

***MAJOR PROJECT ASSESSMENT
Koondrook-Perricoota Forest
Flood Enhancement Works***



Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

August 2010

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EXECUTIVE SUMMARY

NSW Office of Water and Forests NSW (the Proponent) has lodged a major project application and Environmental Assessment to construct and operate a series of regulation structures at the Koondrook-Perricoota Forest (the forest), to restore more frequent and effective flooding to the forest. The proposed infrastructure includes the construction of a channel to divert water from the River Murray to the forest and the regulation structures will contain the floodwaters within the forest and prevent impacts on neighbouring landholders. It is proposed that the forest be flooded every three to four years for a period of up to 100 days. The key ecological objective of the project is to provide an adequate water regime to a representative area of River Gum forest that has, or historically supported, a flood-dependent understorey. The forest is located in the Wakool and Murray Shire Council areas.

The Gunbower-Koondrook-Perricoota Forest is Australia's second largest River Red Gum forest and covers an area of approximately 50,000 hectares. It is listed as a wetland of International Importance under the Ramsar Convention on Wetlands and is one of the six Icon Sites identified under The Murray Initiative. The Murray Initiative was established by the Murray Darling Basin Ministerial Council (MDBMC) in response to concerns about the environmental and economic health of the Murray System. Under The Murray Initiative, improvements in health at the Icon Sites are to be achieved by recovering water for use at the sites and by investing in works to allow managed inundations of the sites. Gunbower-Koondrook-Perricoota Forest includes the Koondrook-Perricoota Forest (the forest), which is located in New South Wales and has an area of approximately 32,000 hectares. This project is only relevant to the forest (i.e. works within New South Wales) and not the entire Gunbower-Koondrook-Perricoota Forest. The Gunbower Forest is located in Victoria. Changes to the flow regime in the Murray River and its tributaries have significantly reduced the ecological health and productivity of the forest. This is mainly due to a reduction in the frequency and magnitude of flooding as a consequence of the long-term effects of river regulation and recent droughts. As a result, the existing flooding regime in the forest is inadequate to support flood dependent vegetation communities.

The project aims to conserve and enhance the current ecological condition of the forest. It has been designed to enable controlled discharges of water from the existing Torrumbarry Weir pool on the Murray River to enhance the flooding regime within the forest. It would involve construction and operation of infrastructure that would have the capacity to divert up to 6,000 ML/d of water from Torrumbarry Weir pool into the forest. The project would be constructed over a period of approximately nine months and be operated under an adaptive management process, reflecting the operational regime of the project. It has been designed to provide flexibility to operate within a range of flows (inundation events). This approach will ensure that the ecological response to inundation events is monitored and evaluated against the objectives for that event. This reflects the adaptive management regime for the operation of the project, where the operation of the project structures can be altered, both during inundation events and from one operation to the next, in order to react to the ecological response observed. The project has a capital cost of approximately \$57,792,000 and would employ 80 people during its construction and provide between two and three full-time positions during its operation.

The Department has assessed the Environmental Assessment, Statement of Commitments, Response to Submissions Report and the eight submissions received in response to the exhibition of the proposal. The main issues that were raised in submissions and through the Department's assessment of the project were potential impacts on flora and fauna during construction and operation, impacts on surrounding land uses due to operation, indigenous heritage impacts and construction noise impacts. The Department is satisfied that the impacts of the project can be mitigated and/or managed to ensure an acceptable level of environmental performance, subject to the adherence to strict environmental conditions. The Department has recommended that specific conditions be imposed on the Proponent to address the key issues raised in the assessment process, including flora and fauna impacts as a result of construction and operation, impacts to surrounding land uses during operation, indigenous heritage, and noise impacts during construction of the project.

Based on its assessment, the Department is satisfied that the project is necessary to restore more frequent and effective flooding to the forest and can be carried out with minimal environmental impact. It is therefore considered that the proposal warrants approval, subject to conditions.

1. BACKGROUND

The NSW Office of Water and Forests NSW (the Proponents) have sought project approval to construct a channel and engineering structures to divert water from the Torrumbarry Weir pool on the Murray River to the Koondrook-Perricoota Forest (the forest) of NSW. The flood enhancement works would enhance the current flows by delivering large flood events every three to four years for a period of up to 100 days to supplement natural high flows or floods in the forest to reinstate a flood regime that mimics that which would have occurred prior to European settlement and surrounding development. The natural flood regime has been changed significantly in the past due to the long term effects of river regulation and drought events.

1.1 Location

The Koondrook-Perricoota Forest is located approximately 30 kilometres northwest of Echuca on the NSW/Victoria border and covers an area of approximately 32,000 hectares. It is part of the Gunbower-Koondrook-Perricoota Forest, which is Australia's second largest River Red Gum forest with a total area of 50,000 hectares.

The Gunbower-Koondrook-Perricoota Forest is listed as a wetland of International Importance under the Ramsar Convention on Wetlands and is one of the six Icon Sites identified under The Murray Initiative. The Murray Initiative was established by the Murray Darling Basin Ministerial Council (MDBMC) in response to concerns about the environmental and economic health of the Murray System. Under The Murray Initiative and the Environmental Management Plan for each Icon Site, improvements in health at the Icon Sites are to be achieved by recovering water for use at the sites and by investing in works to allow managed inundations of the sites. The Gunbower-Koondrook-Perricoota Forest includes the Koondrook-Perricoota Forest (the forest), which is located in New South Wales. The Murray River flows through the forest, with Gunbower State Forest on the southern side of the river in Victoria and Koondrook-Perricoota State Forest on the northern side of the river in NSW. This project is only relevant to the forest (i.e. works within New South Wales) and not the entire Gunbower-Koondrook-Perricoota Forest. Figure 1 below shows the regional location of the project site.



Figure 1: Site Location (reproduced from the Proponent's Environmental Assessment)

1.2 Existing Site

The site subject to the project application is shown in Figure 2. It excludes both the Gunbower State Forest which is located in Victoria, and areas of Koondrook Forest that are located outside the downstream levee, such as Pollack Swamp (shown in Figure 3). The south-western boundary of the site is delineated by the Murray River, whilst the northern boundary adjoins public land managed by the NSW Department of Lands and the Livestock Health and Pest Authority. The site also includes private properties which have been purchased for the project (hatched areas shown on Figure 2).

The site lies within the Murray Darling Basin which comprises the catchments of the Murray and Darling Rivers and their tributaries. The Murray River flows through the forest, with River Red Gum being the predominant overstorey species occupying over 80 per cent of the site. The main land use within the forest is commercial timber production, which is undertaken in accordance with the Riverina Ecologically Sustainable Forest Management Plan. Other uses of the site include recreational uses such as four-wheel driving, motorcycling, horse riding, picnicking and camping.

The project site was visited by representatives of the Department of Planning on Wednesday 22 April 2009.

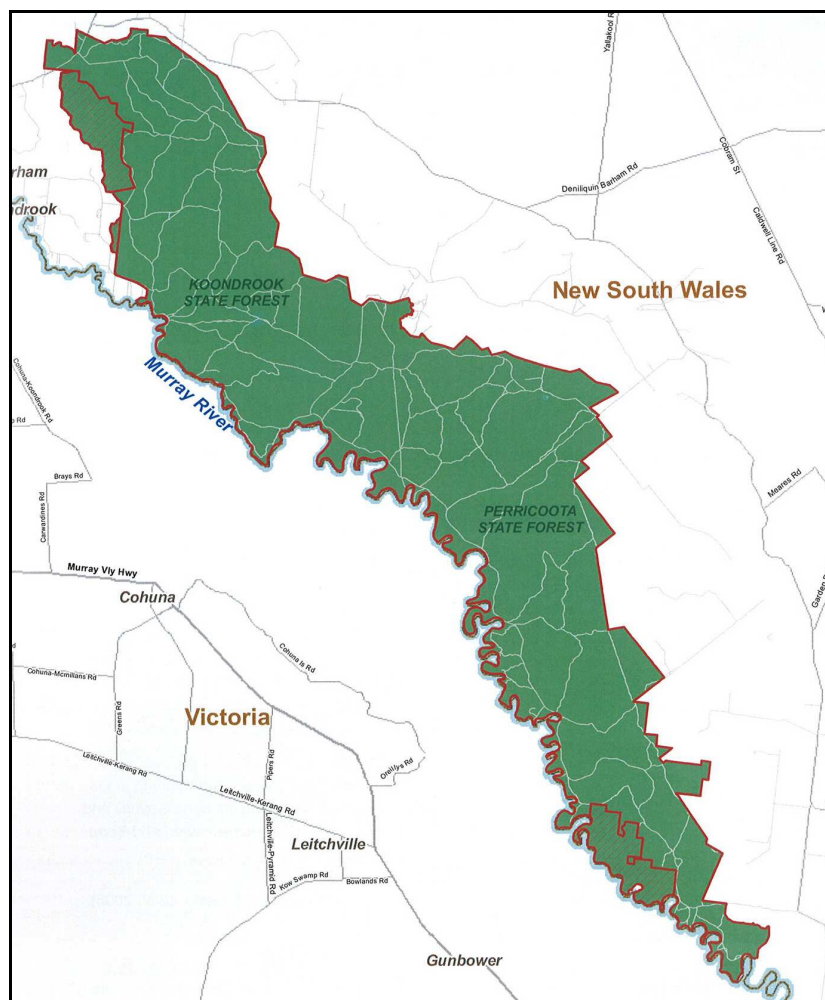


Figure 2: The subject site (reproduced from the Proponent's Environmental Assessment)



Figure 3: Schematic Representation of the Proposed Structures for the Project (reproduced from the Proponent's Environmental Assessment)

1.3 Surrounding Land Use

The project site is situated approximately 30 kilometres northwest of Echuca and 80 kilometres to the southwest of Deniliquin. The site is within both the Murray Shire and Wakool Shire Councils. The upstream parts of the forest are in Murray Local Government Area (LGA) whilst the downstream parts are in Wakool LGA. The area surrounding the site is predominantly in freehold title and is dominated by irrigated and dryland cereal cropping and pastures. The immediate surrounds of the site consists of a mixture of land uses including horticulture, private native forest and rural residential development. The closest towns are shown in Figure 1. The nearest township is Barham which is located a few kilometres from the downstream end of the forest (refer to Figure 1). The main roads in the vicinity of the site include: Barham East Road, an arterial road that provides access to Barham town centre; Moulamein Road, a single-carriage road linking Barham and Moulamein; and Perricoota Road, a two lane north-south road connecting Moama.

The Koondrook-Perricoota Forest is a state forest managed by Forests NSW (a division of Industry and Investment NSW) and is listed on the Register of the National Estate. It is part of the NSW Central Murray State Forests listed as wetlands of international importance under the Ramsar Convention on Wetlands in 2003. The wetland is dependent on frequent flooding of the Murray River to provide water to support flood dependent vegetation communities, including the River Red Gum forest.

2. PROPOSED DEVELOPMENT

2.1 Project Description

The ecological health of the Koondrook-Perricoota Forest has been significantly impacted as a result of modification to the natural flood cycle and recent effects of drought. From surveys conducted on site, there is evidence that the health of River Red Gum in the forest has declined with mortality apparent across large areas. The project would assist in restoring extensive flooding to the forest and maintaining a healthy floodplain community.

The Proponents propose to construct and operate infrastructure with the capacity to divert up to 6,000 megalitres per day (ML/d) from the Torrumbarry Weir pool into the Koondrook-Perricoota Forest to enhance the flood flows to the site. The project would provide flexibility to operate within a range of flows to create a major flood event and also control small or medium flows of variable volume and duration. The structures which form part of the project are classified into the following categories and their locations are shown in Figure 4:

- upstream structures: to divert water into the forest from Torrumbarry Weir pool, including an inlet channel, inlet regulator and associated infrastructure, and regulators at Swan Lagoon to control flows re-entering the Murray River; and
- downstream structures: to control the release of water from the forest and to maximise return flows back to the Murray River. These structures include regulators and a levee to maintain flows within the forest and to control the discharge of water to downstream waterways.

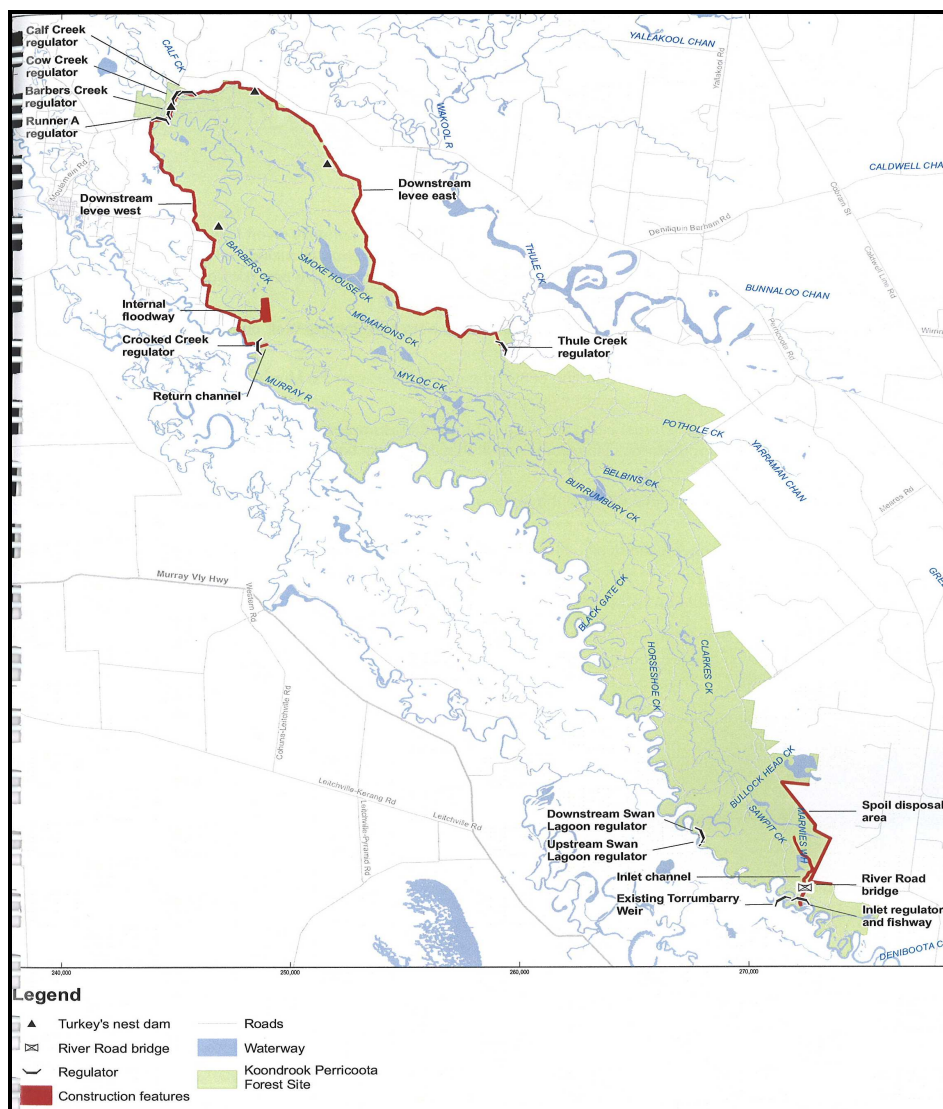


Figure 4: Location of main structures (Reproduced from the Proponent's Environmental Assessment)

The Project is intended to create large flood events which are to occur every three to four years for approximately three to six months, and smaller events to occur more frequently. The large flood events could inundate up to 52 per cent of the forest, with about 41 per cent of the forest inundated for a period of about 100 days to achieve the Icon Site Environmental Management Plans interim objective of maintaining 30 per cent of the River Red Gum forest in healthy condition. The operational, environmental and risk management parameters of which the project has been designed to meet are outlined below.

Operational Parameters:

- Enable a large flood event every 3 to 4 years for approximately 3 to 6 months, and smaller events more frequently;
- Allow for variable diversion flows up to 6,000 ML/day;
- Protect downstream infrastructure and property from flood damage;
- Operational flexibility to enable use of opportunistic flows and adjust inflows, outflows and water balances for flooding events;
- Sound, functional and well engineered structures with 100 year design life; and
- Basic structures with minimal infrastructure to maintain flow operation.

Environmental Parameters:

- Achieve inundation requirements for high priority vegetation communities as per the draft ecological objectives;
- Return flows directly back to Murray River to maximise water savings;
- Minimise any impacts on flow distribution during natural flooding events; and
- Minimise adverse environmental impacts.

Financial/risk Management Parameters:

- Provide effective combinations of structures that enable operational flexibility;
- Meet ecological and engineering objectives in a cost-effective fashion; and
- Recognise and design with consideration of the potential for litigation issues related to changes to inundation.

2.2 Project Components and Operation

Upstream Structures

The structural works for the upstream portion of the project include an inlet channel; an off-take regulator incorporating a dual fishway and turtle ramp; a River Road bridge structure; and Swan Lagoon regulators. The upstream structures are designed to primarily divert flows from the Torrumbarry Weir pool into the forest and prevent diversion flows short circuiting and returning to the Murray River when it reaches Swan Lagoon. The upstream structures (refer to Figure 4) have been designed to meet the following specific requirements:

- capability to divert and control up to 6,000ML/day from the Torrumbarry Weir pool;
- contain diversion flow in the portion of the inlet channel between the Murray River and the inlet regulator;
- distribute flow to the forest along the length of the cutting between the inlet regulator and the intersection with Bullock Head Creek; and
- provide fish passage in and out of the forest and a freshwater turtle escape route in the vicinity of the inlet regulator.

Downstream Structures

The structural works for the downstream portion of the project (refer to Figure 4) include five stop log regulators at downstream creek/outflow points; a downstream levee; a return channel; a floodway; and a return channel regulator and Murray River junction drop-down structure. The downstream structures are designed to control the release of water from the forest and to maximise return flows back to the Murray River. The levee will retain water within the forest and the regulators will control the discharge of water to downstream waterways.

Operation

The Project is designed to allow flexibility in its operation within a range of flows of differing water availability and river conditions. However, the primary function of the structures is to create a major flood event every three to four years to the extent and duration which achieves the Icon Site Environmental Management Plan's interim objective of maintaining 30 per cent of River Red Gum forest in healthy condition, and also small floods to occur more frequently to bring in the ecological benefits to sustain and improve on the health of the ecosystem, and promote an environment which encourages bird and fish breeding.

The project is aimed at delivering a flexible delivery mechanism capable of delivering a range of flood events varying in magnitudes, durations and frequencies. In general, the flooding events which the project would deliver are:

- frequent, low flows to maintain the wetland habitats occurring in lagoons, depressions and flood runners;
- less frequent floods of medium magnitude to maintain the extent of the River Red Gum communities, with larger floods maintaining the extremities, and smaller floods supporting the core areas with flood dependent understorey communities;
- flood events of long duration to facilitate bird breeding; and
- very large, infrequent flood events to occasionally inundate fringing Black Box communities.

The operation of the project would involve three distinct phases: filling; the inundated state; and recession. The filling stage will commence on the first day of operation (day one) and filling will start at 6,000 ML/day. At day 45 the maximum area to be covered would be achieved and inflow would be reduced to 3,400 ML/day. At day 55, the project site would be at the inundated state, where flood pool height will reach 78.5 metres AHD and inflows will be adjusted to maintain pool height. The depth of water will vary from 1.3 metres at the upstream end to 2.4 metres at the downstream end of the forest. The flooded area would remain constant until day 100, where after this point the inflow would cease. The third phase of operation, being recession, would then begin at day 110, where dewatering of the pool would begin and then at day 220 the forest pool would be empty.

Predictive models and detailed investigations of the forest system have provided guidance to the environmental outcomes expected of the flooding events to be delivered. Nonetheless, an adaptive management approach based on real-time management and site specific antecedent conditions will be the primary factors governing the operation of the system, where flexibility will be applied to operate the system under a range of flow events to target specific and different environmental outcomes.

The operations of the project will be undertaken in accordance with an Operating Plan. The Proponent has committed to developing this Operating Plan prior to operation. The Plan is to define measures to be implemented to ensure the project is operated in accordance with the Living Murray Initiative. The Proponent has included a draft Operating Plan in its Environmental Assessment. The Plan provides an overall framework for the operation of the structures in achieving the key ecological objectives within the context of The Living Murray Initiative. The Operating Plan does not contain a detailed description on particular watering events, as the exact nature of future unregulated and regulated river flows, and the volume of water available for the project is variable, dependent on seasonal/climatic conditions and rostering undertaken as part of The Living Murray Initiative. Nonetheless, the structures would be operated with flexibility to allow the management of controlled and uncontrolled events to respond to varying ecological objectives stated in the Operating Plan.

Whilst the Operating Plan is preliminary at this stage and will be finalised in consultation with relevant agencies prior to the commencement of operations, the key ecological objective is *'to provide an adequate water regime to a representative area of River Red Gum forest that has, or historically supported, a flood dependent understorey (macrophytes).'*

The decision on whether inundation events will be initiated and managed will be based on a set of operating principles defined in the Operating Plan. In general, the decision to initiate an inundation event would be based on a consideration of key factors such as the health of the vegetation communities in the forest, achievement of environmental objectives, flooding history, differing water availability and river conditions and risk management requirements.

2.3 Project Need and Justification

The Koondrook-Perricoota Forest is part of the Gunbower-Koondrook-Perricoota Forest and is listed as a wetland of International Importance under the Ramsar Convention on Wetlands. The forest is also one of the six Icon Sites identified under the Living Murray Initiative, established by the Murray-Darling Basin Ministerial Council in response to concerns regarding the environmental and economic health of the Murray River system. The Living Murray Initiative is a partnership of the Australian, NSW, Victorian, South Australian and ACT governments. These states are represented by key agencies that are responsible for meeting the objectives of The Living Murray Initiative and in NSW these include the Proponent (NSW Office of Water and Forests NSW).

The forest has high ecological value in providing important breeding sites for waterbirds and providing habitat for native fish, birds and plants. The forest also has high cultural heritage value related to the extensive use by indigenous people of the area and the central role the river and forest played in the economic development of the early non-indigenous settlements. The forest also has a high level of social value as the public uses the area for a range of recreational purposes. The economic value of the forest is mainly derived from a range of commercial activities permitted under the *Forestry Act 1916*. This includes harvesting River Red Gum timber, which is done on a perpetual and sustainable basis, in accordance with the Riverina Sustainable Forest Management Plan, developed by Forests NSW.

The broad aim of the Living Murray Initiative is to achieve a healthy working River Murray System, which includes returning water to the River's environment. This is to be achieved by recovering water for use at the Icon Sites any by investing in works to allow managed watering of the floodplain environment. The Living Murray Initiative also has developed interim ecological objectives for each of the six Icon Sites. For the Gunbower-Koondrook-Perricoota Forest Icon Site, the overarching objective is to "*Maintain and restore a mosaic of healthy floodplain communities.*" The interim objectives are as follows:

- 30 per cent of river red gum forest in healthy condition and 80 per cent of permanent and semi-permanent wetlands in healthy condition;
- successful breeding of thousands of colonial waterbirds in at least three years out of ten; and
- healthy populations of resident native fish in wetlands.

The Murray-Darling Basin Commission, which is the executive arm of the Murray-Darling Basin Ministerial Council, has observed and investigated each of the Icon Sites to monitor any change in health since the establishment of the interim objectives (note that work at the other Icon Sites has already commenced). The Murray-Darling Basin Commission's report titled *The Living Murray Icon Site Condition Report* (dated 2007) compared results of a survey conducted across the Gunbower-Koondrook-Perricoota Forest Icon Site in 2005 and 2006. The survey results of 2006 indicated that there had been a decline in the health of the River Red Gum vegetation communities since the previous survey in 2005. The results from the 2006 survey indicate that 19 per cent of the River Red Gums in the forest are healthy, 59 per cent are unhealthy and 22 per cent are severely stressed or dead. The Murray-Darling Basin Commission's subsequent report (dated 2008) also found that there was a decline in both the River Red Gum and Black Box vegetation canopy condition and diversity of native plant species in the Gunbower-Koondrook-Perricoota Forest between 2005 and 2008. The report found that if the current trend continues then these vegetation communities will reduce in size and their ecology will be impacted and the wetlands will no longer be significant.

The ecological health of the Koondrook-Perricoota Forest has been in a state of decline related to water stress caused by a lack of water supply from local rivers and creeks, low water levels, lack of groundwater re-charge and inadequate water attenuation across the flood plain. Modification of the natural flood cycle and drought has significantly impacted on the ecological health of the forest. Evidence from the survey conducted across the Icon Sites in 2006 on the health of the River Red Gums indicates that over 81 per cent of the forest is either unhealthy or severely stressed/dead. The areas in the poorest condition where there are clear signs of trees under severe stress are primarily at the higher elevations and the downstream margins of the forest. Mortality is noted across large areas of the forest, including large dominant trees and areas of dense regrowth.

The last substantial flood event in the forest occurred in 1993. Whilst leaf growth is observed after small rain events, the overall condition of the forest is poor and is continuing to decline, with large areas of River Red Gum in unhealthy or average health status. The 2008 Living Murray Icon Site Condition Report indicates that a large

proportion of the River Red Gums has shown signs of severe stress for several years, including dead and dying limbs, loss of leaf cover and epicormic growth (this is the spontaneous growth of buds, shoots or flowers, on branches of woody plants in response to stress such as fire, increased light levels and water stress). There have been no records of waterbirds since 2008 as all wetland sites were dry across the Icon Site.

Since the banks of the Koondrook-Perricoota Forest are relatively high, flows which are greater than 18,000 ML/day downstream of the Torrumbarry Weir are required to enable water to naturally enter the forest. Nonetheless, due to river regulation in the past century, the frequency and duration of flows greater than 18,000 ML/day into the downstream of Torrumbarry Weir have reduced substantially. This has resulted in a reduction of the extent, duration and frequency of floods entering the forest and adversely impacting on the ecosystem of the forest.

Figure 5 shows the average monthly flow downstream of Torrumbarry Weir, for modelled natural flows, actual recorded flows, modelled current flows and predicted flows under the CSIRO Median Climate Change scenario. The figure shows that there has generally been a reduction in the monthly flow in between July and November; the most significant reduction being September where the average flows has reduced from 37,000 ML/day to 28,000ML/day, whilst the predicted flows without climate change is expected to reduce to 21,000ML/day and 12,000ML/day under the influence of climate changes.

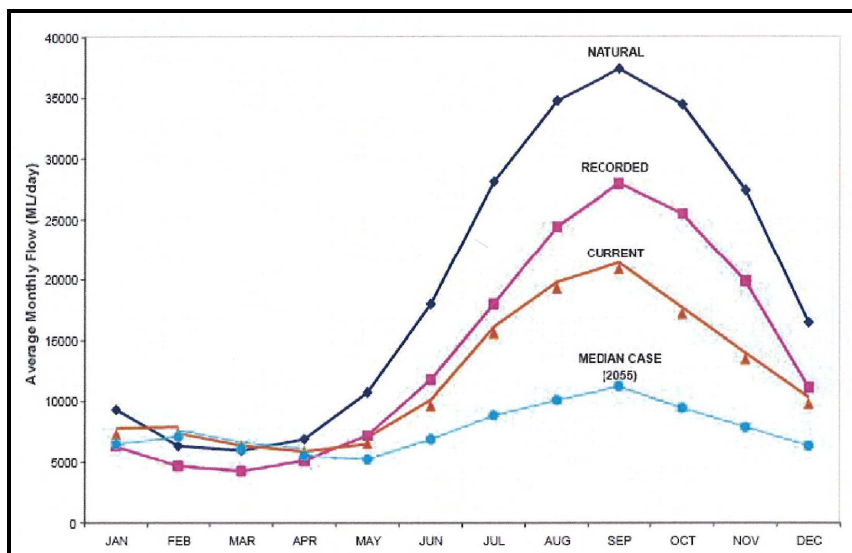


Figure 5: Average monthly river flows downstream of Torrumbarry Weir

This project is proposed by the Proponent to help deliver The Living Murray Initiative and to achieve the interim ecological objectives for the Koondrook-Perricoota Forest in NSW. The project is capable of responding to the following changes in environmental outcomes and events:

- changes in water availability – enable water activity to extend to achieve additional or different environmental outcomes;
- monitoring of environmental outcomes – extension of events, such as fish spawning;
- monitoring of environmental risks – risks such as increases in blue-green algae or blackwater; and
- monitoring of impacts on third-parties – this includes downstream landholders or other communities.

The project is required to restore extensive flooding to the forest, otherwise the ecological condition of the forest would likely to decline further. Whilst low to medium floods would continue to occur, it is acknowledged that they are unlikely to provide the frequency, volume or duration of flows required to meet the water requirements of large areas of the forest. In light of this, the project is generally considered to be the most effective mechanism for maintaining the ecological health of the forest for retaining the cultural, social and economic values associated with the Koondrook-Perricoota Forest.

3. STATUTORY CONTEXT

3.1 Major Project

The proposal is a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* (the Act) applies by virtue of an Order made by the then Minister for Planning under section 75B of the Act on 29 July 2005. The Order declares that where the Proponent is a public authority (other than a local council or county council) and an Environmental Impact Statement is required within the meaning of Part 5 of the Act, then Part 3A of the Act applies. Consequently the Minister for Planning is the approval authority for the project.

3.2 Permissibility

The project site is located on land zoned 1(f) under the Murray LEP 1989, and 1(a) and 1(f) under the Wakool LEP 1992. Under 1 (a) and 1(f) of the Wakool LEP, forestry activities are permissible without development consent. Under 1 (f) of the Murray LEP, forestry is permissible without development consent. The implementation of the project would allow for forestry, as it will promote the proper management and utilisation of forest resources by protecting, enhancing and conserving the forest. Also under clause 31 of the Murray LEP and 33 of the Wakool LEP, development may be carried out on land without development consent by the Forestry Commission, if the development is authorised under the *Forestry Act 1916*, or by any person, if the development is authorised by an authority granted or issued by the Forestry Commission under that Act. The Proponent is Forests NSW (and NSW Office of Water), who is responsible for the control and management of State forests under the *Forestry Act 1916*.

In addition, under Clause 52 (1) of the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP), development for the purposes of forestry may be carried out by or on behalf of a public authority without consent on land in Zone RU3 Forestry or an equivalent land use zone. The Department considers that the project will enable forestry activities, which includes forest conservation, as defined in clause 52(2)(c) of the Infrastructure SEPP. The Department also considers that zone 1(f) is equivalent to Zone RU3 Forestry because the objective of Zone RU3 Forestry is to enable development for the purposes of forestry.

Under Clause 125(1) of the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP), 'Development for the purpose of water reticulation systems may be carried out by or on behalf of a public authority without consent on any land.' The project meets the definition of water reticulation systems as defined under Clause 124 of the Infrastructure SEPP as it involves the transportation of water via channels (canals). Furthermore, both Proponents are public authorities, thus the channels are permissible without consent under the provisions of the Infrastructure SEPP.

The Department therefore considers that the project is an activity which is permissible without development consent on the subject land.

3.3 State Environmental Planning Policy

There are no State Environmental Planning Policies that apply to the proposal that substantially govern the carrying out of the development.

3.4 Director-General's Requirements and Adequacy of Environmental Assessment

The Director-General's Requirements for the preparation of an Environmental Assessment for this proposal were issued on 22 May 2009. The draft environmental assessment submitted on 24 February 2010 was found to be adequate by the Department on 3 March 2010, pursuant to section 75H of the Act.

3.5 Exhibition of the Environmental Assessment

The environmental assessment was placed on public exhibition from 17 March 2010 to 19 April 2010. The public exhibition of the environmental assessment was then extended to 7 June 2010 to take into account representations made by constituents in the Murray Darling electorate, who sought an extension to the original exhibition period. Submissions were invited during these periods in accordance with section 75H of the Act. The environmental assessment was exhibited at the following locations:

- Department of Planning's head office in Sydney;

- Nature Conservation Council of NSW;
- Wakool Shire Council; and
- Murray Shire Council.

The Environmental Assessment was also provided for download from the Department's internet site. Notification of the exhibition period was also made through three separate advertisements in the Deniliquin Pastoral Times, Southern Weekly Magazine and Barham and Koondrook Bridge. The Department has met all its legal obligations so that the Minister can make a determination on the project.

3.6 Objects of the Environmental Planning and Assessment Act 1979

Section 5 of the *Environmental Planning and Assessment Act 1979* details the objects of the legislation. The objects of the Act are:

- (a) *to encourage:*
 - (i) *the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment;*
 - (ii) *the promotion and co-ordination of the orderly and economic use and development of land;*
 - (iii) *the protection, provision and co-ordination of communication and utility services;*
 - (iv) *the provision of land for public purposes;*
 - (v) *the provision and co-ordination of community services and facilities;*
 - (vi) *the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats;*
 - (vii) *ecologically sustainable development;*
 - (viii) *the provision and maintenance of affordable housing; and*
- (b) *to promote the sharing of the responsibility for environmental planning between the different levels of government in the State; and*
- (c) *to provide increased opportunity for public involvement and participation in environmental planning and assessment.*

Objects (i), (vi), (vii) of section 5(a) of the Act are of particular relevance to the environmental impact assessment and determination of the subject project application by the Minister. The project is considered consistent with these objectives as follows:

- with respect to object (i), the project aims to improve the ecological health of the forest which is an important natural resource with significant social and economic values to the community;
- with respect to object (iv), the project is proposed to improve the ecological health of the forest to protect and maintain habitats for a range of flora and fauna and meet the interim ecological objectives established for the Gunbower Koondrook-Perricoota Forest under The Living Murray initiative; and
- with respect to objective (vii), the Act adopts the definition in the *Protection of the Environment Administration Act 1991*, including the precautionary principle, the principle of inter-generational equity, the principle of conservation of biological diversity and ecological integrity, and the principle of improved valuation, pricing and incentive mechanisms. The Environmental Assessment has assessed the impacts of the proposal against the principles of ecologically sustainable development, and the Department is satisfied that the project is consistent with these principles.

The Department has considered these and the remaining objects of section 5 of the Act in its consideration of impacts in Section 5 of this report, except objects 5(b) and (c) of the Act which are considered in section 4 of this report.

4. CONSULTATION AND ISSUES RAISED

4.1 Public Submissions

The Department received a total of eight (8) submissions during the exhibition of the Environmental Assessment. Four submissions were received from the public (a joint submission by the National Parks Association of NSW, The Wilderness Society Sydney, Inland Rivers Network and the Nature Conservation Council of NSW; Wakool River Association; Wakool Landholders Association; and one resident) and the remainder were from Government agencies.

4.2 Public Submissions

None of the public submissions objected to the proposal, however raised issues for the Department's consideration. These issues are summarised below.

- There has been limited consultation with community members and established groups by the Proponent. Therefore, the local community should be involved in the development of the operational regime of the project.
- The key principles of flood plain management and the longer term consequences of these principles have been ignored. The flood model appears not to have considered the effect of constant watering and the associated growth and congestion caused within the floodway and flood-runners.
- There is no detailed information on the water management regime that will be used for operation. Independent expert oversight of the water management regime during operation of the flood scheme is important to ensure that ecological objectives are being met.
- Question whether the flood modelling will be reviewed following the change in the forest alignment.
- Question what the frequency of smaller flood events and the associated negative effects would be.
- Suggest the utilisation of the natural drainage path down Barbers and Thule Creeks.
- Question whether the cost of constructing the turtle ramp and fish ladder is justified by the likely use.
- Some of the maps used in the environmental assessment are misleading and lack detail.
- Question the consequences of removing the natural drying periods of the forest.
- Question the alignment of the eastern levee in relation to the western levee and its associated impact on the designated floodway.
- Damage to Nineteen Mile and Perricoota Forest Roads caused by construction of the project should be repaired by the Proponent.
- Question the impacts from an increase in water level on surrounding properties and the occurrence of black water events.
- Concern about potential impacts from the designed floodway, as it may cause excessive (unnatural) flooding. Also question whether the floodway will create more water for the area in a natural flood event, which would then have consequences for the Wakool River system. Also community groups should participate in the carrying out of the project.
- The project should include an informed consent process with Traditional Owners and all interested Aboriginal parties that is as inclusive as possible, whilst recognising the special rights and interests of Traditional Owners.
- Approximately 100 hectares of Grey Box Woodland within the project site will be flooded and this may potentially destroy the vegetation community, however the environmental assessment does not assess such impacts as a result of flood frequency. A monitoring program should be in place during operation to assess any evidence of decline and to inform the carrying out of future inundation events.
- The construction offset for the loss of Grey Box Woodland is inadequate and all clearing of native vegetation should be offset.
- Impacts associated with the disposal of spoil along the north-eastern edge of the forest and that the creation of 'islands' from the inundation events could increase feral animal predation of native fauna.
- Propose measures for the management of removed hollow-bearing trees, to reduce impacts to fauna.

4.3 Government Submissions

Submissions were received from four (4) Government agencies.

Murray-Darling Basin Authority (MBDA) – supports the project and acknowledges that flexibility will be applied to the operation of project. MDBA requests that any project approval does not impose constraints that will limit operational flexibility, environmental outcomes or capacity to manage risks.

Department of Environment, Climate Change and Water (DECCW) - supports the project, however, provides comment on areas that should be further addressed:

Flora and Fauna

- Stated that adequate consideration has been given towards flora and fauna however finds the following points should be further addressed:
 - o the terms 'permanent' and 'temporary' clearing should be defined, including the development footprint and the Environmental Assessment should be updated to reflect the alteration of the rehabilitation program to an 'active' program, where the Proponent would implement measures to help the impacted areas regenerate;
 - o it should be confirmed whether the zoning of the offset (Forest Management Zone 3a) covers the entire offset area, rather than just the boundary and *Wilsonia rotundifolia* and Grey-crowned Babbler should be included in the Assessment of Significance; and
 - o the Environmental Assessment document should recognise the benefits from the proposal, but also recognise that the current observed decline in condition of the vegetation communities may continue to occur in some areas.

Flooding

- Stated that the Environmental Assessment is generally in line with its comments made during the investigation phase, with regards to the alignments and capacities for regulating structures.
- Stated the spoil disposal area at the upstream end of the forest should be located outside of the forest.

Noise and Vibration

Stated that whilst the Proponent's modelling and mitigation measures suggest compliance in most instances, residences within 500 metres of construction may be impacted by the noise such that the noise affected level is exceeded. As such the Proponent must adopt the Noise Mitigation Measures detailed in its environmental assessment in these situations. Also recommended that the Proponent's draft statement of commitment regarding locating construction sites in a manner to limit noise disturbance, be amended to include implementation of the Proponent's mitigation measures. It is to be noted that the Proponent has since amended its relevant commitment to reflect the change as proposed by DECCW.

Aboriginal Cultural Heritage

Did not raise any specific issues, however, did recommend the Proponent includes a commitment to develop a program for surveys by representatives of the traditional owners along the construction corridor during construction to identify potential issues of concern. DECCW also stated that the Proponent's report on Aboriginal Cultural Heritage is sound and well structured.

Greenhouse Gas Emissions

- Stated that Scope 1 to 3 emissions have been adequately assessed using the appropriate methodology.
- Noted that the project will likely lead to net carbon sequestration.

NSW Industry and Investment (I&I) - did not state a clear position on the project, however, recommended specific information to be included as part of the Operating Plan, and to the satisfaction of I&I, to address the risks to ecology as a result of the adaptive operational approach. The information recommended to be included is as follows:

- detailed proposals for water quality monitoring of dissolved oxygen and dissolved organic carbon levels within the forest and during inundation events and in the Murray River;
- detailed proposals for the monitoring of fish movement into and out of the forest and fish community changes within the forest during inundation events and for the surveillance of the forest during and following inundation events to detect incidences of fish strandings or fish kills; and
- detailed proposals for the monitoring of pest fish response to inundation events.

Department of Water, Land and Biodiversity Conservation (Government of South Australia) – did not state a clear position on the project. However, states that the approach is considered a viable means of achieving the Icon Site objectives despite operational risks. Also states that the success of the proposal is contingent on the effective operation of the structures and avoidance or management of ecological risks. States that clarification on the preferred timing of watering and the potential benefits and risks should be provided. Also in terms of ecology and risk mitigation, details on the following should be provided: mitigation approaches to deal with potential impacts to native fish as a result of incoming pest fish species; the monitoring program during operation; and a clear statement identifying the risks and corresponding monitoring and mitigation strategies, particularly for potentially big risk area of water quality.

4.4 Submissions Report and Preferred Project Report

Upon review of the submissions received, the Department required the Proponent to prepare a Response to Submissions. After the exhibition period, the Proponent proposed changes to the project and the Department required these changes to be detailed in a Preferred Project Report. The Proponent provided information to address the issues raised in the submissions that were received during the public exhibition of the Environmental Assessment. The Proponent's Response to Submissions (including final Statement of Commitments and the Preferred Project Report) was accepted by the Department on 2 July 2010 and was made publicly available on the Department's website at this time. The main proposed change to the project is the postponement of the internal floodway component of the project. This is because further investigations undertaken since exhibition of the environmental assessment have found that the area in which the floodway is proposed is within the lower elevation part of the forest. As such, it is unlikely that an internal floodway will be required to enhance the movement of water towards the return channel. However, the Proponent still seeks approval of this component and its need will be detailed in the Operational Environmental Management Plan for the project. This Plan requires the approval of the Director-General prior to the commencement of operation. This is further discussed in section 5.3 of this report.

4.5 Department's Consideration

Table 1: Department's Consideration of Issues Raised in Submissions

Key Issue	Department's Consideration
Impacts on ecology during construction and operation.	See section 5.1 and 5.2 of this report respectively.
Impacts on hydrology and surrounding land uses.	See section 5.3 of this report.
Potential impacts from noise during construction.	See section 5.4 of this report.
Impacts on Aboriginal heritage.	See section 5.5 of this report.
Roads used for construction should be restored.	The EA stated the possibility of the need to upgrade sections of Nineteen Mile Road and Perricoota Forest Road, to make them suitable for construction. The Department notes that the Proponent would conduct dilapidation surveys of the access roads in the vicinity of the forest, to be undertaken prior to construction commencing to identify the sections of the road(s) that need to be upgraded. A survey would also be undertaken after construction to identify sections of the road network that have been degraded during construction. If road damage is attributable to construction, repairs would be performed to upgrade the roads to the pre-construction state. The Department recommends a condition requiring the Proponent to: ensure that any measures to restore roads as a result of the construction of the project, are undertaken in a timely manner, in accordance with the requirements and to the satisfaction of the relevant road authority and at the full expense of the Proponent; ensure that adequate signage is provided to inform road users of any change in traffic conditions resulting from construction works; and undertake all roadwork in consultation with Council and any relevant road authority.

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

After consideration of the Environmental Assessment, submissions received and the Submissions Report, the Department has identified the following key environmental issues associated with the proposal:

- ecological impacts (construction and operation);
- hydrological and surrounding land use impacts;
- noise impacts; and
- Indigenous cultural heritage impacts.

5.1 Ecological Impacts – Construction

The Proponent undertook an assessment of the flora and fauna impacts of the project, in accordance with the Draft Guidelines for Threatened Species Assessment (DEC/DPI, 2005). A total of 147 plant species (86 native) were recorded by the Proponent during field surveys of the project site. The forest contains a large number of annual or ephemeral plant species, and as such, species diversity varies considerably throughout the year and between seasons. The forest also supports a diverse assemblage of wetland and aquatic plant species during wet periods. Communities present in the forest are listed in Table 2.

Table 2: Vegetation Communities

Community	Variants
River Red Gum Forest	River Red Gum – sedge dominated tall open forest ¹
	River Red Gum- herbaceous grassy tall open forest
	River Red Gum –herbaceous tall open forest
River Red Gum Woodlands	River Red Gum – herbaceous tall open forest ²
	River Red Gum – Warrego Grass – Couch Grass riparian tall woodland
	River Red Gum – Wallaby Grass tall woodland
Black Box Woodlands	Black Box – Lignum woodland
Inland Grey Box Woodland	Inland Grey Box Grassy Woodland ³
Floodplain Marshes	Shallow marsh of regularly flooded depressions on floodplains
Sandhill Pine Woodland ⁴	-
Derived Grassland and Herbland	Derived tussock grasslands

At least 144 vertebrate fauna species were recorded in the forest during the site surveys, comprising of:

- 108 native species, including four threatened species (Gilberts Whistler, Hooded Robin, Diamond Firetail and Australasian Bittern) and a further three species subject to a preliminary determination for listing under the TSC Act (Varied Sittella, Scarlet Robin and White-browed Woodswallow);
- 15 species of microbats, including unconfirmed recordings of the threatened Large-footed Myotis (*Myotis macropus*) and Little Pied Bat (*Chalinolobus picatus*);
- ten terrestrial mammal species, including three native species;
- at least three species of arboreal mammals;
- six species of reptiles in low abundance (potentially attributable to the cool weather during the survey); and
- three species of frog in low abundance and limited calling activity (potentially attributable to the cool weather during the survey and extended dry period preceding the field survey).

There is also potential habitat for four threatened flora species known to occur or predicted to occur in the project area:

- *Amphibromus fluitans* (River Swamp Wallaby-grass) – Vulnerable under both the TSC Act and EPBC Act;
- *Austrostipa wakoolica* (a Spear Grass) – Endangered under both the TSC Act and EPBC Act;
- *Lepidium monolocoides* (Winged Pepper-cress) - Endangered under both the TSC Act and EPBC Act; and
- *Swainsona murrayana* (Slender-Darling Pea) - Vulnerable under both the TSC Act and EPBC Act.

¹ No River Red Gum dominated vegetation communities are listed as Endangered under Federal or NSW legislation.

² *Eucalyptus camaldulensis*, a dominant plant species present in riverine areas, generally forms open forests or woodlands.

³ Grey Box Woodland is listed as an Endangered Ecological Community in NSW (TSC Act) and is also nominated as an Endangered Ecological Community nationally (EPBC Act).

⁴ Endangered Ecological community (TSC Act)

Direct surface disturbance from the project would affect a maximum of 272 hectares. This maximum area takes into account both the areas to be permanently impacted by the project (on which project structures are to be situated) and areas to be temporarily impacted (areas that would contain temporary construction facilities and would be inundated as a result of the project's operation). Areas temporarily affected by construction will be rehabilitated via re-colonisation of native species, particularly River Red Gum Communities following inundation events. These will be monitored in accordance with a Rehabilitation Plan, to be developed in consultation with DECCW (Statement of Commitment No. 6). This plan is to include measures for the active rehabilitation of construction areas to encourage the re-growth of plants and includes managing weeds and the replacement of forest debris on disturbed areas. Of this maximum surface impact, the total estimated area of native vegetation clearance is approximately **266 hectares**. This maximum amount of clearing is likely to be less in practice, given the existing disturbance within the forest. It is to be noted that the total area of vegetation clearance is less than the total area of surface disturbance because:

- a portion of the haul road to the Thule regulator follows the alignment of an existing road outside the forest (0.6 ha);
- some project infrastructure footprints and site facilities overlap (3.8 ha); and
- the by-washes are outside the forest and were not mapped as part of the assessment (1.6 hectares of River Red Gum Forest). By-washes (outlet channels to divert flow of water) are proposed to be constructed along the Barbers Creek system to assist the flow of water into the downstream system. The Proponent is currently reviewing the design of the by-washes, taking into consideration the maximum flow of water required to be released down Barbers Creek. Options available to minimise clearing of River Red Gum Forest to accommodate these structures will be identified during the detailed design phase of the project. This area would be quantified in the Construction Environmental Management Plan required for the project.

The project's construction footprint, including the amount of native vegetation to be cleared within this footprint is outlined in Table 3.

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Table 3: Construction Footprint

Project Infrastructure	Construction Footprint (ha)	Permanent Disturbance Footprint (ha)	Vegetation	Area within Disturbance Footprint (hectares)	Proponent's Evaluation of Impacts
Haul roads (indicative)	7.3	0.0	River Red Gum – Black Box Woodland	0.51	Modification of native vegetation and habitat within footprint, situated in disturbed areas as far as practical. Vegetation would be allowed to regenerate.
			Blackbox – Lignum woodland	0.30	
			Derived tussock grasslands	0.50	
			River Red Gum – herbaceous tall open forest	2.13	
			River Red Gum – wallaby grass tall woodland	2.92	
Site facilities (indicative)	2.9	0.0	River Red Gum – Black Box Woodland	0.97	Modification of native vegetation and habitat within footprint, situated completely outside of EEC areas and in disturbed areas as far as practicable. Vegetation would be allowed to regenerate.
			Blackbox – Lignum woodland	0.98	
			River Red Gum – wallaby grass tall woodland	0.77	
Upstream Structures					
Inlet channel and inlet regulator and fishways	16.5	14.4	River Red Gum – Black Box Woodland	3.11	Permanent removal or modification of native vegetation, including Inland Grey Box Woodland EEC. Understory vegetation would be allowed to regenerate within the channel.
			Blackbox – Lignum woodland	2.28	
			Riverine Inland Grey Box grassy woodland	8.00	
			Derived tussock grasslands	0.41	
			River Red Gum – herbaceous tall open forest	2.21	
			River Red Gum – wallaby grass tall woodland	0.23	
Swan Lagoon structures	0.2	0.15	River Red Gum –sedge tall open forest	0.05	Permanent removal of tall, highly significant riparian River Red Gum Forest.
			River Red Gum – herbaceous tall open forest	0.15	
Spoil disposal area	42.3	0.0	River Red Gum – Black Box Woodland	4.97	Modification of native vegetation and habitat through spreading of approximately 500mm of spoil material. Disturbance would be concentrated on the existing levee and would not be placed in Inland Grey Box Woodland. An option for offsite spoil disposal is being investigated.
			Blackbox – Lignum woodland	38.12	
			River Red Gum – wallaby grass tall woodland	0.04	
Downstream Structures					
Downstream levee alignment	120	69.55	River Red Gum – Black Box Woodland	30.25	Permanent removal of vegetation and habitat along maintenance tracks. Modification of forest and woodland vegetation through conversion to grass and herbland along remainder of levee.
			Blackbox – Lignum woodland	2.81	
			Derived tussock grasslands	5.92	
			River Red Gum – herbaceous tall open forest	12.13	

Project Infrastructure	Construction Footprint (ha)	Permanent Disturbance Footprint (ha)	Vegetation	Area within Disturbance Footprint (hectares)	Proponent's Evaluation of Impacts
			River Red Gum – wallaby grass tall woodland	68.46	
Downstream stop log regulators	5.1	2.6	River Red Gum – Black Box Woodland	0.62	Permanent removal of vegetation and habitat within infrastructure footprint.
			Blackbox – Lignum woodland	0.29	
			Derived tussock grasslands	0.04	
			River Red Gum – herbaceous tall open forest	1.81	
			River Red Gum – wallaby grass tall woodland	2.31	
Internal floodway	5	0.00	River Red Gum – sedge tall open forest	0.52	Modification of native vegetation and habitat within footprint. Vegetation would be allowed to regenerate.
			River Red Gum – herbaceous tall open forest	3.91	
			River Red Gum – wallaby grass tall woodland	0.57	
Borrow pits	65	0.00	River Red Gum – Black Box Woodland	22.74	Modification of native vegetation and habitat within footprint situated in disturbed areas as far as is practicable. Vegetation would be allowed to regenerate.
			Blackbox – Lignum woodland	1.54	
			Derived tussock grasslands	0.47	
			River Red Gum – herbaceous tall open forest	4.92	
			River Red Gum – wallaby grass tall woodland	35.14	
Return channel, return channel regulator and exit structure	1.3	1.3	Derived tussock grasslands	0.82	Permanent removal of vegetation within footprint, the majority of which is exotic grassland.
			River Red Gum – herbaceous tall open forest	0.07	
			River Red Gum – wallaby grass tall woodland	0.34	
Turkey nest dams (four)	1.5	0.00	Derived tussock grasslands	0.18	Removal of native vegetation and habitat within footprint, situated in disturbed areas as far as is practicable. Vegetation would be allowed to regenerate.
			River Red Gum – herbaceous tall open forest	0.03	
			River Red Gum – wallaby grass tall woodland	1.02	
			Blackbox – Lignum woodland	0.17	
By-washes	1.6	1.6			
Temporary	2.5	0.0	River Red Gum – Black Box Woodland	0.14	An additional 2.5 ha of vegetation would be removed through inclusion of this

Project Infrastructure	Construction Footprint (ha)	Permanent Disturbance Footprint (ha)	Vegetation	Area within Disturbance Footprint (hectares)	Proponent's Evaluation of Impacts
topsoil stockpiling at downstream regulators			Blackbox – Lignum woodland	0.49	new disturbance footprint. Removal of native vegetation and habitat within the footprint, situated in disturbed areas as far as is practicable. Vegetation would be allowed to regenerate.
			River Red Gum – herbaceous tall open forest	0.49	
			River Red Gum – wallaby grass tall woodland	1.33	
TOTAL	271.2 (Proponent has rounded this to 272 in its EA)	89.6			

Note – Construction footprint includes both temporary and permanent impact areas.

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Table 3 shows that the total amount of native vegetation to be removed is 268.18 hectares (permanent and temporary), of which **181.48 hectares is to be temporarily impacted** (temporary facilities used for construction) and **86.7 hectares is to be permanently impacted** (installation of permanent structures).

The clearance of the vegetation would also cause displacement or mortality of fauna that are within the surface disturbance area of construction. The project may also interrupt or prevent breeding for one season if species are breeding within or near disturbance footprints during construction.

Offsets for Construction

The Proponent assessed the ecological impacts of the permanent and temporary construction footprints, to determine whether offsetting the impacts would be required. The purpose of the project is to provide positive ecological impacts by restoring the health of approximately 17,000 hectares of the forest and associated floodplain biota. This means that the majority of the vegetation to be removed for construction will be positively affected from the operation of the project in the long term. Notwithstanding this, there would also be resultant residual negative impacts to eight hectares of the Inland Grey Box Woodland, as it would be negatively affected from the proposed environmental watering of the forest (as it is flood-intolerant). However, the Proponent has committed to offset the loss of Inland Grey Box Woodland that is removed for construction. The Proponent has prepared a draft biodiversity offset strategy in consultation with DECCW, which includes the selection of an offset site. The selected offset area is to be located within the former Toorangabby property in the Perricoota Forest. This property was purchased by the Proponent (and added to the State Forests Estate), as it is the proposed location for the Swan Lagoon regulators. There are other areas within this property, which are not to be used for construction, that originally contained areas of Inland Grey Box Woodland and River Red Gum dominated communities. These areas within the former Toorangabby property have been extensively cleared and degraded by historical timber harvesting and sheep grazing. As such, the proposed offset would entail the improvement of the condition of this part of the forest (the selected offset site), through a change in management regime. Improvement of this site would aim to reinstate areas of Inland Grey Box Woodland. The titling and management of these portions of the former Toorangabby property for biodiversity conservation is an additional use of the land. As such, conservation of the offset site in perpetuity would be ensured by titling the Forest FMZ 3a within FNSW's Forest Management Zone (FMZ) system. FMZ is a land based classification system, which identifies the primary management intent across the various components of the landscape. The FMZ system is based on nationally agreed reserve criteria and differentiates between those areas of State Forests that are specifically set aside for conservation, and those areas that are available for other activities, including timber harvesting.

FMZ 3a - Special Prescription, allows only "Activities consistent with the area's nominated special value". Timber harvesting and removal of forest products is excluded from this title. Activities that are consistent with the area's nominated special value are permitted, such as weed and pest management and tactical grazing. Additional activities may also be performed where species conditions are needed to ensure consistency with the area's special value (e.g. road and fire trail construction). The Proponent has found that the FMZ 3a zoning is consistent with other areas of Inland Grey Box Woodland in the State Forest which excludes timber harvesting from these areas. Figure 6 below shows the location of the proposed offset site, including its proximity to the site where eight hectares of the Inland Grey Box Woodland community would be cleared for the project's construction.

The offset site is 149 hectares in area and contains appropriate 'like for like' vegetation communities including 94 hectares of Grey Box Woodland, plus additional habitat for terrestrial fauna in other native vegetation communities. The vegetation types at this offset site have been documented in literature to include:

- 94 hectares of Inland Grey Box grassy woodland (EEC);
- 37 hectares of River Red Gum – herbaceous tall open forest; and
- 17 hectares of Derived tussock grasslands.

The site would offset the clearing of eight hectares of Inland Grey Box Woodland with the conservation and improvement of 94 hectares of Inland Grey Box Woodland, i.e. an offset ratio of approximately 11.5 to 1. It is to be noted that a referral was made by the Proponent to the Department of Environment, Water, Heritage and the Arts to assess whether the proposal is deemed to be a controlled action under the EPBC Act. The Department of Environment, Water, Heritage and the Arts had decided, on 20 January 2010, that the project is not a controlled action under the EPBC Act.

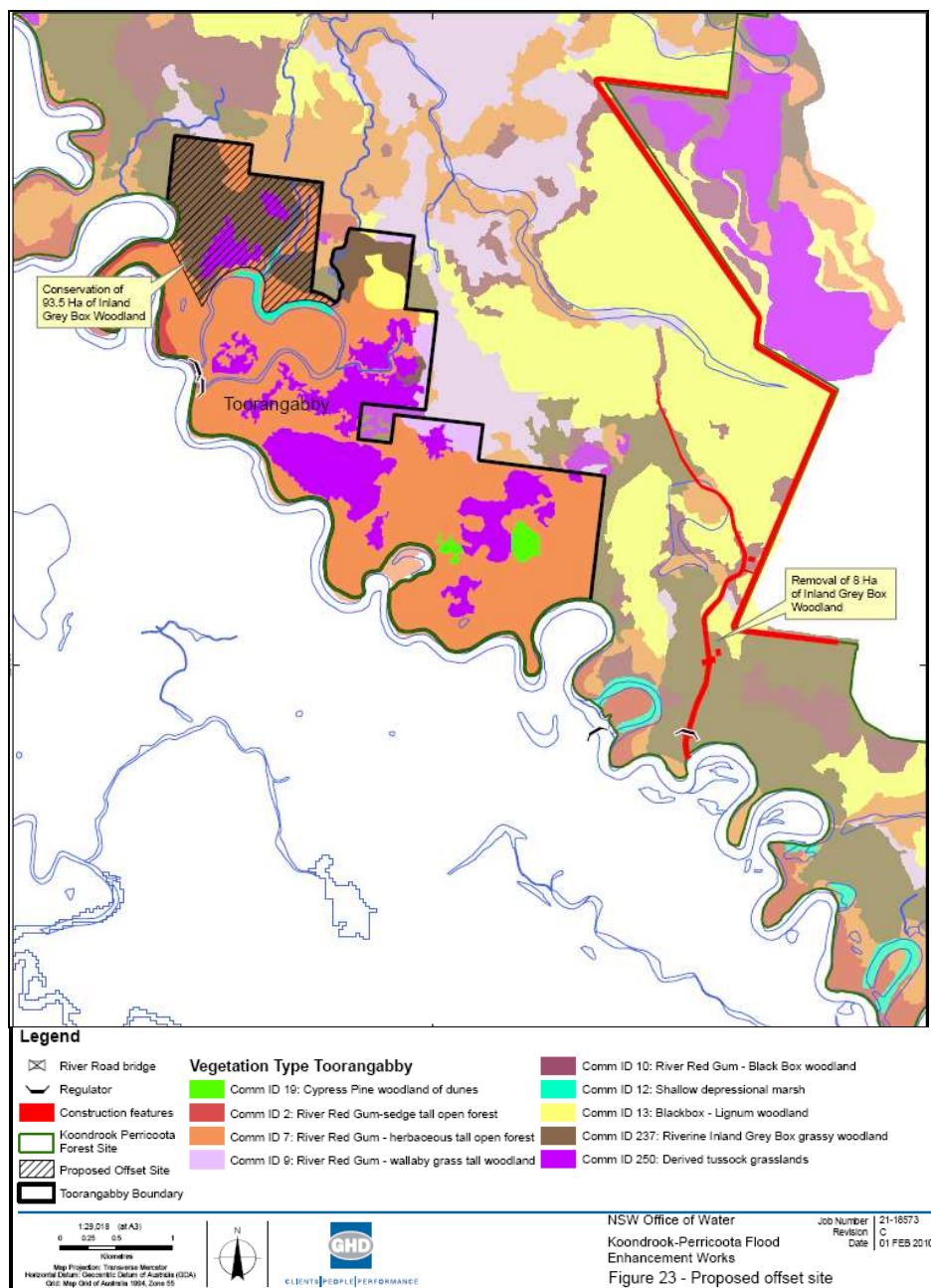


Figure 6: Proposed Offset Site for removal of 8 hectares of Inland Grey Box Woodland (reproduced from the Proponent's Environmental Assessment)

Department's Consideration of Construction Impacts

The forest has an area of approximately 32,000 hectares, which is mostly covered by native vegetation (therefore the Proponent's assessment assumed that the entire area is covered by native vegetation). Of this total area, approximately 181.48 hectares of native vegetation would be temporarily removed during construction and 86.7 hectares would be permanently lost to the facilities required for operation of the proposal. No direct impacts of any known populations of threatened flora species would occur.

The Department notes that the potential habitat for four threatened flora species (River Swamp Wallaby-grass, a Spear Grass, Winged Pepper-cress and Slender-Darling Pea) could be removed by the project. Based on the known ecology of these species, the department considers that direct impacts on these plant species are unlikely during construction. These species are known to thrive in moisture rich areas, however, the project site is currently

relatively dry. Even though these species were not detected during the field surveys, there is potential for dormant individuals to be present, however disturbance to these species is considered unlikely. If present, it is likely that only a small proportion of location populations would be affected, given the maximum construction area of 268 hectares within the 32,000 hectares of similar habitat at the forest site. The extent of potential impact is unlikely to threaten the persistence of these species at the site. In terms of benefits, the Department considers that the proposed inundation (operation of the project) of a portion of the forest would increase the soil moisture of the site and therefore the area of potentially suitable habitat for the four plant species.

The Inland Grey Box Woodland is the one Endangered Ecological Community listed under the TSC Act that is present at the project site. Construction of the project would permanently remove eight hectares of this community. The Department notes that this extent of area is minimal when considering the total area of this community present within the forest (0.84 per cent to be removed of the approximately 951 hectares of Inland Grey Box Woodland in the forest). The Department notes that although commercial timber production is the main land use within the forest, it is undertaken in accordance with the Riverina Ecologically Sustainable Forest Management Plan. This Plan is developed by Forests NSW to guide the sustainable management of the forest, for present and future generations. The project would maintain (not directly impact on) approximately 32,000 hectares of near continuous native vegetation around the project disturbance footprint. Ecosystem functions that are vital to the maintenance of this vegetation community, including pollination, seed fall and germination of plants, are considered to be likely to continue around and/or across gaps in habitat created by the project infrastructure footprints.

Although it is considered the extent of removal of Inland Grey Box Woodland is minimal in comparison to the total area of this community present in the Forest, the community is listed as Endangered and therefore any removal of this community is considered to be significant by the Department. However, the Department finds the offset strategy (as described earlier in this section) proposed by the Proponent to mitigate the impacts on local populations of this Endangered Ecological Community to be satisfactory, as the selected site would offset the clearing of eight hectares of Inland Grey Box Woodland with the conservation and improvement of 94 hectares of this community. Notwithstanding this, the Department notes that the Proponent is yet to finalise the final Offset Package and set a timeframe for the implementation of the Offset Package. As such the Department recommends that the Proponent be required to finalise this package in consultation with, and to the satisfaction of, DECCW. The Final Offset Package is recommended to be finalised prior to the commencement of construction and include the following:

- a) an offset for direct and indirect impacts of the project which maintains or improves biodiversity values;
- b) details of the final suite of biodiversity offset measures selected in accordance with the Package; and
- c) a program (timeline) to achieve the implementation of the final suite of measures.

The Department also considers that a program to monitor the effectiveness of the implementation of the biodiversity offset is needed, but this is not included as part of the Offset Package. For this reason, the Department has recommended that the Proponent be required to include a Monitoring Program as part of the Offset Package, to measure the effectiveness of the final suite of biodiversity offset measures to be provided as part of the Offset Package. The monitoring is to be undertaken during construction (for construction-related impacts) and until such time as the effectiveness of mitigation measures can be demonstrated to have been achieved over a minimum of three successive monitoring periods, or as otherwise agreed by the Director-General. The Monitoring Program is required to include:

- a) provision for the analysis of the data to identify changes to habitat usage and if this can be attributed to the project;
- b) details of measures that would be implemented in the event of changes to habitat usage patterns directly attributable to the construction of the project; and
- c) provision for annual reporting of monitoring results to the Director-General and DECCW, or as otherwise agreed by these agencies.

The Department is satisfied that once finalised, subject to the recommendations made by the Department, the Offset Package would be adequate to mitigate the construction impacts to the Inland Grey Box Woodland. The Department is also satisfied that the Proponent should not be required to offset construction impacts on the other vegetation communities (River Red Gum communities), given the project will benefit, through inundation events, over 16,000 hectares of these communities in the long term.

With regards to impacts on fauna, construction of the project would remove habitat areas for four threatened woodland birds (Gilberts Whistler, the Hooded Robin, Diamond Firetail and the Black-chinned Honeyeater); three threatened microbats (Yellow-bellied Sheath-tail Bat; Large-footed Myotis and Little Pied Bat); two species of arboreal mammals (the Squirrel Glider and the Koala); the hollow-dependant woodland bird Bush Stone-curlew; and three species of preliminary-listed Woodland birds (the White-browed Woodswallow, Varied Sittella and Scarlet Robin). Apart from White-browed Woodswallow, Varied Sittella and Scarlet Robin, all of these species are listed as Vulnerable under the TSC Act.

The Department considers that the project is unlikely to affect the lifecycle of these fauna species, given the maximum construction area of 268 hectares within 32,000 hectares of similar habitat at the Forest. However there will be some disturbances and direct impact to a small portion of habitat which is suitable for the fauna. These impacts and the Department's evaluation of their significance are discussed below.

The scale of disturbance is unlikely to threaten the persistence of these fauna species within the forest. For example, none of the four woodland bird species are known to have a dormancy period that could potentially be affected by the project. These birds are also not known to exhibit long term or ecologically important roosting behaviour that could potentially be affected by the project. It is noted, however, that these species would roost daily in native vegetation and therefore the proposed construction may affect some roosting individuals if they are roosting within or near the disturbance area. However, the Department finds that the construction period will be a short-term impact (approximately 9 months of construction) and there is adequate coverage of appropriate native vegetation available surrounding the construction area, which can provide significant roosting or other habitat opportunities for these species.

Low numbers of the animals have been recorded within the forest and, as such, construction activities may change foraging behaviour of some individuals if they are within or near the disturbance area. However, this disturbance would be short-term in nature and is likely to affect a small proportion of local populations. However, some foraging habitat would be permanently removed as a result of the placement of engineering structures for the project. These animals would have to utilise alternative habitat to compensate for this loss of resources. The Department, however, notes that the Offset Package would provide additional habitat for terrestrial fauna in those vegetation areas improved by the implementation of the Offset Package. The Monitoring Program to be included as part of the Offset Package will include provisions for the analysis of the data obtained from monitoring to identify changes to habitat usage and determining whether this can be attributed to the construction works. If a change to habitat usage is found attributable to the construction works, the Proponent would need to implement management measures to address this change.

With regards to effects on migration, construction of the project may affect migration and dispersal ability, through direct disturbance and removal of habitat within the construction footprint. However, the Department finds that this would affect limited areas and occur for limited periods. Also, birds and bats would readily traverse obstacles and gaps in habitat created by permanent project engineering infrastructure.

The threatened microbat species utilise tree hollows during an annual cool-season dormancy period. The Department notes that approximately 532 habitat trees would be removed during construction. These habitat trees include hollow-bearing trees, nest trees and roost trees. This would disturb the dormancy period of any individuals of this species potentially roosting within the construction period. The Department notes that the Proponent anticipates that construction would occur over a period of 9 months, commencing in October 2009 and finishing in June 2011. This construction period would avoid the winter season, however, there may be trees occupied by microbats during this construction period. The Department notes that the Proponent has committed to the implementation of a pre-clearance inspection protocol, prior to the removal of habitat trees and/or hollow bearing trees. It is not clear to the Department, however, how animals found roosting within the trees will be safely removed and appropriately managed before clearance occurs. As such, the Department recommends a condition that requires the Proponent to detail in the required Construction Environmental Management Plan for the project, the measures to manage and avoid significant impacts to fauna from the removal of hollow-bearing trees. This includes the procedures to install and monitor mitigation measures, such as nest boxes, relocated hollows and fauna fencing for effectiveness and maintenance of the mitigation measures.

DECCW stated in its submission that the Proponent should include *Wilsonia rotundifolia* and Grey-crowned Babbler in its Assessment of Significance. As part of the Submissions Report for the project, the Proponent noted that the

project would not directly impact on any known populations and specific habitat resources, of either species, as such additional Assessments of Significance for these species were not prepared. However, in response to DECCW's comment, the Proponent evaluated the magnitude, extent and significance of impacts of the project on these two species and their habitats. In summary, the Proponent's assessment found that the project is unlikely to have a significant negative effect on local populations of the threatened plant *Wilsonia rotundifolia* and on local populations of the Grey-crowned Babbler. The Department is satisfied with this approach taken by the Proponent and finds that no significant impacts are likely to occur to either species.

The Proponent has also proposed a range of mitigation measures to be implemented during construction, to avoid significant ecological impacts. These include having a suitably qualified ecologist or WIRES-accredited fauna management officer (or equivalent) present during construction works, monitoring habitat trees for fauna and postponing clearing through areas where resident fauna have been found. Also the Proponent would replace removed hollow-bearing trees in nearby revegetation areas and appropriate speed limits will be set for construction traffic to limit the risk of fauna being injured or killed.

The Proponent has also formed a new commitment (Statement of Commitment 6), aligned with DECCW's comment of the need for an active Rehabilitation Plan for the project. This plan is to be developed in consultation with DECCW and Murray Catchment Management Authority, to ensure that temporary disturbance areas (181.48 hectares of the total 286.18 hectares to be disturbed) are actively rehabilitated by the Proponent, rather than only leaving the areas to naturally regenerate. The Murray Catchment Management Authority is a statutory authority that works with landholders, local government and community groups to address natural resource management issues, particularly vegetation management. The proposed project site is situated within the area of the NSW Murray Catchment. The Department supports this commitment, as these disturbed areas would not be able to properly regenerate without intervention and consultation with these appropriate authorities.

The Department concludes that provided the Proponent implements all the nominated environmental commitments, its recommended impact minimisation measures, and the Department's recommended conditions dealing with management measures, the impacts on ecology can be mitigated to an acceptable level.

5.2 Ecological Impacts – Operation

The operation of the project would create cycles of wetting and drying (which will mimic historically natural events) which will cause the floodplain ecosystem to respond. Cycles of wetting and drying will affect the processes and functions of the floodplain ecosystem. Filling will cause the release of nutrients and increase productivity, allowing migratory and mobile organisms such as fish and birds to transfer nutrients between floodplains and subsequently into terrestrial areas. This process of nutrients transfer will trigger growth, breeding and dispersal of fauna and flora. However the Proponent has found that there will also be negative impacts resulting from this phase. These impacts include increased erosion of the floodplain bed and banks, which will cause an increase in turbidity. High turbidity may reduce the penetration of light and therefore lead to the reduction of aquatic macrophytes. Also, with the arrival of floodwaters, eggs, larvae and juvenile fish from the Murray River would enter the forest, causing the depletion of fish in the Murray River. The last key impact from the filling phase will be the diversion of introduced fish species (such as Carp and Eastern Gambusia) into the flooded forest and associated impacts on native fish.

The inundated phase will allow the productivity of the forest to be maintained, however a range of negative impacts have the potential to occur during this phase and are listed below:

- anaerobic (without air) nature of waterlogged soil can impact on terrestrial plants that are intolerant of inundation. The Inland Grey Box Woodland Community is a vegetation community that is intolerant to flooding and therefore this process is likely to negatively impact the community (e.g. causing reduced productivity and death of individuals);
- if the duration of the inundation event is beyond the tolerance levels of the "flood-dependent" species River Red Gum and Black Box Woodland, then these vegetation types can experience a reduction in productivity and even result in death of some individuals;
- an inundation event may act as a shock to stressed River Red Gum due to the prolonged dry conditions evident in the project site. This stress may subsequently lead to death of trees;
- if an inundation event occurs in calm weather and warm conditions, together with high mobilisation of organic carbon stores occurring, then blackwater events can result. A blackwater event is where dissolved oxygen concentrations are greatly reduced and can cause the death of aquatic fauna (e.g. fish and tadpoles);

- once entered with the floodwaters, the introduced fish *Eastern Gambusia*, will prey on native fish and tadpoles. This will cause a reduction in breeding success of native fish;
- terrestrial animals may be concentrated on islands on the floodplains, which could also be occupied by predators such as foxes and cats. Also terrestrial fauna would risk drowning and/or displacement; and
- apart from impacts occurring within the inundated project site discussed above, the health of the Murray River could be impacted. The downstream structures proposed as part of the project are to control the release of water from the Forest and to maximise return flows back to the Murray River. However, potential algal blooms triggered on the project site (during calm and warm conditions) could be returned to the River.

The third and final phase of an inundation event is the recession of floodwaters, and the subsequent drying of the soils. The drying of the soils will lead to the: concentration of nutrients and salts in low-lying wetlands; storage of nutrients in the soil; completion of growth, foraging and breeding activities by wetland biota; germination of floodplain flora; and the slowing down of (or completion of) animal activity during summer. The potential negative impacts caused as a result of this recession phase are as follows:

- the rate of receding water may leave some plants and animals with inadequate time to complete breeding cycles, leading to reduced breeding success and the depletion of egg and seed banks; and
- fish can be left stranded on the floodplain and unable to return to the Murray River due to the rapid fall of water.

Department's Consideration of Operational Impacts

Terrestrial Vegetation

The five vegetation communities present within the project site (Inland Grey Box Woodland, Derived tussock grasslands, Black Box-Lignum woodland, River Red Gum forests and Shallow Marsh) will all be inundated during operation. Apart from Inland Grey Box Woodland and Derived tussock grasslands, all other vegetation communities will significantly benefit from the project's operation as their production is flood-dependent. This is further discussed and considered below. The Inland Grey Box Woodland is considered to have been naturally occurring within the forest, however, some areas of the project site have been colonised by Derived tussock grassland due to the degradation (due to modification of the present flooding regime) of the River Red Gum dominated communities.

Black Box-Lignum Woodland and River Red Gum forests are representative communities of forested wetlands of NSW, which depend on floodwaters to assist in their productivity and health. Floodwaters are a key factor in the nutrient cycle of these forest wetlands, where the soils in which they grow can absorb large quantities of nutrients. Approximately 29,484 hectares of River Red Gum and Black Box-Lignum woodland vegetation communities exist within the forest, of which 17,332 hectares will be inundated. The vegetation community Shallow Marsh is part of Inland Floodplain Swamps and exists among stands of River Red Gum or Black Box forests and woodlands. They are situated in low-lying areas, so they can be flooded regularly. Approximately 1,862 hectares of Shallow marsh exists within the forest, of which 1,357 hectares will be inundated by the project's operation. Flooding within threshold limits will be of benefit to these vegetation communities, however excessive flooding that is above the tolerance thresholds of these communities can lead to negative impacts and therefore prevent the primary objective of the proposal to be met. The Department considers that overall Black Box-Lignum Woodland, River Red Gum forests and Shallow marsh vegetation communities would be benefited as the proposed inundation would be within their tolerance levels.

Black Box-Lignum Woodland requires an average flood frequency of once every three to five years, with average inundation duration of two to four months. Under the project's operation, Black Box-Lignum Woodland would be inundated for a maximum duration of 180 days (and typically for 100 days). This is within the tolerance of this community (tolerates inundation up to 180 days, however optimum is between 30 and 60 days) and as such the effects to this community are expected to be beneficial, with no predicted negative impacts. River Red Gum forest communities require an average flood frequency of once every two to three years, with average inundation duration of 120 to 210 days (maximum is 720 days). Under the project's operation, the duration of the flood within River Red Gum forests would be between 30 and 200 days for the majority of the area, which is considered optimum for this community. Marshes will be inundated by the project's operation for varying durations. The only negative impacts that could be expected on marsh communities may be from areas that are not inundated for a sufficient period of time to allow for the completion of lifecycles of species that live for a limited period (such as species of saltmarsh which require frequent flooding). Approximately 100 hectares would be inundated for less than 60 days, which may not be sufficient for all species within these areas to flower and set seed. However, the vast majority of these

communities would be inundated for more than 60 days and over 400 hectares would be inundated for more than 120 days. As such the majority of the effects to this community are expected to be beneficial.

However, the Department notes that the productivity of the forest (and benefits to health) will only be enhanced by high nutrient retention of the inundated soil. High nutrient retention occurs when the flow of water and drying up rates are slow, turbulence is low and the sediments that enter from the floods are high in organic matter. Also, as noted by the South Australian Government (Department of Water Land and Biodiversity Conservation) in its submission to the Department, clarification of the preferred timing of inundation is needed to understand and monitor the potential benefits and risks to the vegetation communities. For example, the Proponent's environmental assessment indicated a preference for spring/summer flooding that would provide optimum timing for water bird breeding. However, the environmental assessment also states a preferred autumn inundation event to avoid the risk of blackwater events. In response to this issue, the Proponent explained in its Submissions Report that an operating plan would be developed to monitor the operation of the project against the desired water regime for the vegetation classes. For example, for waterbird breeding, a water regime of every six to nine years (in every ten years) is required. The Department understands that the actual benefits and risks over time can only be understood through real-time management; that is, through a flexible operating regime, where each inundation event can be monitored and then the ecological response to the inundation event can be assessed. The results of such an assessment can then be used to plan for subsequent inundation events. This would provide an adaptive management regime to ensure the benefits expected are delivered and the risks are managed to avoid significant environmental impact.

The Department supports the development and implementation of the Proponent's proposed Operating Plan, and notes that this plan would be crucial in determining the appropriate on-going management of the project. The Department also notes that several ecological parameters need to be considered, and form part of the operational design of the project. As such, the Department has recommended a condition that requires the Proponent to prepare and implement an Operational Environmental Management Plan (OEMP), to detail an environmental management framework, practices and procedures to be followed during operation of the project. The OEMP must reflect the overall process for adaptive management, consistent with the operational regime of the project and include a set of objectives and principles to trigger inundation events. Also, as part of the OEMP, the Proponent must include an evaluation of algal bloom risk from operation, including measures to avoid and manage such risks (for example considering the seasonality of inundation events) and management measures for blackwater events. The Department also recommends that as part of this required OEMP, the Proponent prepare and implement a Biodiversity Operational Plan (this Plan is to be a sub-plan of the OEMP). The Biodiversity Operational Plan is to detail how operation would be managed and monitored to minimise impacts to terrestrial and aquatic biodiversity.

Two of the five vegetation communities to be inundated by the project's operation do not rely on flooding for their production and optimum health. These two communities are Inland Grey Box Woodland and Derived tussock grasslands. Inland Grey Box Woodland is intolerant to constant water-logging. Approximately 951 hectares of Inland Grey Box Woodland exists within the forest, of which 189 hectares will be inundated from operation. A majority of this area to be inundated will be flooded for more than 30 days. As such, the operation of the project over a number of years is likely to result in severe stress and degradation, ultimately destroying this community in this location.

Derived tussock grasslands are composed of three types of vegetation structure and species composition, these being herbland (e.g. *Vittadinia cunneata*, *Cotula bipinnate*), grassland (e.g. *Austrostipa* spp. and *Austrodanthonia* sp) and sedgeland (e.g. *Juncus* spp. and *Phragmites australis*). Both herblands and grasslands contain terrestrial plant species that are intolerant of flooding but are likely to survive in the seed bank and re-emerge after the flood recedes. Sedgeland contains emergent aquatic plant species that are tolerant of inundation. For example *Phragmites australis* is tolerant of permanent inundation up to a depth of 1 to 1.5 metres for up to eight months providing that plant is not totally submerged. Approximately 372 hectares of Derived tussock grasslands exists within the forest, of which 46 hectares will be inundated from operation. This community would be inundated for a sufficient period of time to result in the death of some annual terrestrial plants. However, the seedbank would survive and the community may potentially benefit in terms of species diversity and productivity following the recession of the flood, although this is dependent on when the next event would occur and its duration. Impacts on sedge dominated communities are likely to be positive. Given the uncertainties regarding the specific nature of impacts that will occur on these two vegetation communities, due to varying flood duration and timing of one flood event to the next, the Department considers that the Proponent should include a methodology for monitoring and

assessing the health and condition of these vegetation communities. The Department has recommended that this information be included as part of the Biodiversity Operational Plan and include provisions for the analysis and reporting of data (e.g. species composition and species decline), obtained from the monitoring of inundation events, to identify and determine the impact on these communities from the operation of the project. This required methodology must also identify the point at which data obtained would be representative of the likely impacts to the vegetation communities from inundation, in order to detail the significance of impacts to biodiversity as a result of the loss quantified from the assessment of the data obtained. This information will then inform the quantification of biodiversity offset requirements for operational impacts (depending on the type and level of impact found). The Department considers that this approach is appropriate in addressing potential impacts to vegetation communities that are intolerant to prolonged flooding.

Terrestrial Fauna

The proposed flooding of the forest may drown or displace terrestrial fauna, including mammals, reptiles and bird species. The Proponent's environmental assessment finds that local populations of fauna have persisted in the context of natural flood regimes, and are also likely to be resilient to the risks of drowning and displacement. The Department considers that given that the majority of the forest contains trees, which would provide escape routes and alternative shelter and foraging substrate for these animals, the operation of the project would not significantly impact upon local populations of fauna. The Department also considers that a majority of the affected population would utilise alternative habitat and reoccupy the inundation area after flood recession. The Department however, also notes that the flexible operating regime of the project would allow for a better understanding of the actual risks over time, through real-time management. The required Operational Environmental Management Plan for the project is to include provisions for the monitoring of, and assessment of, each inundation event. This scheme aims to achieve an adaptive management regime to ensure the benefits expected are delivered and the risks are managed to avoid significant environmental impact, including impacts to terrestrial fauna and their habitat during operation.

Fish Movement

With regards to impacts on fish movement during operation, the Department supports the proposed fishway structures (termed denil fishway and vertical slot fishway) to be used during operation. The denil fishway has been designed with a diversion flow rate between 900ML/day and 6,000ML/day to suit large fish. It would operate when flows at the inlet regulator are starting to recede and water levels on the floodplain start to recede. This is the stage of the flood cycle when large fish are most likely to start moving from the floodplain into the Murray River. The Department notes that the Proponent has found from its investigation that the Murray Cod, a nationally threatened fish, would use the denil fishway (which has been specifically designed with a 40 cm width to allow large adult Murray Cod to pass through). The vertical slot fishway would be a separate fishway that provides passage for small-bodied fish (e.g. 20 to 100 mm long), including juvenile Murray Cod.

The project also incorporates a freshwater turtle ramp, to be located downstream at the inlet regulator to allow turtles to pass through. The Proponent has committed to detailing proposals in the Operating Plan, for the monitoring of fish movement into and out of the forest and fish community changes within the Forest during inundation events. The Department recommends a condition that requires the Proponent to include a Fish Management Sub Plan, as part of the required Operational Environmental Management Plan, to detail the management of fish movements and impacts as a result of inundation events. This sub-plan has also been recommended to be prepared in consultation with and to the satisfaction of NSW Industry and Investment (Fisheries section) and is to include:

- a description of methods to be used (which include monitoring) for water quality monitoring of dissolved oxygen and dissolved organic carbon levels both within the project site during watering events and in the Murray River and other downstream waterways when water is being discharged from the project site;
- a description of methods to be used for the monitoring of fish movement into and out of the project site and fish community changes within the project site during watering events; and
- a description of methods to be used for the monitoring of pest fish response to watering events, to manage and control the movement of pest fish species.

The Department considers that these recommendations are aligned with the issues raised by the NSW Industry and Investment and the public submissions regarding the management of fish species during operation.

The Department also considers that provided the Proponent implements all its nominated environmental commitments and the Department's recommended mitigation and management measures, the potential significant impacts on ecology can be mitigated during operation to ensure the beneficial objectives of the proposal are achieved.

5.3 Impacts on Surrounding Land

Background

The existing Torrumbarry Weir, located at the south-eastern most end of the Koondrook-Perricoota Forest (the forest), is a key structure in the project design. Torrumbarry Weir has significant potential to assist in Forest inundation due to its ability to raise Murray River water operating levels and given its location is at the highest point of the Forest. Figure 7 below shows the main hydrologic features of the forest. The flow of floodwater through the forest is dominated by the Burrumbury-Barbers Creek system, sourced naturally from the Swan Lagoon on the Murray River, located downstream of the Torrumbarry Weir. The Murray River system comprises of well defined channels, inducing into a myriad of smaller, interlinked runners further into the forest. These runners eventually join together into several defined streams, the largest being Myloc Creek, which becomes Barbers Creek.

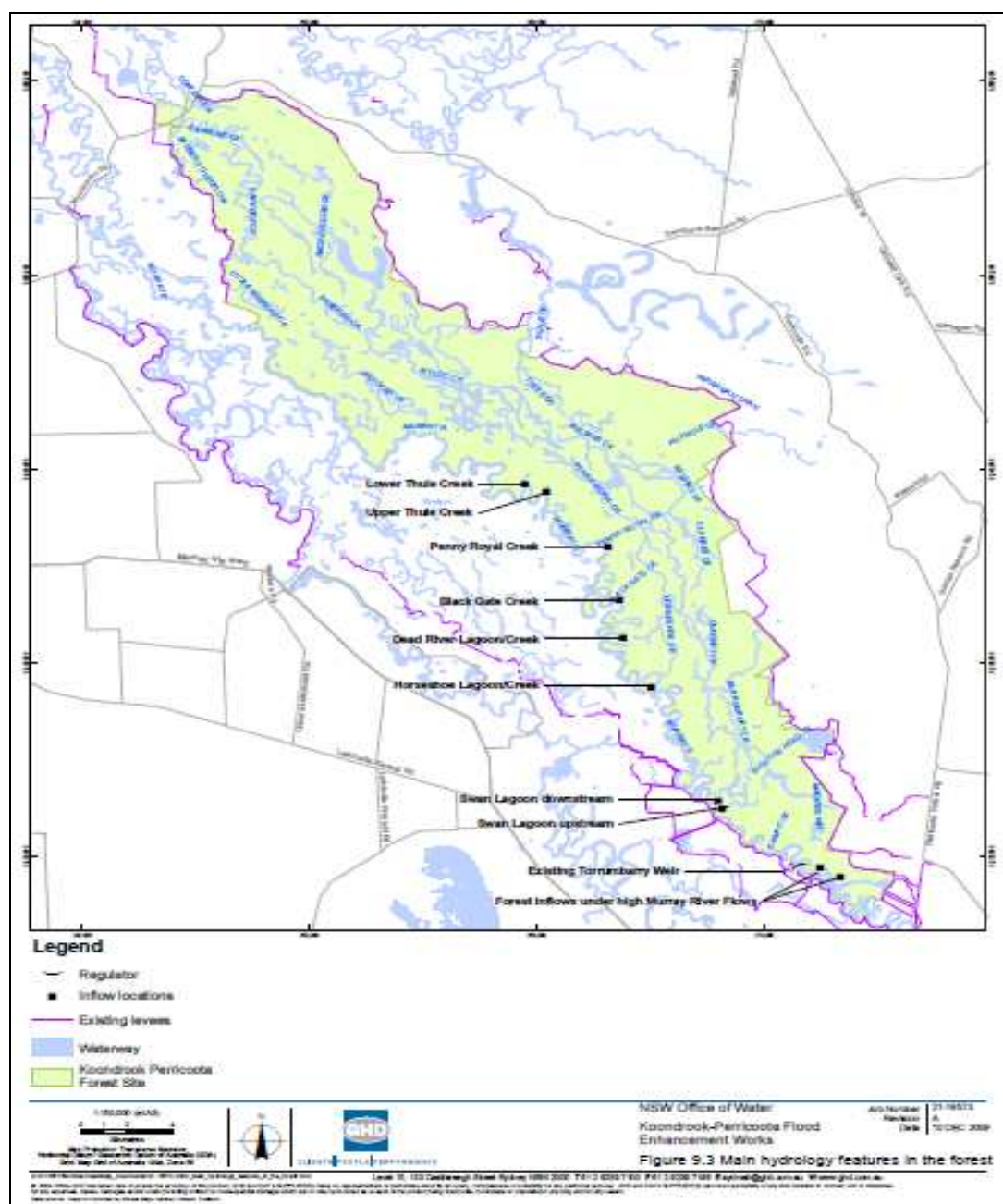


Figure 7: Hydrological Features of the Forest (reproduced from the Proponent's Environmental Assessment)

Existing Levees around the Forest to protect surrounding properties from inundation

The existing levees can be grouped as geographically located: upstream of Torrumbarry Weir and the forest; from the middle to upper forest north side; and at the downstream end of the forest. These are shown in Figure 7 above. The upstream levees are located in a floodplain zone that provides a pathway for floodwaters into the upper reaches of the forest in moderate to large floods (size is greater than 60,000 ML/day), e.g. the 1993 flood event. The known levees in the middle to upper end of the forest are mostly on private land and their purpose is to prevent the escape of floodwaters from the forest onto private farmlands. Flood mapping indicates that moderate to large floods may outflank or breach these banks causing inundation of adjacent private lands. However, satellite imagery indicates that the banks were effective for the 1993 flood (1 in 20 years). With regards to levees located at the downstream end of the forest, an existing bank is located to the north of Barham. In conjunction with other smaller banks, this has protected the town from moderate to large historic floods, such as the 1975 and 1993 floods (1 in 20 years).

Issues

The key potential impacts caused as a result of the operation of the project are:

- impacts on the Murray River water allocation and supply security conditions in the context of the project's water requirements from the river system;
- impacts on the Murray River flows and levels downstream of the forest due to the diversion of water into the forest and return of water directly to the Murray River;
- impacts on the forest itself and surrounding land use due to the proposed flooding regime and the extent of inundation; and
- impacts on the Barbers Creek system and the hydrological regime outside the forest, due to the operation of the downstream regulators.

Department's Consideration

Impacts on the Murray River (Diversion of Water)

The Department notes that the project has been designed to minimise impacts on flow conditions in the Murray River downstream of the forest boundary and also to minimise impacts during large flood events. Water would be diverted from the Murray River via the inlet channel and regulator, up to a design flow of 6,000 ML/day. Water would reach and stand in the lower forest area to a design level of 78.5 metres AHD for duration of 100 days. It would then be released to Barbers Creek via the lower regulator structures which discharge into Wakool River. This water would then eventually be returned to the Murray River at its junction with the Wakool River, approximately 360 kilometres downstream of the forest. One complete inundation event is expected to require approximately 466 GL of water, of which 225 GL would be used by the forest (evaporation and infiltration) and 222 GL would be returned to the Murray River. The process for adaptive management, consistent with the project's operational regime, would allow the project to operate within the flow rates of the Murray River and to manage any changes to the river bank stability. Under the operating regime of the project, natural high flow events will be used to trigger a managed inundation event. The operation of the project would therefore be integrated with the needs of the Murray River system as a whole, such that there will be no significant impacts to both the flow regime of this river, and to other water requirements along the river system. On this basis, the Department considers that there would not be significant impacts from the diversion of water from the Murray River.

Impacts on Surrounding Land Use

Existing Levees

The eastern and northern boundary of the forest is bounded by private property which includes mixed land use (dryland and irrigated agriculture). An existing levee system extends from the southern most point of the forest adjacent to the Murray River and, except for some isolated sections of high ground, along the entire boundary to Moulamein Road. These levees have been constructed by private landowners to provide flood protection to the adjacent private property (Figure 9). Flood inundation extents from the 1993 flood event show that the existing forest levees contained that flood within the forest boundary and prevented uncontrolled flooding of private property. Under a managed inundation event, the Proponent's modelling has shown that in the upstream part of the forest, the depth and overall extent of flooding would be less than the 1993 flood event. As such, the Department finds that based on the modelling data, the project would not increase on the risk of flooding to private property in this area. The downstream area of the forest contains existing levees on the western perimeter, adjacent to Barbers Creek and the flood runners upstream of Moulamein Road. The Department notes that these levees protect the township of Barham from flooding.

Upgrade of the downstream Levee

Upgrade of the downstream levee that provides flood protection to Barham is required to raise the flood pool to achieve a desirable duration of inundation in the middle and upper reaches of the forest. The Proponent has stated that the downstream levee would be engineered and maintained to higher standards than the existing levee and this would reduce the risk of the levee being overtopped during uncontrolled flood conditions. This construction would reduce the risk of lands immediately downstream of the levee to be inundated, including Barham. The detailed design phase of the project would refine the design to mitigate the potential risks to areas downstream of the levee embankments. As part of the required Operational Environmental Management Plan for the project, the Department has recommended a condition that requires the Proponent to detail measures to avoid flooding risks to landholders, including active involvement of the local community in addressing the risks and management measures, such as the Wakool Landholders Association and the Wakool River Association, which are both representatives of the downstream areas of the project site.

During moderate to large Murray River floods, all forest inundation structures would be de-activated to enable floodwaters to enter the forest area in an uncontrolled manner, similar to the existing (without project infrastructure) situation. During the 1993 event, floodwaters entered the forest in locations both upstream and downstream of Torrumbarry Weir. The 1991 flood event inundated approximately 7,800 hectares of the forest, with the Torrumbarry Weir flow rate being 43,000 ML/day (with an average recurrence interval of less than 1 in 2 years). The 1993 flood event inundated approximately 23,600 hectares of the forest, with the Torrumbarry Weir flow rate being 60,000 ML/day (with an average recurrence interval of 1 in 10 years). The estimated flood extent resulting from a managed flood event (operation of the project) would be between the 1991 event and the 1993 flood event.

The Department is satisfied that the project has been designed to provide flexibility to operate over a range of flows to ensure that effective and measurable environmental outcomes are delivered and risks to the environment are managed to avoid significant negative impacts to the Murray River flows and river bank stability. The Department is also satisfied that the project would not impact upon neighbouring properties.

5.4 Construction Noise Impacts

Noise and Vibration Impacts

The area surrounding the forest is mainly held in freehold title and is dominated by irrigated and dryland cereal cropping and pastures. Barham is the closest town to the project site and is located near the downstream end of the forest, approximately four kilometres from the nearest point of the project infrastructure. Approximately ten buildings or collections of buildings are located within 500 metres of the project infrastructure and the majority of these are in the vicinity of the downstream levee. As such, there is the potential for residents to be affected by construction noise and vibration.

The Interim Construction Noise Guideline (DECC, 2009) sets out the management levels of noise at residences, which distinguishes between the Noise Affected Level, which is the point where there may be some community reaction to noise (being the Rating Background Level plus 10 dB) and the Highly Noise Affected Level, which is the point above which there may be strong community reaction to noise (being 75dBA)). The Noise Affected Level for the project is 50dB(A) for the daytime (7am to 6pm), 45dB(A) for the evening (6pm to 10 pm) and 40 dB(A) for the night (10pm to 7am). Background noise levels of 40 dB(A) for the daytime (7am to 6pm), 35 dB(A) for the evening (6pm to 10 pm) and 30 dB(A) for the night (10pm to 7am), were assumed based on negligible traffic noise.

The Proponent proposes to carry out construction works generally six days per week, approximately 11 hours per day (nominally 7:00am to 7:00pm, Monday to Saturday), however soil conditioning may occur within the borrow pits at night (6:30pm to 7:00am). The Proponent states that the scheduling of the soil conditioning works has been set so as to minimise potential conflicts with other construction works.

For construction activities to be undertaken outside these recommended standard hours, the Noise Affected Level is the RBL plus 5dB. The Proponent predicted noise levels for each construction activity for different distances from the work sites (refer to Table 4 on the following page).

Table 4: Construction Noise Impacts

Source of construction impact	Construction Noise Affected Level 50 dB(A) (recommended working hours)	Predicted Noise at 100m distance, dB(A)	Predicted Noise at 500m distance, dB(A)	Predicted Noise at 1000m distance, dB(A)	Predicted Noise at 2000m distance, dB(A)	Predicted Noise at 4000m distance, dB(A)
Clearing topsoil (day shift)	50	70	55	46	35	19
Bulk earthworks (day shift, 11 hours per day, 6 days per week)	50	73	58	49	38	22
Conditioning (two production spreads, night shift, 11 hours per night, 6 nights per week)	35*	63	48	39	28	12
Channel excavation to spoil (day shift)	50	71	56	47	36	20
Structures site preparation crew (day shift)	50	70	55	46	35	19
Sheet piling (day shift)	50	67	52	43	32	16
Crane operations (day shift)	50	49	34	25	14	0

*this is the recommended value outside of working hours.

Shaded green notes noise level above the recommended noise level.

The noise assessment indicates that day and evening noise affected levels would be exceeded at properties within 500 metres if no mitigation measures were implemented. It is not clear from the Proponent's assessment whether the measures outlined in the environmental assessment to mitigate exceedances of the noise levels will be successful. Table 5 below and Figure 8 show only six buildings are located within 500 metres of the construction zone and 14 are within 1000 metres.

Table 5: Distances between Receptors and the Construction Zone

Distance (m)	Number of Buildings
0 - 100	0
100 - 200	0
200 - 300	1
300 - 400	2
400 - 500	3
500 - 1000	8
1000 - 2000	18
2000 - 4000	82

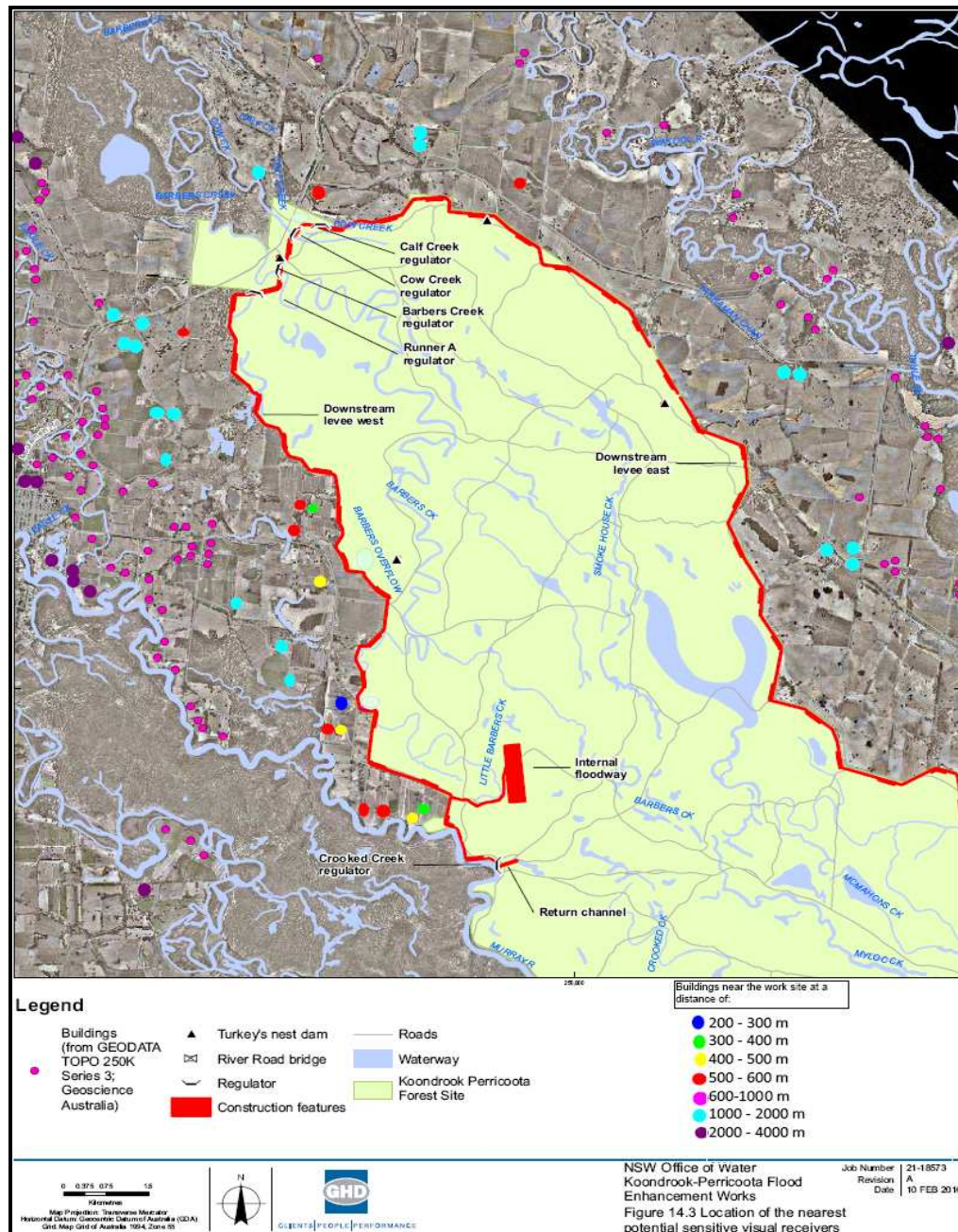


Figure 8: Location of the Nearest Potential Sensitive Receptors

Department's Consideration

Construction Noise

The Department notes that the Proponent utilised data from a geographic information system to identify buildings in close proximity to the project site (from the project site and up to four kilometres away) and therefore assumed, for the purposes of its assessment, that the building recorded is occupied. The Proponent also stated that some of these buildings would be residential receivers inhabited on a permanent basis, and therefore used the recommended noise levels for residential receivers specified in the Interim Construction Noise Guideline (DECC, 2009), against the background noise levels at the buildings to assess noise impacts. Therefore, the Department, for the purposes of its assessment and ensuring all potential receptors are taken into account (i.e. assuming the worst case), has also considered all of these receptors (i.e. buildings) to be residential receivers. As such, the Department has recommended the Proponent be required, in developing the CEMP, confirm the receptor type for all structures within 2000 metres of the construction zone and that the noise levels determined for these receptors are appropriate to the use of that receptor. It is noted that no blasting is proposed for the project.

The Department considers there are two issues with regards to noise impacts, being the predicted exceedances of the Noise Affected Level and secondly the Proponent proposing to do work outside of the standard hours. The Department notes that there are six receptors located between 200 and 500 metres of the project site and therefore have the potential to experience construction noise levels above the Noise Affected Level during the day. The Department also notes that the Proponent has defined 'day' as being work conducted six days per week, nominally 7:00am to 7:00pm. The Department also notes that construction works for conditioning (two production spreads, night shift, 11 hours per night, 6 nights per week) are proposed outside the standard construction hours and could potentially cause noise levels well above the 'out of hours work criteria' (the RBL plus 5dB) being 35dB(A). This means there is potential for noise exceedances to occur both during the daytime (highest noise level being 73 dB(A), representing an exceedance of 23dB(A) above the Noise Affected Level) and also during the 'out of hours night work' (highest noise level being 63dB(A), representing an exceedance of 28dB(A) from the Noise Affected Level for night time works outside the standard hours).

With regards to the Proponent's proposed work outside the standard hours of construction, the Department notes that the Interim Construction Noise Guideline (DECC) states that a strong justification is typically required for works to be conducted outside the standard hours. Apart from stating that it intends to complete construction works within 9 months, the Proponent does not justify the reasoning for conducting works outside the standard hours, particularly considering that such works have been predicted to cause high noise levels at receptor locations. The Proponent has committed to consult all potentially affected residents prior to construction works being undertaken outside the specified standard hours, to provide information on the need for the works, management measures and methods to contact the project team in the event of a complaint. However, this commitment (or the other related commitments) does not address the need for any negotiating agreements with the community, with respect to such works that are predicted to be more than 5dB(A) above the noise criteria (i.e. above 35dB(A)). As such, the Department recommends that the standard hours of construction apply to the project, where an audible noise may be generated at a sensitive receptor (Monday to Friday 7 am to 6pm and Saturday 8 am to 1 pm). However, the Department also recommends works be permitted to be conducted outside of these hours if: the works do not cause construction noise to be audible at any sensitive receiver; or for the delivery of materials required by the police or other authorities for safety reasons; or where it is required in an emergency to avoid loss of lives, property and/or to prevent harm; and if negotiated noise agreements are in place. The Department has also recommended a condition that allows a mechanism through which the Proponent can apply for out of hours works on a case by case basis. This application must be submitted to the Director-General for approval. The Director-General will assess the need for the proposed out of hours works and investigate whether potential impacts can be mitigated and/or managed.

The Department also recommends that a Construction Noise Management Plan (CNMP) be prepared as part of the Construction Environmental Management Plan, which would need to include details of the consultation process for noise mitigation measures with any affected residences. The Construction Environmental Management Plan requires the approval of the Director-General prior to the commencement of construction works. These recommendations will ensure that noise emissions are limited and any exceedances from the noise goals will be controlled and negotiated.

Construction Traffic Noise

Road traffic noise was assessed in accordance with DECC's *Environmental Criteria for Road Traffic Noise*. The recommended 'base' goals for land use developments with the potential to create additional traffic on local roads are L_{Aeq} , 1hr levels of 55 dB(A) during the day time (7 am to 10pm) and land use developments with the potential to create additional traffic on collector roads are L_{Aeq} , 1hr levels of 60 dB(A) during the day time. The Proponent considered the identified nearest receptor locations to proposed traffic routes and stated that that no significant increase in noise levels are anticipated in the area. However, for the purposes of ascertaining that noise generated by heavy vehicle movements is expected to comply with the adopted noise design criteria at sensitive receiver locations, the Department recommends that the Proponent be required to develop a Traffic Management Protocol, as part of the Construction Environmental Management Plan. This Protocol will outline the management of traffic conflicts that may be generated during construction of the project and must include details of how construction traffic will be managed in proximity to local and regional roads and sensitive receivers located in close proximity to these roads, and detailed consideration of measures to be employed to ensure traffic volume, acoustic and amenity impacts along the heavy vehicle routes are minimised.

Construction Vibration

The Proponent has undertaken preliminary investigations for the potential impacts from vibration. It has considered the DECC's *Assessing Vibration: A Technical Guideline*, 2006 and BS 6472 - 1992, *Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*. BS 6472 is recognised by DECCW as the preferred standard for assessing the 'human comfort criteria'. Bulk earthworks, sheet piling, clearing of topsoil and conditioning of soil would cause vibration. The BS 6472 includes human comfort peak vibration limits for the frequency range of 1 Hz to 80Hz, which is applicable to the project works. These values are limits that may cause loss of amenity to the occupant, however for short duration construction projects they are considered conservative. Table 7 below shows the vibration limits and the predicted vibration levels. It can be seen from Table 7 that sheet piling may produce levels of vibration that are potentially intrusive when undertaken within 200 to 500 metres of residential dwellings.

Table 6: Vibration Levels for residential receptors

Plant Item	Continuous Vibration (mm/s Peak) for Day (7am-10pm)	Predicted Vibration at 200 m	Predicted Vibration at 500 m	Predicted Vibration at 1000 m
Piling	0.28	0.1 – 2.3	0 – 1.3	0 – 0.8
7 Tonne compactor	0.28	0 – 0.5	0 – 0.3	0 – 0.2
Dozer	0.28	0 – 0.3	0 – 0.2	0 – 0.1
Backhoe	0.28	0 – 0.1	0	0

Blue text represents vibration levels above the recommended levels.

Floor vibration at levels of about 0.15mm/s is perceptible to humans and motion becomes 'noticeable' at a level of approximately 1 mm/s. The DECC's *Assessing Vibration: A Technical Guideline* document (August 2006) states that the maximum vibration level generated by the operation of a plant item should not exceed 2mm/s, to ensure no risk of cosmetic damage to buildings occurs (at this level the vibration is also easily noticeable by humans). A higher vibration level may also lead to structural damage to buildings, however, if the levels are kept below this threshold then it is not anticipated that any such damage would result. The Proponent has committed to making site workers aware of the potential vibration impacts on local residents to encourage them to take practical and reasonable measures to minimise the impact during the course of their activities. The Department also recommends a condition requiring the Proponent to ensure that the vibrations resulting from the project do not exceed the preferred values for vibration (for low probability of adverse comment or disturbance to building occupants) presented in *Assessing Vibration: A Technical Guideline* (DECC, February 2006), at any affected residential dwelling. The Proponent is required to survey all buildings within 2000 metres of the construction site to also inform the Proponent's final measures to mitigate potential vibration impacts. The final mitigation measures will be included in the required CEMP. The Department considers this approach adequately addresses the issue of potential cosmetic damage to surrounding buildings.

The Department is satisfied that noise and vibration levels of the project can be managed to ensure the levels are acceptable for the purposes of avoiding significant public amenity impact. In particular, the Department notes that noise and vibration would only cause impacts during construction, which will be temporary and of nine months duration. The Department is also satisfied that there are no operational sources of noise and vibration that would cause significant impacts external to the project site (i.e. no impacts on receptor locations).

5.5 Indigenous Heritage Impacts

The Proponent undertook a cultural heritage assessment of the project site, in accordance with the Interim Guidelines for Aboriginal Community Consultation (DECC) which included: a desktop review of archaeological literature and data, including a review of heritage registers to determine known Aboriginal sites in the area; field work (in June and November 2009); and invitations to government agencies and advertisements in local newspapers in May 2009 for interested parties to register an interest with the Proponent for the purposes of participating in the assessment. Interest was received Barapa Barapa Nation, Yorta Yorta Nation and Wamba Wamba Nation, Moama Local Aboriginal Land Council (LALC) and Deniliquin LALC.

A range of Aboriginal sites were identified in the Koondrook-Perricoota Forest including stone artefact scatters, scarred trees, mounds (earth and ovens), middens and hearth and burial locations. Up to seven sites including

three previously recorded and four identified during surveys for the project, could be affected during construction. These sites are situated close to the forest boundary. The Aboriginal burial site has the potential to contain additional burials and to provide information which is of value in scientific analysis and the resolution of potential research questions. As such, this site is considered to be of high archaeological significance. Four scarred trees have been recorded as in very poor condition, i.e. the trees are either dead or unstable. These have some potential to provide information of value in scientific analysis, due to the poor state of these sites, and they are assessed as having low to moderate archaeological significance.

Direct impacts on these sites may be avoided through the implementation of management measures, such as temporary fences to prevent access during construction. In terms of operation, the Proponent notes that the forest underwent natural seasonal flooding prior to river regulation and this flooding would have inundated these sites. The Proponent has therefore found that the project would not have a deleterious effect on any Aboriginal site as the project seeks to implement a more natural flood regime. Any sites that would now be subject to the enhanced flooding regime within the forest would have also been subject to natural seasonal flooding and therefore no additional management measures are proposed.

Department's Consideration

Construction

The Department notes that the Proponent is able to construct the project in a manner that can avoid any direct impact to the identified Aboriginal sites. However, as the burial site (59-4-0060) is of high archaeological significance, the Department recommends a specific condition requiring the Proponent to avoid disturbance to this site during construction. With regards to the four scarred trees and any detected Aboriginal material not previously identified, the Department recommends a condition that requires the Proponent to:

- fence the boundaries of the four scarred trees (K-PA1, K-PA2, K-PA3 and K-PA4), prior to the commencement of construction works, to protect them from any direct and indirect impacts of construction; and
- in the event that any heritage or archaeological material not previously identified is uncovered during construction, construction activities that could affect the finds must cease immediately and relevant authorities must be consulted regarding the appropriate course of action before work can recommence.

With respect to the two previously recorded sites of unknown type, the Department recommends a condition requiring the Proponent to investigate prior to the commencement of construction, the possible location to ascertain the likely impacts. The final construction management measures for indigenous heritage must be included in the required Construction Environmental Management Plan. This Plan requires the Director-General's approval prior to construction commencing.

The joint submission from environmental groups stated that Traditional Owner groups should be involved in the construction (and operation) stage of the project, to ensure any significant impacts are identified and managed appropriately. The Department notes that the Proponent has formed a Joint Indigenous Group, which contains representatives from Yorta Yorta Nation, Barapa Barapa Nation, Deniliquin Local Aboriginal Land Council and Moama Local Aboriginal Land Council. The purpose of this Group is to work in partnership with the project team (the Proponent) to advise and protect the integrity of their cultural heritage during the construction, and to achieve cultural and socio-economic benefits for Indigenous people. The Proponent has also committed to developing an Indigenous Heritage Management Plan, to define the procedures to be implemented during construction to avoid or otherwise minimise impacts on items of Aboriginal heritage significance. This plan is to include an education program for all construction personnel on their obligations relating to Aboriginal cultural material and a program for surveys by Traditional Owner representatives in the construction area. The Department notes that participation of Traditional Owner Groups with regards to construction is important to address potential issues and management proposals that these groups may have in avoiding significant impact. The Department supports the commitments made by the Proponent in addressing this issue and has recommended a condition which requires the Proponent to include representatives of the Traditional Owner Groups in the Joint Indigenous Group. The Department has defined Traditional Owner Groups as those groups that cover the project area, these being Murray Lower Darling Rivers Indigenous Nations; Barapa Barapa Nation; Yorta Yorta Nation; and Wamba Wamba Nation. The Joint Indigenous Group shall be given an opportunity to survey the construction area during the consultation process, to identify potential issues requiring management, to avoid significant impact to Aboriginal Cultural Heritage.

Operation

The Department supports the Proponent's conclusion that the project would not have a deleterious effect on any Aboriginal site as the project seeks to implement a more natural flood regime. Any sites that would now be subject to the enhanced flooding regime within the forest would have also been subject to natural seasonal flooding. However, the Department considers that the adaptive operational regime, which is based on monitoring the state of the site during inundation, should also include the monitoring of Aboriginal sites to manage any significant effects on them. As such, the Department recommends a condition that requires the Proponent to include, as part of the required Operation Environmental Management Plan, measures to monitor and manage indigenous heritage values on site including involvement of the Joint Indigenous Group. The Operation Environmental Management Plan (OEMP) is to be submitted for the approval of the Director-General no later than 12 months from the date of the approval of the project (or as otherwise agreed to by the Director-General). Any changes made to the OEMP in response to the adaptive management regime, must be submitted for the approval of the Director-General, at least one month prior to the proposed commencement of the modified operation regime.

The Department is satisfied that potential impacts on Aboriginal Heritage sites can be avoided during construction and operation of the project. This conclusion is based on the proviso that the Proponent implements all its nominated environmental commitments and the Department's recommended mitigation and management measures.

6. CONCLUSIONS AND RECOMMENDATIONS

The Department has assessed the Environmental Assessment, Statement of Commitments, Response to Submissions Report and submissions received during the exhibition period and is satisfied that the impacts of the project can be mitigated and/or managed to ensure an acceptable level of environmental performance. The Department recommends that the Minister approve the project, subject to conditions.

The project would provide an adequate water regime to a representative area of the forest that has, or historically supported, a flood-dependent understorey. This is consistent with the Living Murray Initiative and the implementation of the project would achieve the interim ecological objectives for the Koondrook-Perricoota Forest in NSW. The adaptive operational regime of the project is considered to be the most effective mechanism for maintaining the ecological health of the forest for retaining the cultural, social and economic values associated with the Koondrook-Perricoota Forest.

The construction of the Koondrook-Perricoota Forest Flood Enhancement Works Project would include several mitigation measures to protect the surrounding environment and to ensure the proper management, to ensure no significant net impacts occur as a result of its construction and operation. The Proponent has presented a number of mitigation measures through the Environmental Assessment and its Statement of Commitments and the Department has included additional measures as part of its recommended conditions to further mitigate potential impacts on the surrounding environment. In this regard, the Department has recommended that specific conditions of approval be imposed on the Proponent to address the key issues raised in the assessment process, as follows:

- Flora and fauna construction impacts - the requirement to prepare a Flora and Fauna Management Plan, as part of the Construction Environmental Management Plan, to minimise and manage impacts to the ecology of the forest. As part of this Plan, the Proponent is required to offset negative impacts to vegetation as a result of construction, that would not directly benefit from the operation of the project (these communities being Inland Grey Box Woodland and Derived tussock grasslands);
- Flora and fauna operational impacts – the requirement to prepare a Biodiversity Operational Plan to detail how operation of the project would be managed and monitored to minimise impacts to terrestrial and aquatic biodiversity. As part of this Plan, the Proponent is required to include a methodology for monitoring and assessing the health and condition of those vegetation communities that will not benefit from the proposed operational regime, including Inland Grey Box Woodland and Derived tussock grasslands. The implementation of the methodology will inform the quantification of biodiversity impacts on 'flood-intolerant' vegetation communities and determine specific biodiversity offset requirements for operational impacts;
- Impacts on surrounding land uses during operation – requirement to identify, as part of the Operation Environmental Management Plan, measures to avoid flooding risks to landholders, including active involvement of the local community in addressing the risks and management measures;
- Indigenous heritage impacts – specific conditions to avoid disturbance to significant Aboriginal sites identified in the Environmental Assessment during construction. Requirement to identify, as part of the Operation Environmental Management Plan, measures to monitor and manage indigenous heritage values on the project site, including involvement of the relevant Local Land Councils, Committees and Traditional Owner Groups.
- Construction noise impacts - specific conditions to limit hours of construction to acceptable times and to ensure negotiated noise agreements are developed with residences that may experience audible construction noise from works proposed to be undertaken outside standard working hours.

On balance, the Department considers that the project can be undertaken in an ecologically sustainable manner and would have significant environmental benefit. The Department therefore recommends that the Minister for Planning or his delegate approve the project, subject to the conditions.

Chris Wilson
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Major Project Assessments

Richard Pearson
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Development Assessment & Systems
Performance

APPENDIX A – RECOMMENDED CONDITIONS OF APPROVAL

APPENDIX B – STATEMENT OF COMMITMENTS

APPENDIX C – SUBMISSIONS REPORT

APPENDIX D – ENVIRONMENTAL ASSESSMENT
