlas Bionet for the Narromine LGA shows 62 plant species listed as Threatened and 44 animal (including birds and bats) species listed as Threatened. In addition there are 14 Threatened Ecological Communities (TECs) - 11 Endangered Ecological Communities and three Critically Endangered Ecological Communities. Of the 14 TECs listed under the *Biodiversity Conservation Act 2016,* seven have a listing under the EPBC Act. Twelve migratory species of birds are also listed under the EPBC Act.

The *aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River* (Darling River EEC) is listed under the *Fisheries Management Act 1994* and includes all native fish and aquatic invertebrates within all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow diversions to anabranches, the anabranches, and the floodplains of the Darling River within the State of New South Wales, and including Menindee Lakes and the Barwon River. The sections of the Macquarie River downstream of Burrendong Dam are part of this EEC. The Final Recommendation of the Fisheries Scientific Committee indicates that '*in its natural state, many of the water-bodies in this EEC are characterised by variable and unpredictable patterns of high and low flows*".

The TECs and threatened species listed under the BC Act, FM Act and EPBC Act as having being recorded in the locality or have the potential to be present in the locality may occur within the Darling River EEC.

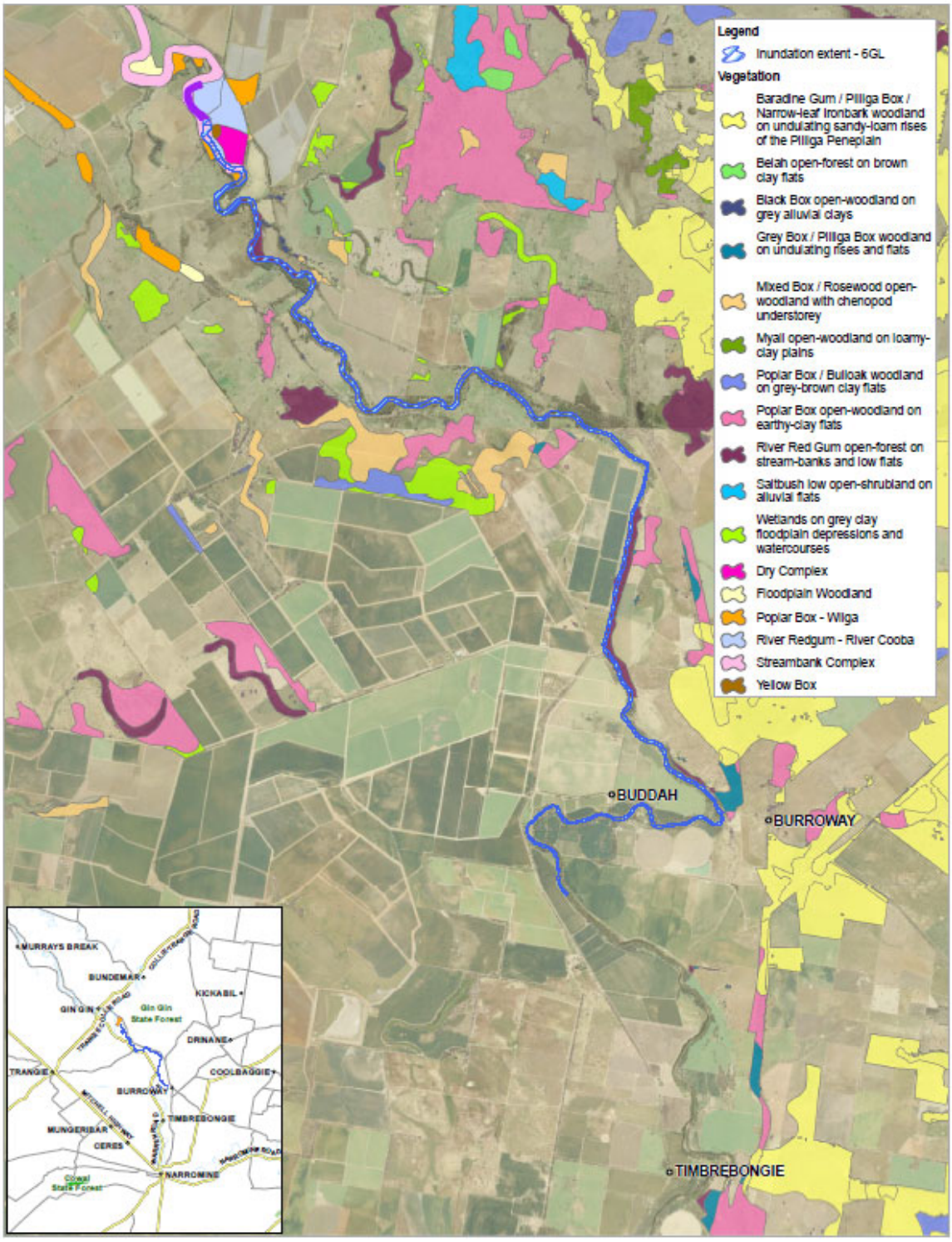

Figure 9 Vegetation types in the project area

5.3.1.2 Threatened freshwater fish distribution

The following threatened freshwater fish under the *Fisheries Management Act 1994*, with listings of Vulnerable (V), Endangered (E) or as an Endangered Population (EP), have indicative distributions in the Macquarie River catchment (Riches and others 2016) in the vicinity of the project:

- Eel-tailed Catfish (E, EP)
- Olive Perchlet (E, EP)
- Southern Purple Spotted Gudgeon (E)
- Silver Perch (V)
- Trout Cod (E).

Instream structures are also listed as the Key Threatening Process *Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams.* The *Degradation of Native Riparian Vegetation along NSW watercourses* and the *Removal of Large Woody Debris for NSW Rivers and Streams* are also Key Threatening Processes that may apply to the project.

Three fish species are protected under the EPBC Act and are known to occur in the section of river between Warren and Dubbo. These are:

- Murray Cod (Vulnerable)
- Silver Perch (Critically Endangered)
- Trout Cod (Endangered).

A review of the impacts of weirs on the aquatic habitats of the Macquarie River (NSW Department of Primary Industries 2006) included the existing Gin Gin Weir and the assessment confirms the priority for fish passage at this location.

Gin Gin Weir is ranked as a high remediation priority due to the following factors:

- Class 1 fish habitat - major permanently flowing waterway and presence of one or more threatened fish species (the Macquarie River is within the expected distribution of silver perch (*Bidyanus bidyanus*), olive perchlet (*Ambassis agassizii*), purple spotted gudgeon (*Mogurnda adspersa*) and trout cod (*Maccullochella macquariensis)*)
- Diverse range of native fish (High Conservation Value)
- Location within the catchment (fish habitat located in the lower end of the catchment have a higher conservation need due to the higher prevalence of spawning grounds or core habitats)

- Improved stream connectivity with the next upstream barrier to fish passage is Narromine Weir approximately 50km away and the next barrier downstream is Warren Weir approximately 45km away
- Low frequency of drown out (flow at which fish passage is possible, where head loss and velocities are minimal).

5.3.1.3 Macquarie Marshes

The Macquarie Marshes extend across the Lower Macquarie Floodplain north of Warren and are a significant downstream ecosystem. The wetlands are recognised in listings by NSW and the Commonwealth – listed as Critically Endangered under the *Environmental Protection & Biodiversity Conservation Act 1999*. The marshes are nationally and internationally important given their size, diversity of wetland types, extent of wetland communities and large-scale colonial waterbird breeding events. Within the wetlands are areas listed by Ramsar and are also subject to international agreements on migratory bird breeding sites.

5.3.1.4 Aquatic habitat

In an assessment completed in 2015 (NSW Department of Industry, Skills and Regional Development 2015), the Macquarie River in the vicinity of Gin Gin Weir was rated with a fish community status of 'Poor'. Key fish habitats have been mapped by the Department of Planning, Industry and Environment (Regions, Industry, Agriculture & Resources). The length of the Macquarie River that traverses the re-regulating storage site and pool is identified as Key Fish Habitat.

The Instream Value of the Macquarie River in the locality of the project ranges across medium, high and very high values. Percent cover of Native Woody Riparian Vegetation ranges from low to very high. The River styles Recovery Potential assessment categorises the location as Conservation, indicating that the River is in stable and good condition (NSW Department of Industry 2018a).

The ecological value of high probability groundwater dependent vegetation ecosystems in the locality of the project ranges across medium and high values. The high ecological value areas are potentially associated with the highly diverse riparian vegetation communities and the connected riparian corridors that these provide for threatened bird species (NSW Department of Industry 2018b).

5.3.1.5 State Forests

There are no State Forests along the River in the vicinity of the project.

5.3.1.6 National parks and reserves

There are no National Parks or reserves along the River in the vicinity of the project. Downstream reserves include Macquarie Marshes Nature Reserve.

5.3.2 Summary of potential issues

5.3.2.1 Construction

Potential impacts to biodiversity values during construction include:

- Loss of riparian and native terrestrial vegetation
- Loss of areas of endangered ecological communities
- Injury or mortality to fauna due to clearing and increased construction traffic
- Loss of terrestrial habitat due to clearing and impoundment
- Fragmentation of riparian habitat and loss of movement corridors and connectivity.

Mitigation measures will be applied to the project minimising the extent of the construction area and therefore the vegetation required for removal at the project site and for access, protecting vegetation outside the construction area, instituting native fauna management protocols for the construction area and rehabilitating and revegetating disturbed areas.

5.3.2.2 Operation

The greatest threat to the Ramsar site and the greater Macquarie Marshes is identified as the alteration of the natural flow regime through river regulation. Environmental watering flows to the marshes will be unaffected by the re-regulating storage. Impacts to other parts of the flow regime are likely and the effects of this on the area of the Macquarie Marshes and the River downstream of the re-regulating storage will be assessed.

Other potential impacts during the operation of the re-regulating storage include:

- Change of flowing river habitats to pool habitat
- Impacts to aquatic habitats and riparian vegetation from the regular variability of water levels within the storage and the associated effects on river bank stability
- Improvements to fish passage in the locality with fish passage provided at the new storage and the removal of the barrier effects of Gin Gin Weir.

Mitigation measures will be put in place to ensure that: the operation of the re-regulating storage delivers required environmental water downstream; the fish passage is operated and maintained

to meet the target operating objectives; and, the operating regime of the storage is managed to minimise adverse impacts to river banks.

5.3.3 Proposed further assessment

Biodiversity impacts will be further assessed in accordance with the NSW *Biodiversity Conservation Act 2016*, and documented in a Biodiversity Development Assessment Report that will document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method. This will address guidelines including:

- *Biodiversity Assessment Method* (Office of Environment and Heritage 2017)
- *Policy and guidelines for fish habitat conservation and management* (Department of Primary Industries 2013)
- *NSW Biodiversity Offsets Policy for Major Projects* (Office of Environment and Heritage 2014)
- *Risk assessment guidelines for groundwater dependent ecosystems* (Serov and others 2012).

The assessment will include:

- Reviewing existing information and database records
- Field surveys, including vegetation mapping, plot/transects, threatened flora searches, and flora and fauna habitat surveys
- Identifying the extent of native vegetation within and adjoining the construction site and the re-regulating storage pool inundation area
- Assessing the potential impacts on biodiversity, including impacts on threatened species, populations and ecological communities and habitat. This will include Murray cod breeding areas and habitat for freshwater mussels
- Identifying the character of the Macquarie Marshes Ramsar site and assessing any impacts of the project to critical components, processes and services of the site that define its character
- Identifying and assessing aquatic habitats and fauna in accordance with the *Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management* (NSW Department of Primary Industries 2013)
- Assessing any contribution to a Key Threatening Process
- Assessing impacts to fish movement (and life cycles) in the River and the amelioration of impacts provide by fish passage at the new re-regulating storage and Gin Gin Weir
- Identifying mitigation measures

- Identifying impacts requiring offsetting, and the requirements and options for offsetting
- Conducting assessments of significance pursuant to the *Environmental Protection and Biodiversity Conservation Act 1999* significant impact guidelines for impacts on matters of national environmental significance, NSW *Biodiversity Conservation Act 2016* for terrestrial biota, and the *NSW Fisheries Management Act 1994* for threatened aquatic biota.

5.4 Heritage

5.4.1 Aboriginal Heritage

The project site is located within the traditional country of the Wiradjuri People. The project locality is on the lands of the Trangie Local Aboriginal Land Council (LALC), Narromine LALC and Warren Macquarie LALC.

The initial search of the Aboriginal Heritage Information Management System (27 July 2019) indicated no registered Aboriginal sites or places within one kilometre of the proposed re-regulating storage structure. Registered sites are located adjacent to the River around Rocky Point, some 20 kilometres upstream. The River at Rocky Point will be within the inundation area of the new re-regulating storage.

The nature of the recorded sites suggests that similar sites are likely to exist at other locations along the River and across the landscape.

A search of Native Title Vision, the National Native Title Tribunal's online mapping database (24 November 2019), indicated no Native Title determinations or applications at the project site.

5.4.2 Historic Heritage

Local environmental plans, the State Heritage Register and the National Heritage List were reviewed to identify heritage items in the vicinity of the project site.

Only Gin Gin Weir is contained in the above listings. It is listed in WaterNSW's s170 Heritage and Conservation Register. The listing refers to the weir as being of 'Moderate State' significance but this level of significance is no longer recognised in NSW for the overall listing of a place. The weir is not currently listed as being of either local or state significance.

In the upper reaches of the re-regulating storage pool is the property Buddah, near Timbrebongie, which is listed as a heritage item in the *Narromine Local Environmental Plan 2011*.

5.4.3 Summary of potential issues

5.4.3.1 Construction

Since early European settlement, the locality has been subject to significant disturbance. Items and sites of Aboriginal heritage significance are most likely to occur in areas associated with water sources.

In the vicinity of the project only Gin Gin Weir is listed as an item of historic heritage. There is also the potential for archaeological items associated with its construction to persist in the locality.

Gin Gin Weir will be modified to permit fish passage in periods of low flow or low storage levels. A section of the weir will be removed to permit fish passage. Alterations to the weir may also be required to stabilise the remaining structure or for navigation and public safety. The alterations, modifications or removal of part of the existing Gin Gin Weir will have an effect on the structure's heritage value.

Potential impacts to Aboriginal sites may occur during the construction phase, primarily with earthworks and clearing. Archaeological survey work and assessment will be undertaken for the EIS to determine the extent of potential impacts and ensure that any impacts are assessed and managed.

Mitigation measures will include avoiding and protecting items of cultural heritage or archaeological significance. Modifications to Gin Gin Weir will be the minimum required to provide for fish passage, stability of the existing structure and public safety.

5.4.3.2 Operation

No direct impacts are predicted during operation. Indirect impacts associated with the operation of the re-regulating storage pool will be further assessed.

5.4.4 Proposed further assessment

An Aboriginal cultural heritage assessment will be undertaken which will involve:

- Identify and assess any impacts in accordance with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (Office of Environment and Heritage 2011) and *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water 2010)
- Completing updated database searches and reviewing any previous investigations and assessments
- Identifying mitigation measures
- Preparing an Aboriginal cultural heritage assessment report.

A non-Aboriginal heritage impact assessment will be undertaken to assess the potential impacts of construction and operation. It will involve:

- Searches of heritage databases and a review of relevant literature, including consideration of the heritage assessment completed for Gin Gin Weir
- Identifying areas of potential archaeological significance
- Assessing heritage significance, including that of Gin Gin Weir, in accordance with relevant guidelines (NSW Heritage Office, 2001) and include a statement of heritage impact for all heritage items
- Assessing potential impacts to items of local, state, National and Commonwealth heritage significance
- Carrying out an archaeological assessment, where required, to determine the presence of potential non-Aboriginal archaeological items and the potential impacts of the project
- Consulting with relevant stakeholders
- Identifying recording and public interpretation of items of heritage significance affected by the project
- Identifying mitigation measures.

5.5 Social and economic

5.5.1 Overview

Land in the locality is used for dryland and irrigated cropping and grazing. Regional tourism is also an important contributor to the local economy, including an emphasis on river based activities although public access points to the River are limited.

Local towns include Narromine, Trangie and Warren. Dubbo, 67km by road to the south east, is the closest major population centre to the project site.

The project site is within the Narromine local government area.

5.5.1.1 Local reserves

Two reserves managed by Narromine Shire Council are located on the River and are likely to be impacted by the project:

- Gin Gin Weir Reserve at Gin Gin Weir includes land on both sides of the River, including Crown Reserve No76510 on the downstream right bank, managed by the council as a public reserve
- Timbrebongie Falls Reserve is located on the River between Gin Gin Weir and Narromine.

5.5.2 Summary of potential issues

5.5.2.1 Construction

Construction has the potential to result in the following social and business issues:

- Impacts associated with property access and acquisition
- Changes to access for some landowners, residents and visitors including as a result of changes to access in the immediate vicinity of the project site
- Impacts to community amenity, including as a result of changes to traffic, noise, air quality and the visual environment
- Impacts to Gin Gin Weir Reserve, including restrictions on access, use and its visual quality
- Employment and business opportunities as a result of the generation of construction related jobs, revenue for businesses providing construction facilities and resources, and increased patronage for some businesses providing services for employees in local towns.

Mitigation measures will include minimising long term alienation of private and public land, retaining access to private land throughout construction and promoting use of local businesses for construction resources.

5.5.2.2 Operation

Operational impacts to land use would mainly affect those areas around the new re-regulating storage and upstream in the area of inundation. The use of land occupied by the re-regulating storage would change from a public recreation reserve to water supply. Potential social and business issues include:

- Impacts to land owners occupying land subject to property acquisition or easements
- Impacts on the recreational opportunities provided by the Gin Gin Weir Reserve with a resulting loss of riverside beach areas in a locality where there are few publicly accessible river reserves (if the loss cannot be offset)
- Impacts to water intakes from riverside pumps for changes to river levels in the new re-regulating storage
- Changes to cross-river access
- Benefits to agricultural users in the vicinity of the re-regulating storage and downstream
- Environmental and recreational benefits with improved fish passage in this locality.

Mitigation of operational impacts will include maintaining long term public access to the Gin Gin Weir Reserve, rehabilitating areas cleared for construction and providing enhanced recreational opportunities with the re-regulating storage pool.

5.5.3 Proposed further assessment

A land use and property assessment will be undertaken to assess the potential impacts of construction and operation. It will include:

- Identifying land uses, ownership and existing access arrangements
- Reviewing relevant planning instruments, regional plans and land use strategies
- Confirming land acquisition requirements
- Assessing potential impacts on land use and property during construction and operation
- Identifying mitigation measures, including potential opportunities to enhance or upgrade recreation areas impacted by the project.

A socio-economic impact assessment will be undertaken to assess the potential impacts of construction and operation. It will include:

- Analysing available community data, reviewing the characteristics of communities in the study area and preparing a profile of communities with the potential to be affected by the project
- Identifying community facilities in the study area
- Analysing the outcomes of community consultation in relation to community values (including the values attached to places or facilities), issues and concerns
- Describing the existing business and economic environment and analysing how this might be impacted by the project
- Reviewing the results of other relevant specialist assessments
- Assessing the potential impacts and benefits of the project during construction and operation
- Identifying mitigation measures
- Considering any cumulative impacts from construction and operation of the project and other projects in the area.

5.6 Soils and land

5.6.1 Overview

The project site locality is part of the Upper Darling Plains physiographic region and is a low lying alluvial floodplain at around 220mAHD.

The dominant soils on the Upper Darling Plains and Cobar Plains are grey and brown Vertosols and red Chromosols. The project locality is characterised by Chromosols which exhibit a strong texture contrast between the upper and lower horizons. A narrow belt of Dermosols occur along the Macquarie channel, which have structured horizons at depth, but lack strong texture contrast between upper and lower horizons. The locality is considered very good cropping land with fertile soils and short, low slopes. The main land and soil hazards in the subregion are soil salinity and waterlogging, structural decline, carbon decline, acidification and wind erosion. (Welsh and others 2014).

A search of the NSW EPA contaminated Land Register (24 November 2019) did not identify any contaminated lands on or adjacent to the re-regulating storage.

5.6.2 Summary of potential issues

5.6.2.1 Construction

The exposure of soil and the associated spoil may have the potential to increase the risk of an erosion and runoff hazard. The majority of areas that would encounter soil disturbance are likely to have received some level of disturbance in the past due to current land use. In summary:

- Soils exposed during excavation and vegetation removal may result in erosion
- Watercourses within the project corridor may be impacted through an increase in sediment loads during rainfall events that would lower existing water quality. Other pollutants could potentially be introduced to waterways during construction, through chemical spills
- Erosive soils that exist in the area may create stability issues during construction
- Compaction of soils during construction could lead to decreased permeability
- Wind erosion may occur from unsecured stockpiles or soil mounds created during the earthworks or mobilisation of fill material
- Mitigation measures will be put in place that include minimising removal of vegetation, stabilising of disturbed soils and stockpiles, providing water management across the project site, and rehabilitating the project site.

5.6.2.2 Operation

The operation of the re-regulating storage will result in a more regular cycle of wetting and drying of riverbanks within the inundation area of the re-regulating storage. The periods of saturation of river banks as the re-regulating storage pool is filled will be followed by the drying out of the banks

as the re-regulating storage pool is depleted. This operation could lead to increasing bank surcharge and riverbank cracking with impacts on riverbank stability and resultant bank slumping.

The hydraulic impact of the re-regulating storage will be to create a localised increase in turbulence and flow velocity immediately downstream of the re-regulating storage. This has the potential to cause erosion of the river bed and banks, and may result in the creation of a deep pool downstream of the re-regulating storage. The stilling basin on the downstream base of the re-regulating storage, and further bed and bank protection will prevent these impacts. There is also potential for erosive impacts to river banks at river bends immediately downstream of the re-regulating storage.

The raised pool level created by the re-regulating storage may promote localised raising of groundwater levels in the areas adjoining the River. The River may be a naturally losing stream in this locality and recharge source for the deep alluvial aquifer below the River.

Mitigation measures will include protecting the river bed and banks downstream of the re-regulating storage and operating the storage to minimise substantial adverse impacts to river bank stability.

5.6.3 Proposed further assessment

Further investigation and assessment will be completed to:

- Assess the construction and operation of the re-regulating storage to soils and river geomorphology in the vicinity of the project
- Assess the effects of the re-regulating storage's area of inundation and proposed operations on riverbank stability
- Identify whether the land is likely to be contaminated and identify if remediation of the land is required
- Assess whether salinity is likely to be an issue and if so, determine the presence, extent and severity of soil salinity within the project area. The assessment will identify any impacts of the project on soil salinity and how it may affect groundwater resources and hydrology
- Identify mitigation measures.

5.7 Hazards

5.7.1 Overview

A considerable amount of overbank flooding occurs in the Macquarie River reach between Narromine and Marebone. During the 1990 flood, approximately 50% of the peak flow recorded at Narromine broke out of the Macquarie River in the reach between Narromine and Gin Gin. Major breakouts from the left bank in this reach include Bugaboo Point, located 25 kilometres downstream of Narromine Bridge, and downstream Rocky Point. These were active during the large floods of 1955 and 1990 (Bugaboo Point was also active during the 2010 flood). On the right bank, overflows occur in a north-westerly direction, mainly downstream of the Crooked Creek offtake (NSW Department of Industry, 2018c).

The project site is within the Macquarie River floodplain, subject of the *Draft Floodplain Management Plan for the Macquarie Valley Floodplain 2018*. Floodplain management in this region has been administered by the NSW Government since the late 1970s in response to the impact of flood works associated with irrigation development on the passage of floodwaters.

Major fire seasons have occurred around Narromine in 1957, 1964, 1979, 1987 and 2001. These years have generally reflected periods of healthy vegetation growth after good winter and spring rainfall followed by a very hot summer. However severe fires were also experienced during the drought. Recent experience shows that major fires are now occurring much more frequently. In 95-99% of cases of fires in the Orana area the normal fire suppression methods generally brings these fires under control within a few hours. With the other 1-5% of cases that can only be described as major fires or fire storms Orana Bush Fire Management Committee 2011).

5.7.2 Summary of potential issues

5.7.2.1 Construction

Construction has the potential to result in the following issues:

- Changes to flooding regimes and behaviour upstream or downstream of the location of temporary access, construction infrastructure, stockpiles and compounds
- Impairment or modification of existing drainage patterns
- A fire source including through the operation of equipment, machinery and vehicles, careless acts by individuals or power supplies.

These impacts would generally be short term and temporary over the period of construction. Flooding of sections of the project site may occur during high river flows or high intensity rainfall events.

Mitigation measures may include locating stockpiles outside of water courses, constructing access tracks at close to surrounding ground level, rehabilitating construction areas to original landforms and minimising activities during periods of high risk

5.7.2.2 Operation

A key operational issue relates to the presence of the new re-regulating storage which will change existing flooding conditions. The re-regulating storage could affect upstream and downstream flows and flood behaviour, change the duration and extent of inundation and lead to scouring downstream.

The operation of the re-regulating storage would be designed to address these issues and minimise potential flooding impacts. The operation of the re-regulating storage is unlikely to be a major bush fire source.

Mitigation measures will include operating the re-regulating storage to established high flow and flood flow arrangements, and maintaining access tracks to minimise local flooding impacts.

5.7.3 Proposed further assessment

Further investigations to assess (and model) the impacts on flood behaviour during construction and operation for a full range of flood events including:

- Any detrimental increases in the potential flood effects to properties, assets and infrastructure
- Consistency with the applicable floodplain management plan and the *Floodplain Development Manual* (Department of Infrastructure Planning and Natural Resources 2005)
- Compatibility with the flood hazard of the land
- Downstream velocity and scour potential
- Impacts the development may have upon existing community emergency management arrangements for flooding. These matters must be discussed with the State Emergency Services and Narromine Shire Council
- Any impacts the development may have on the social and economic costs to the community as consequence of flooding.

A bush fire risk assessment will be completed to identify potential ignition sources during construction and operation, and the best management for any fire risks.

5.8 Visual

5.8.1 Overview

The landscape and visual quality of the locality is characterised by farmlands and a corridor of riparian vegetation following the river course.

The project site is contained within an area of farmland and riparian woodland. The locality already contains a weir and weir pool.

It is not expected that the project site could be viewed from the main public roads in the locality. Public access to the River is limited by private landholdings apart from at Gin Gin Weir Reserve and Timbrebongie Falls Reserve.

5.8.2 Summary of potential issues

5.8.2.1 Construction

During construction, visible elements would include work sites, river diversion works, the re-regulating storage and fish passage under construction, machinery and equipment, fencing, stockpiles, waste materials, compounds and any lighting. This will be visible from private property and Gin Gin Weir Reserve.

There would also be a reduction in recreational space at Gin Gin Weir Reserve. Public access to this area will also be restricted.

Mitigation measures will include locating construction activities away from sensitive receivers and such that existing vegetation offers visual screening, and retaining public access to parts of Gin Gin Weir Reserve.

5.8.2.2 Operation

The project will introduce a new re-regulating storage and fish passage into the landscape and associated power supply and operational equipment. The removal of trees and vegetation will be a long term visible change.

Mitigation measures will include rehabilitating and revegetating disturbed areas.

5.8.3 Proposed further assessment

A landscape character and visual impact assessment will be undertaken to identify the potential impacts of construction and operation. It will include:

- Identifying existing landscapes and features

- Analysing impacts to views and vistas
- Identifying heritage items that may be impacted
- Assessing impacts to public recreation areas
- Identifying mitigation measures.

5.9 Air, noise and vibration

5.9.1 Overview

The background noise environment is typical of a rural area comprised of agricultural properties and rural residences. Background noise levels are expected to be low and the main existing noise sources in the vicinity of the proposal would be associated with traffic on the road network and operation of agricultural plant and machinery.

The nearest sensitive receptors to the site will be the public accessing Gin Gin Weir Reserve. The closest homestead to the site is some 1.5 km away and there are three homesteads within 2km of the site.

5.9.2 Summary of potential issues

5.9.2.1 Construction

The construction of the re-regulating storage would increase noise and potentially vibration at receivers close to the site. Construction will generate noise due to the operation of plant and machinery. Piling activities will also generate noise and vibration. Increased construction traffic will also contribute to these levels.

There will also be temporary increases in emissions from construction plant and the dust that may result from earthworks and ground disturbance, stockpiles and vehicle movements.

The potential impact of increased dust and emissions depend on the scale of the activity, the quantities of material handled, the distance to sensitive receivers and wind conditions. Any impacts would be temporary.

Work will generally be undertaken within standard construction hours. However, work outside of these hours is likely and the EIS will assess extended construction hours for the development, including on Saturday and Sunday, and potentially overnight.

Mitigation measures will include minimising construction activities near any sensitive receivers.

5.9.2.2 Operation

During operation of the re-regulating storage (gate operation and discharge of water) any associated noise and air quality levels are likely to be minimal, limited to adjusting gates and maintenance activities.

5.9.3 Proposed further assessment

A construction noise and vibration assessment would be undertaken for the project. Occupants of noise sensitive properties would be consulted as part of this assessment. This assessment would involve a quantitative construction noise assessment (in accordance with the NSW EPA Interim Construction Noise Guidelines) and include the following:

- Identification of noise sensitive receivers
- Noise monitoring for baseline noise levels (if required)
- Modelling and predictions of noise levels
- Planning to ensure that activities are organised to minimise impacts during construction.

An assessment will also be made of the potential impact of increased dust and emissions to sensitive receivers. The assessment will also consider the scale of the activity, the quantities of material being handled, the distance to sensitive receivers and wind conditions.

5.10 Access

5.10.1 Overview

There are sealed roads on either side of the River with Warren Road to the south of the River and Burroway Road to the north. The two roads are connected in the west by the Trangie Collie Road at Gin Gin and in the south at Narromine. Immediate access to the project site would be, from the west via Gin Gin Weir Road off Warren Road and, from the east, via the existing Gin Gin Weir Reserve access track off Burroway Road. Most of the roads in the locality are classified as local roads, except for the Mitchell Highway which connects Dubbo to Nyngan via Narromine and Trangie which is a State road (No.7) and the Trangie Collie Road is a Regional road (No.347).

5.10.2 Summary of potential issues

5.10.2.1 Construction

During construction, heavy vehicles would deliver construction plant, equipment and materials, and remove waste. There would be an increase in heavy vehicle movements on roads and an

increase in light vehicle movements associated with smaller deliveries and construction worker transport. Refer to Figure 7 for expected access arrangements to the site.

Mitigation measures will include managing construction access and traffic consistent with a traffic management plan for the project site.

5.10.2.2 Operation

During operation, there will be a small number of additional light traffic movements in the locality associated with operating and maintaining the re-regulating storage.

A river crossing around 15 km upstream of the site may be affected during operational conditions and further assessment is required to determine crossing usage, levels and potential for inundation.

5.10.3 Proposed further assessment

A traffic, transport and access assessment will be undertaken to assess the potential impacts of construction and operation. The assessment will include:

- Confirming the existing traffic and transport environment
- Identifying and assessing potential traffic impacts, including site access identification, construction traffic volumes, the nature of existing traffic and the need to apply traffic management measures
- Identifying and assessing other potential transport impacts to public roads
- Identifying and assessing potential access impacts
- Considering the potential for cumulative impacts
- Identifying mitigation measures.

5.11 Other environmental issues

5.11.1 Resources and waste

The main legislation relevant to the management of waste in NSW are the *Protection of the Environment Operations Act 1997* (POEO Act), the *Protection of the Environment Operations (Waste) Regulation 2014* (Waste Regulation) and the *Waste Avoidance and Resource Recovery Act 2001* (the WARR Act).

The POEO Act establishes the procedures for environmental control and for issuing environmental protection licences covering issues such as waste. The Waste Regulation regulates matters such as the obligations of consignors (producers and agents), transporters and receivers of waste in relation

to waste transport licensing and tracking requirements. The WARR Act aims to ensure that waste management options are considered against the following waste management hierarchy:

1. Avoidance of unnecessary resource consumption
2. Resource recovery (including reuse, reprocessing, recycling and energy recovery)
3. Disposal.

Summary of potential issues

Construction

Resources

Construction materials would be required to construct the project, including concrete, steel and gravel. Prefabricated components will also be required including re-regulating storage gates and operating equipment. These would be sourced from relevant manufacturers and suppliers.

Construction water would be sourced from the River in accordance with a licence issued under the *Water Management Act 2000*.

Waste

The majority of waste associated with the project would be generated during construction and may include:

- Excavation waste (spoil)
- Demolition waste (if required)
- Hazardous waste/contaminated spoil (if required)
- Vegetation waste
- Liquid waste (including contaminated groundwater)
- Other construction waste
- General wastes from site workers and personnel.

Wastes would be managed in accordance with the waste provisions contained within the POEO Act and, where reused off site, would comply with relevant EPA resource recovery exemptions. A waste management strategy will be developed for the project.

Operation

The volume of wastes generated during operation would be minor and associated with maintenance and any replacements required in the long term. Wastes would be managed by the implementation of WaterNSW's standard waste management strategies.

Proposed further assessment

The EIS will provide further details on resource and waste management for the project, including:

- Estimating the quantity of key waste types that may be generated
- Identifying the approximate resource requirements for the project, including estimation of key materials requirements
- Identifying a management hierarchy to reduce the volume of spoil needing to be disposed
- Identifying the availability of materials from the region, including from quarries, potential material suppliers and reuse of materials
- Assessing the potential waste management approach and impacts
- Summarising the approach to managing contaminated soil should these be encountered
- Identifying mitigation measures.

5.11.2 Safety

Hazard and risk impacts associated with the project have the potential to affect the surrounding environment and human health.

Summary of potential issues

Construction

Potential issues during construction include:

- Risks associated with the accidental release of dangerous or hazardous materials to the environment due to improper handling or storage, or in the event of a vehicle or construction equipment incident
- Risks associated with the accidental release of contaminated groundwater or soil, if present, to the environment
- Risks of exposure to increased levels of noise and dust from work sites and construction vehicles
- Flooding or inundation of construction work areas during heavy rainfall or high river flows.

Other construction activities could result in impacts to the health and safety of site workers, users, visitors and the local community if improperly managed. These include:

- Operation of vehicles and construction equipment on site
- Transportation of equipment, excavated spoil and material to and from site
- Potential for risks to public safety resulting from unauthorised access to construction work areas.

All construction work would be isolated and secured from the general public. Health and safety risks during construction would be managed by the implementation of standard workplace health and safety requirements. A work health and safety management plan, and safe work method statements, would be developed in accordance with regulatory requirements.

Operation

Potential issues during operation include:

- Risks associated with any recreational use around the existing weir walls and submerged hazards
- Risks from unauthorised access to the new re-regulating storage and its operating gates.

Proposed further assessment

A risks and health assessment will be undertaken for the project and it will include:

- Reviewing the relevant regulatory framework and applicable guidelines
- Identifying construction and operational activities with the potential to cause impacts to off-site receivers
- Describing the design features of the project that would manage risk and hazards during the operational stage
- Qualitatively assessing potential impacts, including reviewing the results of the noise and vibration assessment and the air quality assessment in relation to the potential for health impacts
- Identifying mitigation measures.

6. Summary

The Macquarie River valley experiences relatively low water reliability and security compared to other water systems in NSW, particularly arising from distribution difficulties and operational inefficiencies. WaterNSW proposes to construct, operate and maintain a re-regulation storage on the Macquarie River near Gin Gin to increase the security of the supply of water, to realise the full potential of water intensive agricultural operations and improve town water security in the region.

The project is State significant infrastructure under the State and Regional Development SEPP and WaterNSW is therefore seeking approval under Part 5.2 of the EP&A Act for the project. WaterNSW will also refer the project to the Minister for the Environment to determine whether or not the project is an action that will need formal assessment and approval under the EPBC Act.

Further engineering and environmental studies would be undertaken to refine the design and this would take place in parallel with the EIS.

WaterNSW will submit an EIS to the NSW Department of Planning, Industry and Environment that will assess potential impacts associated with the project. Stakeholders including government agencies, representatives of the Aboriginal community, landholders and the broader community would be consulted during preparation of the EIS. This would provide opportunities for ongoing iterative feedback during the approvals process.

The project has the potential to generate substantial positive impacts by creating direct and indirect employment in the region. Potential areas of environmental risk may include hydrology and water quality, ecology, and Aboriginal cultural heritage.

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APPENDICES

A. Scoping worksheet

Project : **Macquarie River Reregulating Storage**

Calculate Level of Assessment in EIS - | Clear Category

	MATTERS	IMPACTS		ASSESSMENT LEVEL	CUMULATIVE IMPACTS	COMMUNITY ISSUES	ASSESSMENT APPROACH	SCOPING REPORT
Potential matters that could be affected by the project		Is the project (without mitigation) likely to cause an impact?	Are the impacts (without mitigation) likely to be significant based on the magnitude of the impacts and/or sensitivity of receivers?	What level of assessment is required to assess impacts and determine mitigation measures?	Will cumulative assessment be required?	Did the community raise any concerns about the impacts?	Indicative approach to assessment in EIS	Where was this addressed in the Scoping Report?
Group	**Specific**	**Impact?**	**Significant Impact?**	**Assessment Level**	**Cumulative Impact?**	**Concerns?**	**Category**	**Section**
ACCESS	access to property	Unknown	Unlikely	Standard	No	Yes	Scoping Report with focussed engagement	5.10
	parking	Unknown	Unlikely	Standard	No	No	Scoping Report	2.3 & 5.10
	port / airport facilities	N/A	N/A				None (include short explanation in Scoping Report)	
	road / rail network	Yes	Unlikely	Standard	No	No	Scoping Report	2.2 & 5.10
	other - please specify							
AIR	atmospheric emissions	N/A	N/A				None (include short explanation in Scoping Report)	
	gases	N/A	N/A				None (include short explanation in Scoping Report)	
	particulate matter	Yes	Unlikely	Standard	No	No	Scoping Report	5.9
	other - please specify							
AMENITY	noise	Yes	Unknown	Detailed	No	No	Detailed Assessment	5.9
	odour	N/A	N/A				None (include short explanation in Scoping Report)	
	vibration	Unknown	Unlikely	Standard	No	No	Scoping Report	5.9
	visual	Yes	Unlikely	Standard	No	No	Scoping Report	5.8
	other - please specify							
BIODIVERSITY	conservation areas	Yes	Unknown	Standard	Yes	Yes	Standard Assessment and CIA with focussed engage	5.3
	native vegetation	Yes	Likely	Detailed	No	Yes	Detailed Assessment with focussed engagement	5.3
	native fauna	Yes	Likely	Detailed	Yes	Yes	Detailed Assessment and CIA with focussed engagen	5.3
	fish and fish passage	Yes	Likely	Detailed	Yes	Yes	Detailed Assessment and CIA with focussed engagen	5.3
BUILT ENVIRONMENT	private property	Yes	Unknown	Standard	No	Yes	Standard Assessment with focussed engagement	2.4.4 & 5
	public domain	Yes	Unknown	Standard	Yes	Yes	Standard Assessment and CIA with focussed engage	5.5
	public infrastructure	Yes	Unknown	Standard	No	Yes	Standard Assessment with focussed engagement	5.5
	other - please specify							
ECONOMIC	livelihood	Unknown	Unlikely	Standard	No	Yes	Scoping Report with focussed engagement	5.5
	natural resource use	Yes	Unknown	Detailed	Yes	Yes	Detailed Assessment and CIA with focussed engagen	5.5
	opportunity cost	Yes	Unknown	Standard	No	Yes	Standard Assessment with focussed engagement	5.5
	other - please specify							
HAZARDS & RISKS	biosecurity	N/A	N/A				None (include short explanation in Scoping Report)	
	bush fire	Unknown	Unlikely	Standard	No	No	Scoping Report	2.4.3 & 5.7
	coastal hazards	N/A	N/A				None (include short explanation in Scoping Report)	
	dams	Yes	Likely	Standard	Yes	Yes	Standard Assessment and CIA with focussed engage	2.2 & 5.2
	dangerous goods	N/A	N/A				None (include short explanation in Scoping Report)	
	environmental hazards	N/A	N/A				None (include short explanation in Scoping Report)	
	floods	Yes	Likely	Detailed	Yes	Yes	Detailed Assessment and CIA with focussed engagen	2.4.3, 5.2 & 5.7
	groundwater contamination	N/A	N/A				None (include short explanation in Scoping Report)	
	hazardous / offensive development	N/A	N/A				None (include short explanation in Scoping Report)	
	land contamination	N/A	N/A				None (include short explanation in Scoping Report)	
	land movement	N/A	N/A				None (include short explanation in Scoping Report)	
	waste	Unknown	Unlikely	Standard	No	No	Scoping Report	5.11.1
	other - please specify							
HERITAGE	Aboriginal cultural	Yes	Unknown	Detailed	Yes	Yes	Detailed Assessment and CIA with focussed engagen	5.4
	historic	Yes	Likely	Detailed	No	Yes	Detailed Assessment with focussed engagement	5.4
	natural	N/A	Unlikely				None (include short explanation in Scoping Report)	
	other - please specify							
LAND	land capability	Unknown	Unknown	Standard	No	No	Standard Assessment	5.6
	soil chemistry	Unknown	Unknown	Standard	No	No	Standard Assessment	5.6
	stability / structure	Yes	Likely	Detailed	No	Yes	Detailed Assessment with focussed engagement	5.6
	topography	Yes	Unlikely	Standard	No	No	Scoping Report	5.6
	other - please specify							
SOCIAL	community services / facilities	Yes	Unknown	Standard	Yes	Yes	Standard Assessment and CIA with focussed engage	5.5
	health	N/A	N/A				None (include short explanation in Scoping Report)	
	housing availability	N/A	N/A				None (include short explanation in Scoping Report)	
	safety	Unknown	Unknown	Standard	No	No	Standard Assessment	5.11.2
	social cohesion	N/A	N/A				None (include short explanation in Scoping Report)	
	other - please specify							
WATER	ground water quality	Unknown	Unknown	Standard	Yes	Yes	Standard Assessment and CIA with focussed engage	5.2
	hydrological flows (including flooding)	Yes	Likely	Detailed	Yes	Yes	Detailed Assessment and CIA with focussed engagen	5.2
	surface water quality	Yes	Likely	Detailed	Yes	Yes	Detailed Assessment and CIA with focussed engagen	5.2
	water availability	Yes	Likely	Detailed	Yes	Yes	Detailed Assessment and CIA with focussed engagen	5.2
	other - please specify							

B. Community and Stakeholder Engagement Strategy

Community and stakeholder engagement objectives

Community engagement and regular communication are important parts of the development of the project.

WaterNSW has the following objectives in undertaking community and stakeholder engagement activities for this project:

- Ensure that the community and stakeholder engagement is open and transparent, and the community understands the purpose of the engagement and how and when they will be involved
- Provide opportunities for discussion, communication and feedback that reflect the diversity of the community, and stakeholder interests and are inclusive of all that may be affected by the project
- Make available information that is easy to obtain, understand and tailored to issues and interests
- Ensure that the project development and delivery meets the balance of the stakeholder and community needs and expectations
- Respond to community contact in a timely manner that also identifies how the feedback will be addressed.

WaterNSW will proactively engage and inform affected stakeholders and the community about the project and provide opportunities for feedback. Issues raised during the engagement will be provided to the project team to inform project development and environmental assessment and the preparation of the EIS.

Engagement activity

Stakeholder Forums

A series of stakeholder forums were held with identified community, angler, recreational, irrigator and environmental groups to inform the development of the Detailed Business Case (DBC). A list of the groups who were invited to attend these forums can be seen below in Table B1.

Table B1 Invitees to stakeholder forums

Stakeholder Forum 1	Stakeholder Forum 2	Stakeholder Forum 3
Trangie-Nevertire Irrigation Scheme	Outback Dragons	Healthy Rivers Dubbo
Commonwealth Environmental Water Office	Dubbo Canoe Club	Little River Landcare Group Inc
Narromine Irrigation Board of Management	Macquarie River Paddle Club	Nature Conservation Council
Central West Local Land Services	WomDomNom Organising Committee	Dubbo RiverCare Group Inc
NSW Minerals Council	OzFish Unlimited	Inland Waterways Rejuvenation Association
NSW Farmers Association	Keep Australia Fishing	Cenwest Environmental Services
NSW Waterwatch	NSW Council of Freshwater Anglers	Inland Rivers Network
NSW Irrigators Council		Marie Ryan - Conservationist
Trangie Agricultural Research Centre		
Floodplain Management Australia		
Dubbo Field Naturalist and Conservation Society		
Macquarie River Food and Fibre		

Key: - attended the forum

Community feedback received

Table B2 below provides a detailed summary of feedback received during the engagement activities undertaken to date.

Table B2 Community feedback to date

Category	Issue raised	Stakeholder
Construction		
Access	Continued public access to site	Narromine Shire Council
Consultation		
Enquiry about consultation program	Questions regarding opportunity and timing of formal project feedback period	DPIE (Regions, Industry, Agriculture & Resources)
	Enquiry into the consultation process for the project and engagement opportunities	Warren Macquarie LALC Narromine LALC
	Opportunity for RAP registration consultation	Narromine LALC
	Enquiry as to when the project was formally announced	Attendees of Stakeholder Forum 1
	Enquiry as to when the scoping document would be put to DPIE for consideration	DPIE (Regions, Industry, Agriculture & Resources)
	Enquiry regarding the development of the EIS and associated next steps	Attendees of Stakeholder Forum 1
Feedback on consultation activities / collateral	Suggestions for consultation with: • ROSSCo • CAG • MRFF • Buddah Lake Irrigators Association • Greenhide Irrigation Scheme • Macquarie Marshes organisation • Other unregulated regulators at the lower Macquarie • The effluent users association	Environment, Energy and Science Group of DPIE Narromine Shire Council Attendees of Stakeholder Forum 3
	Requirement for further engagement on recreational and social needs on inland water spaces	Narromine Shire Council DPIE (Regions, Industry, Agriculture & Resources)
	Angst in the community around the water sharing plan development and consultation	Environment, Energy and Science Group of DPIE

Category	Issue raised	Stakeholder
	fatigue, should communicate hydrological impacts of the project	
	Need to clearly communicate ownership of asset and its operation. Previous assets have been poorly built and non-functional.	Warren-Macquarie LALC
	Request to review terminology. Terms need to be clearly defined and to use simplified terms (i.e. 'gates' and 'losses')	All
	Reference to lack of community trust in WaterNSW and other government agencies based on previous experiences	Attendees of Stakeholder Forum 3 Landowners within 50km upstream of the project site
	Request for clear data and figures that show the transparency of what general water security is, and how this will be released to the customers, including the environment	Attendees of Stakeholder Forum 3
	Suggestion to implement interactive engagement tools as opposed to traditional methods	Attendees of Stakeholder Forum 1
	Town hall meetings are the preferred form of consultation with the community	Warren Shire Council
Justification and options considered	Should not go straight to concrete build options with the punitive ordering system	Environment, Energy and Science Group of DPIE
Request for information / general enquiry	Link for project webpage requested once live	Warren Shire Council
	Request for community and environmental groups to be kept informed throughout the process	Attendees of Stakeholder Forum 1
	Gin Gin noted as project site Continued communication regarding the project requested	Orana Water Utilities Alliance

Category	Issue raised	Stakeholder
	Question as to whether DPIE will conduct a site inspection to understand how the system will work	Narromine LALC
	Engagement process and DPIE process. Need to arrange meeting for the board. Consider including River Smart for further information	Warren Macquarie LALC
	Updates for LALCs. Opportunity for presentation to the members if desired.	Trangie LALC
	Questions regarding the impacts to the Trangie-Nevertire Irrigation Scheme and the Tenandra Irrigation Scheme	Directly impacted landowners
	Potential impacts to private property along the River	Directly impacted landowners
	Questions regarding other projects occurring in or planned for the area	Directly impacted landowners
	Question regarding river operations and tributary flow management	Commonwealth Environmental Water Office
	Enquiry into how the project is being funded	DPIE(Regions, Industry, Agriculture & Resources)
	Question regarding when construction is due to begin	Directly impacted landowners
	Enquiry into whether project will look into groundwater	Directly impacted landowners
	Concern that if the area around the new structure is used for recreation, this may lead to vandalism of private property	Directly impacted landowners
	Request to see: • further modelling of downstream flows • whole of river modelling • rainfall rejection figures • flow capacity comparison	DPIE (Regions, Industry, Agriculture & Resources)

Category	Issue raised	Stakeholder
	• modelling broken down into 5 year periods • likely velocities • figures showing the likely headwater and tail-water levels, as well as likely variation in these levels • normal operating levels	
	Enquiry as to whether invert levels would match the existing river channel	DPIE (Regions, Industry, Agriculture & Resources)
	Enquiry regarding the size of the proposed structure	DPIE (Regions, Industry, Agriculture & Resources) Landowners within 50km upstream of the project site
	Enquiry as to what will happen to the existing weir at Gin Gin as a result of the proposed project	DPIE (Regions, Industry, Agriculture & Resources)
	Questions regarding the desired outcomes of the project	Warren Shire Council
Scope for influencing project	Enquiry as to when opportunity for formal feedback would be provided	DPIE (Regions, Industry, Agriculture & Resources)
Economic matters		
Access to water for agriculture	Concern over potential impacts to access to water for irrigation and farming	Directly impacted landowners Landowners within 50km upstream of the project site
	Impact of water restrictions on farming businesses	Narromine LALC
	Impacts on existing Gin Gin Weir and pumping pool and irrigation offtakes	CAG members ROSCCo members
Costs and Benefits of secure water supply	Reassess the rainfall debiting system, where any runoff from rainfall is debited against landowners allocations	Narromine Shire Council
	Water delivery efficiency issues	Warren Shire Council

Category	Issue raised	Stakeholder
	Funding of infrastructure and implications for irrigators	CAG members ROSCCo members
Impact to productive land	Calculation of the benefit cost ratio	Environment, Energy and Science Group of DPIE
Land value	Concerns regarding potential decrease in land value	Directly impacted landowners Landowners within 50km upstream of the project site
Tourism	Acknowledgement that recreational fishing brings in $7 million in tourism and this needs to be reflected in the EIS	Attendees of Stakeholder Forum 2
Environmental matters		
Aquatic ecology	Impacts on Ramsar Wetlands and if a referral under the EPBC Act is required relating to Matters of National Environmental Significance need for EPBC referral	Environment, Energy and Science Group of DPIE
	Concern regarding potential negative impacts to native fish species, migration conditions and breeding areas	DPIE (Regions, Industry, Agriculture & Resources) Directly impacted landowners
	Potential opportunities for aquatic biodiversity offsets	DPIE (Regions, Industry, Agriculture & Resources)
	Potential to block fish passage, including downstream movements of fish, impacting native fish species	DPIE (Regions, Industry, Agriculture & Resources)
	Note that in order to effectively attract fish to the fishway entrance, the fishway (or associated infrastructure) should pass minimum flows approximating 10 % of river discharge	DPIE (Regions, Industry, Agriculture & Resources)
	Recommendation to consult with the WaterNSW Strategic Fishway Optimisation Project to confirm design and operational considerations for the fishway	DPIE (Regions, Industry, Agriculture & Resources)

Category	Issue raised	Stakeholder
	Concerns that there is a risk for flows through the regulator to have velocities in excess of the swimming capabilities of native fish	DPIE (Regions, Industry, Agriculture & Resources)
	Recommendation to include overshot gates to reduce the risk of injury or mortality to fish during downstream passage	DPIE (Regions, Industry, Agriculture & Resources)
	Enquiry as to whether wetlands and riparian habitats considered in the strategic business case	DPIE (Regions, Industry, Agriculture & Resources)
	Impact on the hydro-dynamic complexity of the fish as they are time and temperature sensitive and this will determine the flow requirements for fish	DPIE (Regions, Industry, Agriculture & Resources)
	Concern regarding the ecological character of the Macquarie Marshes Ramsar site	Commonwealth Environmental Water Office Macquarie-Cudgegong Environmental Water Advisory Group
	Potential for the inclusion of a fish ladder	Attendees of Stakeholder Forum 1
	Concerns regarding transition from a flowing habitat to a still habitat	DPIE (Regions, Industry, Agriculture & Resources)
	Impacts to larval drift as a result of the proposed structure, and the need to assist larval dispersal to manage biodiversity	DPIE (Regions, Industry, Agriculture & Resources)
	The need to consider threatened species in the area, and whether the Threatened Ecological Community Committee will need to be consulted	DPIE (Regions, Industry, Agriculture & Resources)
	Concerns raised about fish movements at new and existing barriers	Narromine LALC
	Need for a fish passage for Gin Gin	Trangie LALC

Category	Issue raised	Stakeholder
	Water needs to flow to sustain the life cycle of fish	Attendees of Stakeholder Forum 2
	Concern for: • fish population past Warren as there is currently no flow • fish deaths • stratification of the water if it is stored	Attendees of Stakeholder Forum 2
	Concerns regarding the Murray cod breeding ground situated downstream of the existing Gin Gin Weir. It was noted that cod require stable water levels to breed	Attendees of Stakeholder Forum 2 Attendees of Stakeholder Forum 3 Commonwealth Environmental Water Office
	Concern regarding impacts to the habitat of fresh water mussels	Commonwealth Environmental Water Office
	Suggestion that upgrades are needed for the current fishways in the system	Attendees of Stakeholder Forum 3
	Concern regarding the protection of key threatened species (such as eel-tailed catfish, silver perch, trout & Murray cod).	Attendees of Stakeholder Forum 3 Commonwealth Environmental Water Office
	It was noted that the removal of rifle and run would be detrimental to fish habitat	Attendees of Stakeholder Forum 3
	Concern that, even with the inclusion of a fish passage, the impacts to fish species in the River would not be negated as only the strongest fish would be able to get through	DPIE (Regions, Industry, Agriculture & Resources)
Cumulative impacts	Need to model the overall environmental impacts of the project	Environment, Energy and Science Group of DPIE Macquarie Cudgegong Environmental Water Advisory Group

Category	Issue raised	Stakeholder
Erosion	Concerns regarding the stability of the river banks	DPIE (Regions, Industry, Agriculture & Resources) Landowners within 50km upstream of the project site
	Concerns regarding increased erosion as a result of raised water levels	DPIE (Regions, Industry, Agriculture & Resources)
Flooding and inundation	Upstream impacts, specifically the potential backlog of water and inundation	Narromine Shire Council
	Query about the inundation extent with the new re-regulating storage in place	Attendees of Stakeholder Forum 2 Attendees of Stakeholder Forum 3
	Impacts of inundation on vegetation along the river bank	Attendees of Stakeholder Forum 2
	Concerns regarding: • management of the re-regulating storage pool, mitigation measures and potential flooding • potential flood events (i.e. 2016 flooding) • how the new structure will impact the area and individual riverside properties • river levels and their impacts on the Macquarie Marshes	Landowners within 50km upstream of the project site CAG members ROSCCo members
	Impacts on floodplain from increase and change in river structure	Buddah Lakes Irrigators Association
	Importance of considering flood mitigation measures when designing the proposed structure	DPIE (Regions, Industry, Agriculture & Resources)
	Rising water levels would have negative impacts on vegetation	DPIE (Regions, Industry, Agriculture & Resources)
	Assessment of alluvial ground water and seepage	Environment, Energy and Science Group of DPIE

Category	Issue raised	Stakeholder
Geotechnical disturbance and subsidence	Discussion raised about ground disturbance. It has been requested that no dirt is to be turned without cultural approvals. This needs to be considered for any geotechnical drilling	Narromine LALC
Project approval	Enquiry as to whether the project has been given approval	Attendees of Stakeholder Forum 3
	Enquiry as to whether the project is of State significance	DPIE (Regions, Industry, Agriculture & Resources)
	Enquiry as to whether the SEARS have been issued for the project	Attendees of Stakeholder Forum 3
Reduction in surface water flow	Concerns surrounding debris management in high flow areas, with a build-up of debris resulting in flow blockage	Attendees of Stakeholder Forum 1
	Concerns regarding impacts to flows to the Macquarie Marshes, including the Ramsar site	Commonwealth Environmental Water Office
	Concern regarding maintenance of water levels in order for equipment to keep functioning	Landowners within 50km upstream of the project site
Terrestrial ecology	Concerns were raised about raising the water level due to the re-regulating storage pool and the impacts this would have on local vegetation along the river banks	All
	Potential threats to endangered species	Attendees of Stakeholder Forum 3
	Impacts to the carbon cycle due to vegetation impacts of the project	Attendees of Stakeholder Forum 3
	Concern regarding river gums on property and conservation of the land. Potential to register woodland on conservation listing	Landowners within 50km upstream of the project site
	Impacts to terrestrial habitats as a result of changed water levels	DPIE (Regions, Industry, Agriculture & Resources)

Category	Issue raised	Stakeholder
Water quality	Issues of water seepage along fault line between Rocky Point and Buddah Lakes	Attendees of Stakeholder Forum 1
Post-construction		
Amenity and visual impact	Public access to site post-construction for use as a recreational space	DPIE (Regions, Industry, Agriculture & Resources) Directly impacted landowners
Operation of the system	Regulation of the operating system	Warren Shire Council
	Need for the flow levels to overshoot the re-regulating storage	DPIE (Regions, Industry, Agriculture & Resources)
	Need for the inclusion of Macquarie Cudgegong Long Term Flow Strategy	DPIE (Regions, Industry, Agriculture & Resources)
	Need for mechanisms to adapt the structure and operation of the new re-regulating storage after construction as required	DPIE (Regions, Industry, Agriculture & Resources)
	Importance of taking into account the migration impacts on fish species and the integrity of the flow components when developing the operating principles of the re-regulating storage	DPIE (Regions, Industry, Agriculture & Resources)
	Requirement for robust operating protocols to be developed in parallel with the planning process	DPIE (Regions, Industry, Agriculture & Resources)
	Concern that the proposed re-regulating storage would capture and store tributary flows of unregulated rivers (such as Bell, Little and Fish). These tributaries are key to success for threatened species	Environment, Energy and Science Group of DPIE Attendees of Stakeholder Forum 2 Attendees of Stakeholder Forum 3
	The need to consider fish migration and breeding when establishing the operating principles of the proposed structure	DPIE (Regions, Industry, Agriculture & Resources)
	Enquiry as to how the system will operate	Narromine LALC

Category	Issue raised	Stakeholder
	Questions raised around management and operation of the re-regulating storage	Trangie LALC
	Enquiry into how the water will be managed once it is captured	Attendees of Stakeholder Forum 2
	A question was raised as to how often rainfall rejections occur	Attendees of Stakeholder Forum 2
	Suggestion for water to be stored off-stream	Attendees of Stakeholder Forum 2
	Question regarding water operating rules for the re-regulating storage and whether these would be in line with the water sharing plans	Attendees of Stakeholder Forum 2
	Enquiry as to whether the operational criteria be reset	Environment, Energy and Science Group of DPIE
Water sharing plans	Angst in the community around the water sharing plan development and consultation fatigue; should communicate hydrological impacts of the project	Attendees of Stakeholder Forum 3
	Alignment of operating rules with water sharing plans	Attendees of Stakeholder Forum 2
	Integration of this project in the water sharing plan, transparency is needed around commitments and the approach coordinated	DPIE (Regions, Industry, Agriculture & Resources)
	Sentiment that the Macquarie River is a big contributor to the Barwon River and it should not be hampered by a re-regulating structure	Attendees of Stakeholder Forum 3
	Concern regarding whether climate change features will prompt changes to the draft water sharing plans	Attendees of Stakeholder Forum 3
	Enquiry as to how this project is integrated into the existing water sharing plans	DPIE (Regions, Industry, Agriculture & Resources)
Social and cultural matters		

Category	Issue raised	Stakeholder
Aboriginal heritage	Discussion about Timbrebongie Falls Reserve; this site has significance	Narromine LALC
	Concerns regarding the indigenous connection to the River and the impacts on this connection should flows stop	Landowners within 50km upstream of the project site
	Need to identify Aboriginal cultural heritage items and places that may be impacted by the project	Trangie LALC Narromine LALC
Cultural impact	Level of community 'ownership' of recreational sites around the proposed structure	DPIE (Regions, Industry, Agriculture & Resources)
	Re-regulating storage location should consider social needs and in channel recreational areas (e.g. access way, boat ramps, public toilets, amenities)	Narromine Shire Council DPIE (Regions, Industry, Agriculture & Resources)
	Social impacts if the existing weir were to be removed	Narromine Shire Council
	Importance of social connectivity for the community	Attendees of Stakeholder Forum 2
	Lack of community benefit of the project	Attendees of Stakeholder Forum 3
	Need for behaviour change surrounding the current irrigation culture	DPIE (Regions, Industry, Agriculture & Resources) Attendees of Stakeholder Forum 3
	Concern raised about how blocking the flow at this point limits the water running down Ewenmar Creek which runs through the Beemunnel community (an important community location)	Warren Macquarie LALC
	Impacts of water restrictions on businesses	Narromine LALC
	Discussion raised regarding local opportunities. It is important to ensure that	Narromine LALC

Category	Issue raised	Stakeholder
	local opportunities for employment and procurement are considered	
	Cultural approval needed prior to having trucks on site and any ground disturbance or intrusive activity. Request that no dirt is turned without prior cultural approval	Narromine LALC
	Need for behaviour change in the local community with regards to water order rejections	DPIE (Regions, Industry, Agriculture & Resources)
European heritage	Status of Gin Gin Weir, and what will happen to it, especially as the existing weir is listed on the WaterNSW Heritage register	DPIE (Regions, Industry, Agriculture & Resources)
	Recommendation for the full removal of the instream portion of Gin Gin Weir down to bed level	DPIE (Regions, Industry, Agriculture & Resources)
	Desire to install signboards and maintain a section of the structure/abutments	DPIE (Regions, Industry, Agriculture & Resources)
	Considerations about the history of the existing Gin Gin Weir	Attendees of Stakeholder Forum 1
	Impacts to the existing weir (removal or changes)	All
Land use	Use of the site as a recreational space post-construction. Preference for land to still be used recreationally by the local community	DPIE (Regions, Industry, Agriculture & Resources)
Recreation loss	Social and recreational impacts if the existing weir at Gin Gin were to be removed	All
	Potential impacts to Trangie ski club	Landowners within 50km upstream of the project site
	Use of Gin Gin Weir as a recreational area for Trangie residents	Narromine LALC
	The community would be upset by impacts on the existing Gin Gin Weir as it is used by several board and local members (also for	Trangie LALC

Category	Issue raised	Stakeholder
	recreational purposes as there is no river in town)	
	Gin Gin recreational area is widely used by families. There are concerns regarding the potential impacts to the recreational uses of Gin Gin Weir	Attendees of Stakeholder Forum 2