Appendix A: Director-General's Requirements

NSW GOVERNMENT | Planning & Infrastructure

Contact: Belinda Scott
Phone: (02) 9228 6472
Fax: (02) 9228 6455
Email: Belinda.Scott@planning.nsw.gov.au

Our ref.: SSD-6284

Mr Greg Vilder
Riverina Water County Council
PO Box 456
Wagga Wagga NSW 2650

Dear Mr Vilder

Subject: Director-General's Requirements for Wagga Wagga Water Treatment Plant Augmentation (SSD-6284)

The Department has received your application for the above project.

I have attached a copy of the Director-General's Requirements (DGRs) for the preparation of an Environmental Impact Statement (EIS) for the project. These requirements have been prepared in consultation with relevant government authorities. I have also attached a copy of the government authorities' comments for your information.

The DGRs have been prepared based on the information you have provided to date. Please note that under Schedule 2 Clause 3(5) of the *Environmental Planning and Assessment Regulation 2000*, the Director-General may alter these requirements at any time. If you do not submit an Environmental Assessment for the project within 2 years, you must consult the Director-General in relation to the preparation of the EIS.

Prior to exhibiting the EIS that you submit for the project, the Department will review the document to determine if it adequately addresses the DGRs. The Department may consult with other relevant government authorities in making this decision. Please provide 4 hard copies and 4 electronic copies[1] of the EIS to assist this review.

If the Director-General considers that the EIS does not adequately address the DGRs, the Director-General may require you to revise the EIS. Once the Director-General is satisfied that the DGRs have been adequately addressed, the EIS will be made publicly available for at least 30 days.

If your project is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Department of the Environment to determine if an approval under the EPBC Act is required for your project (http://www.environment.gov.au or 6274 1111).

[1] At least one electronic version should contain file parts no greater than 5Mb each. File parts should be logically named and divided.

Your contact officer for this proposal, Belinda Scott, can be contacted on 02 9228 6472 or via email at Belinda.Scott@planning.nsw.gov.au. Please mark all correspondence regarding the proposal to the attention of the contact officer.

Yours sincerely,

15.1.14

Chris Wilson
Executive Director
Development Assessment Systems and Approvals

ATTACHMENT 1
Director-General's Requirements
Section 75F of the *Environmental Planning and Assessment Act 1979*

Director-General's Requirements

Section 78A(8A) of the *Environmental Planning and Assessment Act 1979*
Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*

Application number	SSD - 6284
Project	Upgrade of the Wagga Wagga Water Treatment Plant with a 55ML/day Clarification and Dual Media Filtration process and the ability to treat raw water with turbidity levels up to 300 NTU.
Location	91 Hammond Avenue Wagga Wagga NSW 2650 The proposal is located within the Wagga Wagga Council area.
Proponent	Riverina Water County Council
Date issued	15 January 2014
General requirements	The Environmental Impact Statement (EIS) must be prepared in accordance with and meet the minimum requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (Regulation), with particular reference to the information required by clauses 6 and 7 of that schedule. The EIS must also include the following: • construction methods, location and alignment of project components, operation details including changes to existing operations, system capacity, treatment technology and water quality standards, wet weather and flood event management and interfaces with existing infrastructure, energy requirements and any staging; • an assessment of the need for, scale, scope, operational mode and location of the project in relation to predicted water usage and demand; and • an analysis of site suitability with respect to potential land use conflicts with existing and future land uses, taking into account local and strategic land use objectives.
Key issues	The EIS must include assessment of the following key issues: **Strategic Justification –** the EIS must: ➢ clearly outline the strategic context of the project, having regard to existing and future development in the area and relevant government policies and strategies; and ➢ describe the need for and objectives of the project, including its relevance to the overall water treatment and management scheme for the area; alternatives considered (both alignments and technologies), and an assessment and justification of the environmental costs and benefits of the project relative to alternatives. **Water Quality, Hydrology and Soils** - include an assessment of water quality, hydrology and soil impacts (including impacts to groundwater) taking into account applicable NSW Government policies including applicable Water Sharing Plans. The assessment is to: • consider impacts arising from the construction of new infrastructure and changes to operation of the treatment plant, management of sludge solids and supernatant;

- assess the potential impacts to groundwater, creeks, wetlands, drainage lines and from flooding associated with the project;
- assess impacts to licenced water users and basic landholder rights; and
- include management measures to prevent, monitor or minimise impacts including precautionary discharges or overflows and subsequent impacts to nearby riparian corridors and waterways, notification systems, response capability and contingency measures.

Ecological Impacts – include a flora and fauna assessment consistent with the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005):

- taking into consideration aquatic and terrestrial impacts on any threatened species (particularly the *Grey-headed Flying-fox*, *Murray Cod*, *Trout Cod* and *Silver Perch)*, populations, ecological communities (including the *Aquatic Ecological Community in Natural Drainage System of the Lower Murray River Catchment*), critical habitat, riparian, instream ecology, water and groundwater dependent ecosystems including consideration of the *NSW Groundwater Dependent Ecosystems Policy* and any impacts to local or regional biodiversity corridors;
- with details of how flora and fauna impacts would be managed (details of any proposed screening of the river intake to minimise impacts to aquatic fauna are to be included); and
- consideration of the *NSW Offset Principles for Major Projects* (July 2013) where applicable. Sufficient certainty must be provided to demonstrate that viable and achievable options to offset impacts are available where impacts are unavoidable.

Non Indigenous Heritage – include an assessment of the potential impact on non-indigenous heritage values/items and proposed mitigation measures, consistent with the NSW *Heritage Manual* (1996). Where impacts to State or locally listed non-indigenous heritage items are proposed, a Statement of Heritage Impact must be included for these items and measures identified to mitigate and manage impacts.

Aboriginal Heritage – include an assessment of the potential impact on Aboriginal heritage values/items and proposed mitigation measures in accordance with the Draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005).

Human Health – the Environmental Assessment must identify any change to risk to human health, including mitigation measures and management to ensure appropriate standards are met.

Odour –include an assessment of any potential odour sources associated with construction and changes to operation and management measures to minimise any potential odour impacts to sensitive receivers.

Noise and Vibration – include an assessment of noise and vibration impacts during construction and operation and in a cumulative context with existing development. The assessment must consider the following guidelines, as relevant: *Interim Construction Noise Guidelines* (DECC 2009), *Industrial Noise Policy* (EPA, 2000) and *Road Noise Policy* (DECCW 2011).

	Traffic and Transport – include an assessment of impacts to the local and regional road and rail network, including direct impacts from construction or operational traffic. The assessment shall include details of the nature/mode of traffic generated and estimated traffic volumes and proposed transport routes. **Visual Amenity** – include an assessment of changes to visual amenity, with reference to surface components and vegetation removal and include proposed mitigation measures. **Hazards and Risk** – include an assessment of the hazards and risk including details of waste and/or chemicals handling, storage and disposal during construction and operation and identification of management measures associated with operation. This is to include details of the treatment and disposal of backwash from the treatment plant. **Environmental Risk Analysis–** notwithstanding the above key assessment requirements, the EIS shall include an environmental risk analysis to identify potential environmental impacts associated with the project (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified, an appropriately detailed assessment of those impacts must be included
Consultation	You must undertake an appropriate and justified level of consultation with relevant parties during the preparation of the EIS, including: ▪ local, State or Commonwealth government authorities and service providers including the Department of Health, the Environment Protection Authority, the Office of Environment and Heritage, the Department of Primary Industries (including the NSW Office of Water), the Murrumbidgee Catchment Management Authority, Roads and Maritime Services and Wagga Wagga Council; ▪ specialist interest groups, including local Aboriginal land councils; and ▪ the local community, including affected landowners. The EIS must describe the consultation process, document consultation undertaken and identify any issues raised (including where these have been addressed in the EIS).
Further Consultation after 2 years	If you do not lodge an EIS for the development within 2 years of the issue date of these DGRs, you must consult the Director-General in relation to the preparation of the EIS.

ATTACHMENT 2
Government Authority Responses to Request for Key Issues
For Information Only

NSW EPA

PCU50061

Our reference: EF13/3516 DOC13/90490
Contact: Chris Burton 02 6022 0609

The Manager
Major Projects Assessment – Industry Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Attention: Belinda Scott

Dear Mr Ritchie

Re SSD 6284 - Proposed Water Treatment Plant Augmentation at Wagga Wagga

I refer to your electronic mail dated 5 December 2013 to the Environment Protection Authority (EPA) seeking our comments on the draft Director General Requirements (DGR) for the preparation of an Environmental Impact Statement (EIS) for the proposed augmentation of the Riverina Water water treatment plant at Wagga Wagga.

The EPA has considered the details of the project as outlined in the preliminary assessment report. The EPA's key information requirements for the project relate to the assessment of water and waste water discharges and handling and storage of chemicals. The specific issues that we consider to be critical to an assessment of the proposed development include the following.

- The treatment and disposal of backwash from the treatment plant; and
- The storage and handling of chemicals used at the premises.

The draft DGR includes the other key issues for the EPA. In carrying out the assessment the applicant should refer to the relevant guidelines identified at Attachment A. It is strongly recommended that the applicant consult with the EPA during the assessment period.

If you have any further enquiries about this matter please contact Chris Burton by telephoning 02 6022 0609.

Yours sincerely

BRIAN WILD 9 December 2013
Head Albury Unit
Environment Protection Authority

PO Box 544 Albury NSW 2640
Second Floor, Government Offices
512 Dean Street Albury NSW 2640
Tel: (02) 6022 0600 Fax: (02) 6022 0610
ABN 30 841 387 271
www.epa.nsw.gov.au

ATTACHMENT A

Guidance Material - Assessing Environmental Impacts

Greenhouse gases

- Draft Guidelines: Energy and Greenhouse in EIA (DoP, 2002)

Factors and Methods Workbook (AGO, 2006)

Noise and vibration

- NSW Industrial Noise Policy (DECC, 2000). Available online http://www.epa.nsw.gov.au/resources/noise/ind_noise.pdf
- Appendices - NSW Industrial Noise Policy. Available online http://www.epa.nsw.gov.au/resources/noise/ind_noise_app.pdf
- Assessing Vibration: a technical guideline (DECC, 2006) Available online http://www.epa.nsw.gov.au/resources/noise/vibrationguide0643.pdf
- Interim Noise Construction Guideline (DECCW, 2009). Available online http://www.epa.nsw.gov.au/resources/noise/09265cng.pdf

Water quality

- National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000)
- National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ, 2000)
- Using the ANZECC Guidelines and Water Quality Objectives in NSW (DECC, 2006)

Groundwater

- The NSW State Groundwater Policy Framework Document (DLWC, 1997)
- The NSW State Groundwater Quality Protection Policy (DLWC, 1998)
- The NSW State Groundwater Dependent Ecosystems Policy (DLWC, 2002)
- National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC, 1995)

Stormwater

- Managing Urban Stormwater: Soils and Construction (Landcom, 2004)
- Managing Urban Stormwater: Treatment Techniques (Draft) (DECC, 1997)

Wastewater

- National Water Quality Management Strategy - Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) - November 2006. Available online http://www.environment.gov.au/water/publications/quality/pubs/water-recycling-guidelines-health-environmental-21.pdf

Waste

- Technical guidelines: Bunding and Spill Management (DECC, 1997). Available online http://www.epa.nsw.gov.au/mao/bundingspill.htm
- Waste Classification Guidelines, Part 1: Classifying Waste, December 2009. Available online http://www.epa.nsw.gov.au/resources/waste/091216classifywaste.pdf

NSW GOVERNMENT Office of Environment & Heritage

Your Reference	SSD 13_6281
Our reference:	DOC 13/87192
Contact:	Peter Ewin 02 6022 0606

Ms Belinda Scott
Senior Planning Officer
Major Projects Assessment
Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Ms Scott

RE: Wagga Wagga Water Treatment Plant Augmentation (SSD - 6284)

Thank you for your electronic mail dated 5 December 2013 to the Office of Environment and Heritage (OEH) requesting comments on the draft Director General's Requirements (DGRs) for the Environmental Impact Statement (EIS) to be prepared by Riverina Water County Council for the proposed upgrade to the Wagga Wagga Water Treatment Plant (WTP). This response is in regard to statutory matters relating to application of the *Environmental Planning and Assessment Act 1979,* the *National Parks and Wildlife Act 1974* and the *Threatened Species Conservation Act 1995.*

OEH has considered the draft DGRs and the Preliminary Environmental Assessment (PEA) and support the proposed methods to assess impacts of the project on both biodiversity (including threatened species) and Aboriginal cultural heritage. However, there are some potential impacts that have not been identified in the PEA that OEH considers need to be addressed in the EIS, as outlined in Attachment 'A'. These information requirements are as follows.

- Full consideration of the potential flood impacts for adjoining landholders associated with upgrades to the levee surrounding the location of the proposed works; and
- Assessment of potential impacts on the Grey-headed Flying-fox (*Pteropus poliocephalus*) colony adjoining the site and consideration of a protocol for mitigating impacts during construction.

In carrying out the assessment the proponent should refer to the relevant guidelines identified in Attachment 'B'.

The EIS needs to clearly identify the nature and scope of the complete project including any ancillary activities associated with the project.

Should you wish to discuss this submission further, please contact me on (02) 6022 0606, or at peter.ewin@environment.nsw.gov.au.

Yours sincerely

P. Ewin 19/12/13

PETER EWIN
Team Leader Planning
South West Region
Regional Operations
Office of Environment and Heritage

PO Box 829 Albury NSW 2640
Second Floor, Government Offices
512 Dean Street Albury NSW 2640
Tel: (02) 6022 0600 Fax: (02) 6022 0610
ABN 30 841 387 271

ATTACHMENT 'A'

Flooding

The PEA provided by Riverina Water County Council (RWCC) does not take into account the flood impact that a 100 year ARI flood level levee would have on adjacent areas that lie outside the levee system. The RWCC compound is located in the southern floodplain of the Murrumbidgee River in the East Wagga Industrial Area adjacent to many businesses that lie on either side of Hammond Avenue. These businesses have been flooded recently and are particularly sensitive to any proposals that may lead to increases in their flood risks.

Section 5.8 of the PEA assumes that the levee upgrade would have already occurred by the time that approval for the augmentation of the WTP is given, but this is yet to be determined. RWCC have an obligation under Part 5 of the *Environmental Planning and Assessment Act 1979* Act to assess the impacts of the levee upgrade and develop mitigation options where necessary to offset these impacts. OEH are aware that RWCC are currently in the process of developing a Flood Impact Assessment Report for the upgraded levee system as part of this requirement. In our opinion this flood impact assessment should be incorporated into the EIS that occurs for the subject site as a whole.

As such, OEH recommends that the requirement for the assessment of flood impacts of the levee upgrade to the 100 year ARI flood level (and the development of mitigation options where necessary) along which an assessment of other feasible options for flood protection of the site, be inserted into the DGRs.

Biodiversity

The primary aims of the EIS for the proposal, as it relates to biodiversity, will be to assess potential impacts of the development on the threatened Grey-headed Flying-fox (GHFF) (*Pteropus poliocephalus*). This species is known to seasonally roost in riparian vegetation approximately 500 m to the east of the Water Treatment Plant. River Red Gums (*Eucalyptus camaldulensis*) immediately adjacent the development site also provide potential habitat. Sudden, loud noises associated with construction may scare the animals and can result in the abandonment and death of dependent young if adults are frightened while foraging away from the roosting camp.

OEH recommends the development of a protocol for minimising the likely impacts of construction. As a minimum, the protocol should cover:

- targeted survey for GHFF prior to construction, including trees between the development site and the river and the known camp locations in riverine vegetation up to 500 metres to the east of the existing WTP;
- actions to be undertaken if GHFF are found in the vicinity of the development site, including, but not limited to: halting construction, consulting a fauna expert, monitoring the population during construction, and pre-construction liaison with animal welfare organisations to enable support if required;
- appropriate timing of construction works to minimise potential impact to GHFF;
- protecting trees that provide potential habitat for GHFF; and
- considering the location of flyways around identified flying-fox camps for construction of above-ground electrical transmission lines, to minimise GHFF being electrocuted or colliding with powerlines.

The OEH policy for managing flying-fox camps and further information about GHFF is available on the OEH website at www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10697

ATTACHMENT 'B'

Guidance Material

Assessing Threatened Species Impacts

- NSW Threatened Species website
  www.environment.nsw.gov.au/threatenedspecies/index.htm
- NSW offset principles for major projects (state significant development and infrastructure)
  www.environment.nsw.gov.au/biodivoffsets/nswoffsetprincip.htm
- Biobanking Assessment Tools
  www.environment.nsw.gov.au/biobanking/tools.htm
- Threatened species assessment guidelines (DECC, 2007)
  www.environment.nsw.gov.au/threatenedspecies/tsaguide.htm
- Atlas of NSW Wildlife
  www.bionet.nsw.gov.au/

Aboriginal Cultural Heritage Impacts

- Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation. Department of Environment and Conservation. July 2005. This guide was developed for EP&A Act Part 3A projects, and is still applicable in the context of SSD and SSI projects.
- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011). This document provides guidance on the process for investigating and assessing Aboriginal cultural heritage in NSW
  www.environment.nsw.gov.au/licences/investassessreport.htm
- Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010). This document further explains the consultation requirements that are set out in clause 80C of the *National Parks and Wildlife Regulation 2009*. The process set out in this document must be followed and documented in the EIS
  www.environment.nsw.gov.au/licences/consultation.htm
- Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010)
  www.environment.nsw.gov.au/resources/cultureheritage/ddcop/10798ddcop.pdf
- Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010). The process and methods described in this Code should be followed where the assessment of Aboriginal cultural heritage requires an archaeological investigation to be undertaken
  www.environment.nsw.gov.au/licences/archinvestigations.htm

NSW GOVERNMENT | Department of Primary Industries

OUT13/37397

Ms Belinda Scott
Major Projects Assessment
NSW Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

belinda.scott@planning.nsw.gov.au

Dear Ms Scott,

Wagga Wagga Water Treatment Plant Augmentation (SSD 6284)
Request for input into Director General Requirements

I refer to your email dated 5 December 2013 to the Department of Primary Industries in respect to the above matter.

Comment by the NSW Office of Water
The NSW Office of Water advises that although the draft Director General Requirements outline some of the issues the Office of Water would require to be addressed in an Environmental Impact Statement (EIS), it is recommended the EIS be required to address and describe the following key matters, and the general list of environmental assessment requirements provided in Attachment A:

1. All relevant approvals required as part of the project from the Office of Water, including approval under Section 60 of the *Local Government Act 1993* to construct or extend water treatment works. The proponent is required to consult with the Urban Water unit of the Office of Water to discuss the concept plan for the proposal. It is recommended this consultation is undertaken as soon as possible to enable Council to gain an understanding of the information which will need to be provided to support the application. Council should contact Bill Ho, Manager Urban Water on (02) 8281 7326 to discuss the application. Information regarding the application process for a approval under Section 60 the Local Government Act can be viewed at: http://www.water.nsw.gov.au/Urban-water/Country-Towns-Program/Best-practice-management/Regulations-for-water/Water-and-sewage-treatment-works/Section-60-approval-for-water-or-sewage-treatment-works/default.aspx
2. Adequate and secure water supply for the proposal. All water required for the development and sources of water should be accounted for and outlined in the EIS.

3. Existing and proposed water licensing requirements are in accordance with the *Water Act 1912* and/or *Water Management Act 2000*. This is to demonstrate that any existing licences (include licence numbers) and licensed uses are appropriate, and to identify where additional licences are proposed. It is important the EIS outlines all proposed monitoring bores on site, and appropriate licences are obtained, unless an exemption applies.
4. An assessment of impacts on groundwater and surface water sources including adequate mitigating, monitoring and contingency requirements to address any surface and groundwater impacts.
5. It is important any works which may intercept groundwater are outlined in detail in the EIS to allow the Office of Water to undertake a proper assessment of any potential impacts. If dewatering is required, appropriate licences are obtained to account for the take of this water.
6. An assessment of the impact of the proposed development on groundwater dependent ecosystems (GDEs), adjacent licensed water users and basic landholder rights.
7. Detailed examination of the options to remediate and rehabilitate any excavated/disturbed areas, including remediation and revegetation of riparian areas, if applicable.
8. The EIS will need to identify all riparian areas on the site including any creeks, wetlands, drainage lines etc and outline any impacts the development may have on these areas, outline the intended management of these areas, including monitoring and mitigation measures, or any works proposed for these areas. All watercourses and drainage lines in the area should be located on a plan in the EIS.
   It is important appropriate buffers are provided adjacent to all watercourses and wetlands affected by the development.
   Design and construction of works within 40 metres of watercourses are to be in accordance with the Office of Water's *Guidelines for Controlled Activities (2012)*.
9. The EIS should include an assessment of the impacts of the proposed development on flooding, including impacts on neighbouring properties and infrastructure.

For further information please contact Christie Jackson, Planning and Assessment Coordinator (Tamworth office) on 6701 9652, or at:
christie.jackson@water.nsw.gov.au.

Comment by Fisheries NSW

Fisheries NSW advises:

(i) there is significant evidence both in Australia and overseas that large numbers of fish at varying life stages are vulnerable to extraction from river ecosystems by water pumping stations.

(ii) the Murrumbidgee River in this location forms part of the *Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment,* which is listed as an Endangered Ecological Community (EEC) under the provisions of the *Fisheries Management Act 1994*. It is also within the known range of range of other threatened species including but not limited to Murray Cod, Trout Cod and Silver Perch which are listed under the Fisheries Management Act and/or *the Environment Protection and Biodiversity Conservation Act* (Cwth).

(iii) Fisheries NSW considers that the pumping station poses a risk of having a significant impact upon the EEC and threatened fish species.

(iv) accordingly, the Director General Requirements should include a requirement for the environmental assessment to include proposals for measures that will be included (i.e. screens) to prevent the entry and entrainment of fish (including larval stages) by the raw water intakes.

(v) By way of information, discussion and recommendations in relation to this issue is included in: Boys, C.A., Baumgartner, L., Rampano, B., Robinson, W., Alexander, T., Reilly, R., Roswell, M., Fowler, T., and Lowry, M., (2012) *Development of fish screening criteria for water diversions in the Murray-Darling Basin*.

For further information please contact Luke Pearce, Fisheries Conservation Manager (Albury office) on 6042 4213, or at: luke.pearce@dpi.nsw.gov.au.

Yours sincerely

Tony Heffernan
A/Executive Director Business Services

Attachment A

Wagga Wagga Water Treatment Plant Augmentation (SSD 6284)

Request for Input into Director General Requirements
Additional comment by the NSW Office of Water

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1. Legislation

The assessment is required to take into account the objects and water management principles of the *Water Management Act 2000* (*WMA*) and statutory requirements of the *Water Act 1912* administered by the NSW Office of Water, as applicable.

2. Water Sharing Plans

Gazetted Water Sharing Plans (WSPs) prepared under the provisions of the *WMA* establish rules for access to, and the sharing of water between the environmental needs of the surface or groundwater source and water users. The assessment is required to demonstrate consistency with the rules of the WSP, if relevant.
Refer to: http://www.water.nsw.gov.au/Water-Management/Water-sharing/default.aspx

3. State Government technical and policy documents

The assessment is required to take into account the following NSW Government policies, as applicable:

- *NSW Aquifer Interference Policy*
- *NSW Groundwater Policy Framework Document - General*
- *NSW Groundwater Quality Protection Policy*
- *NSW State Groundwater Dependent Ecosystem Policy*
- *NSW State Rivers and Estuaries Policy*
- *NSW Wetlands Policy*
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*
- *Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting*
- *Guidelines for the Assessment and Management of Groundwater Contamination*
- *Guidelines for Groundwater Protection in Australia*

Note: An aquifer interference assessment framework is available at:
http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/Aquifer-interference

4. Controlled activities guidelines

The assessment is required to take into account the following NSW Office of Water *Guidelines for Controlled Activities (2012)*, as applicable, for all activities to occur on waterfront land as defined in the *WMA*:

- Riparian corridors (and associated Vegetation Management Plans)
- Watercourse crossings
- Laying pipes and cables in watercourses
- Outlet structures
- In-stream works

Refer: http://www.water.nsw.gov.au/Water-Licensing/Approvals/Controlled-activities/default.aspx

5. Groundwater

a) Licensing

All proposed groundwater works, including bores for the purpose of investigation, extraction, dewatering, testing or monitoring must be identified in the proposal and unless exempt, an approval obtained from the Office of Water prior to their installation.

b) Groundwater source

The assessment is required to identify groundwater issues and potential degradation to the groundwater source and provide the following:

- Details of the predicted highest groundwater table at the development site.
- Details of any works likely to intercept, connect with or infiltrate the groundwater sources.
- Details of any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes.
- Describe the flow directions and rates and the physical and chemical characteristics of the groundwater source.
- Details of the predicted impacts of any final landform on the groundwater regime.
- Details of the existing groundwater users within the area (including the environment) and include details of any potential impacts on these users.
- Assessment of the quality of the groundwater for the local groundwater catchment.
- Details of potential impacts of the proposal on quality of groundwater, both in the short and long term, and proposed mitigation measures.
- Details on measures proposed to prevent groundwater pollution.
- Details on protective measures for any groundwater dependent ecosystems (GDEs).
- Details of proposed methods of the disposal of waste water and approval from the relevant authority.
- Assessment of the need for an Acid Sulfate Management Plan (prepared in accordance with ASSMAC guidelines).
- Assessment of the potential for saline intrusion of the groundwater and measures to prevent such intrusion into the groundwater aquifer.
- Details of the results of any models or predictive tools used.

Where potential impact/s are identified the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on:

- Details of any proposed monitoring programs, including water levels and quality data.
- Reporting procedures for any monitoring program including mechanism for transfer of information.
- An assessment of any groundwater source/aquifer that may be sterilised as a consequence of the proposal.
- Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category).
- Description of the remedial measures or contingency plans proposed.
- Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period.

c) Groundwater dependent ecosystems (GDEs)

The NSW Groundwater Dependent Ecosystems Policy provides guidance on the protection and management of GDEs and sets out objectives and principles. The assessment is required to identify any impacts on GDEs and address:

- Identification of potential GDEs within the development site and adjacent area.
- Current GDEs condition, water quantity and quality required by the ecosystems.
- Flora and fauna assessment for all ecosystems which includes macro invertebrate and macrophyte diversity and abundance assessments within all water courses within and adjacent to the development site.
- Determine critical thresholds for negligible impacts.
- Manage groundwater extraction within defined limits thereby providing flow sufficient to sustain ecological processes and maintain biodiversity.
- Ensure sufficient groundwater of suitable quality is available to ecosystems when needed.
- Ensure the precautionary principle is applied to protect GDEs, particularly the dynamics of flow and availability and the species reliant on these attributes.

- Details on protective measures to minimise any impacts on GDEs and any potential offset areas which will be monitored and protected.

d) Contingency measures

Where potential impacts are identified the assessment will need to identify limits to the level of impact and contingency measures that would remediate, reduce or manage potential impacts to the existing groundwater resource and any dependent groundwater environment or water users, including information on:

- Details of proposed monitoring programs, including water levels and quality data.
- Reporting procedures monitoring programs including mechanism for transfer of information to the Office of Water.
- An assessment of any groundwater source/aquifer that may be sterilised as a consequence of the proposal.
- Identification of any nominal thresholds as to the level of impact beyond which remedial measures or contingency plans would be initiated (this may entail water level triggers or a beneficial use category).
- Description of the remedial measures or contingency plans proposed.
- Any funding assurances covering the anticipated post development maintenance cost, for example on-going groundwater monitoring for the nominated period.

6. Surface water and riparian protection

The Office of Water is responsible for the sustainable management of rivers, estuaries, wetlands and adjacent riverine plains. The assessment is required to consider the impact of the proposal on watercourses and associated riparian vegetation within the site and provide the following (where applicable):

- Identify the sources of surface water.
- Details of stream order (using the Strahler System).
- Details of any proposed surface water extraction, including purpose, location of existing pumps, dams, diversions, cuttings and levees.
- Detailed description of any proposed development or diversion works including all construction, clearing, draining, excavation and filling.
- An evaluation of the proposed methods of excavation, construction and material placement.
- A detailed description of all potential environmental impacts of any proposed development in terms of vegetation, sediment movement, water quality and hydraulic regime.
- A description of the design features and measures to be incorporated into any proposed development to guard against long term actual and potential environmental disturbances, particularly in respect of maintaining the natural hydrological regime and sediment movement patterns and the identification of riparian buffers.
- Details of the impact on water quality and remedial measures proposed to address any possible adverse effects.

7. Rehabilitation, final landform and final void management

Where relevant, the assessment must include:

- Justification of the proposed final landform with regards to its impact on local and regional groundwater systems and surface water systems.
- A detailed description of how the site will be progressively rehabilitated and integrated into the surrounding landscape.
- Detailed modelling of potential groundwater volume, flow and quality impacts of the presence of an inundated final void on identified receptors, specifically considering those environmental systems likely to be groundwater dependent.
- A detailed description of the measures to be put in place to ensure that sufficient resources are available to implement the proposed rehabilitation.
- The measures that would be established for the long-term protection of local and regional aquifer and surface water systems and for the ongoing management of the site following the cessation of the project.

8. Water management structures/dams

The assessment is required to provide information on the following for all existing and proposed water management structures:

- Calculation of the Maximum Harvestable Right Dam Capacity (MHRDC) for the project.
- Date of construction (for existing structures).
- Details of the legal status/approval for existing structures.
- Details of any proposal to change the purpose of existing structures.
- Details of any remedial work required to maintain the integrity of existing structures.
- Clarification as to whether the structure is located on a watercourse.
- Details of the purpose, location and design specifications for the structure.
- Size and storage capacity of the structure.
- Details if the structure is affected by flood flows.
- Details of any proposal for shared use, rights and entitlement of the structure.

End Attachment A

Appendix B: Preliminary Hazard Analysis

Riverina Water County Council

Wagga Wagga Water Treatment Plant

Preliminary Hazard Analysis

Final

September 2014

Presented by Hunter Water Australia Pty Limited

ABN 19080869905

Report Details

Report Title	Wagga Wagga Water Treatment Plant: Preliminary Hazard Analysis
Project No.	3963
Status	Final
File Location	\\HO-FS1\Projects\Riverina Water\3963 Wagga Wagga WTP EIS\2. Tasks\2. Task 2 EIS\Preliminary Hazard Analysis\PHA Report.docx
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Document History and Status

Revision	Report Status	Prepared by	Reviewed by	Approved by	Issue Date
0	Final	M Balandin M Carter	Anne Finegan	M Balandin	4-Sep-14

Executive Summary

Introduction

Riverina Water County Council (RWCC) operates the Wagga Wagga Water Treatment Plant (WTP). RWCC is proposing to replace the existing Wagga Wagga WTP in order to treat water turbidities up to 300 Nephelometric Turbidity Unit (NTU) and be capable of maintaining a secure production of water of 40 ML/d from the Murrumbidgee River in the short to medium term, and 55 ML/d by 2026.

The water treatment process proposed includes dosing of chemicals to provide for:

- Adjustment of raw water and final water pH by doing with caustic soda (Sodium hydroxide).
- Coagulation to remove dissolved organic matter and colloidal particles by using alum (Aluminium Sulphate or Aluminium chlorohydrate).
- Binding particles together for easier removal with polymer (Polyacrylamide).
- Disinfection and oxidisation with chlorine (Sodium hypochlorite).
- Fluoridation for dental health (Sodium silicofluoride).

Following commissioning of the new plant, further chemical dosing may be considered depending on a review of raw water quality and the treated water quality. These chemicals may include:

- Calcium hydroxide (lime) to adjust raw water pH and alkalinity
- Carbon dioxide to optimise coagulant pH
- Potassium permanganate to oxidise manganese so that it can be removed by coagulation
- Powdered Activated Carbon to reduce taste and odour issues arising from presence of organics and/or algal growth

For the first stage of the water treatment plant operation, substances classed as Dangerous Goods would be required to be transported and stored on site. The Dangerous Goods concerned are corrosive substance Class 8 (namely Sodium hypochlorite and Sodium hydroxide) and a toxic substance Class 6.1 (Sodium silicofluoride).

Subsequent storage and use of dangerous goods in the water treatment process may include Calcium hydroxide (Class 8), Carbon dioxide (Class 2.2), Potassium permanganate (Class 5.1) and Powdered Activated Carbon (Class 4.2). An analysis of storing these substances has not been undertaken at this stage, as the need and volume of use of the chemicals would not been known until the plant has been operating for a number of years and more is known about the raw water quality and the outcomes of the treatment process.

The storage of dangerous goods requires review under the provisions of *State Environmental Planning Policy No.33 - Hazardous and Offensive Developments* (SEPP 33) when a development application is prepared. The SEPP 33 guidelines list the quantity of Dangerous Goods that may be stored before the SEPP is triggered. Where Dangerous Goods are stored above the screening level threshold quantity listed in the SEPP 33 guidelines, a Preliminary Hazard Analysis (PHA) to assess whether the proposed transport and storage of Dangerous Goods is hazardous is required to be prepared.

Methodology

The methodology used for preparing a PHA is outlined in *The Multi-Level Risk Assessment Guidelines* and *Hazardous Industry Planning Advisory Paper (HIPAP) No.6 - Hazard Analysis Guidelines*, published by the Department of Planning. The guidelines indicate that for corrosive substances a qualitative PHA would be adequate to address the hazards and risks associated with the proposed development.

In the preparation of the PHA for the new Wagga Wagga WTP, the following approach was adopted:

- Identify if the screening thresholds of SEPP 33 are triggered.
- Identify the hazards with the storage of the Dangerous Goods.
- Identify the safeguards proposed at the site.
- Qualitatively assess the risks in regards to the proposed safeguards.
- Report on the findings of the study including conclusions and recommendations.

Hazard Analysis

It was identified that the following storage of Dangerous Goods at the WTP would exceed the SEPP 33 threshold:

- Sodium hypochlorite (Class 8)
- Sodium hydroxide (Class 8)
- Sodium silicofluoride (Class 6.1)

Therefore a hazard analysis was undertaken for these Dangerous Goods.

Conclusion

The PHA identified that the storage of the goods would not result in off site impacts. If spills of substances were to occur on the WTP site, they would be contained within bunds designed for such occurrences.

As the WTP design is developed, it will be necessary to assess the effectiveness of the proposed designs in relation to the PHA assumptions. Hence, the following studies would be completed as part of the ongoing assessment prior to commencement of operations:

- a Hazard and Operability (HAZOP) Study
- Emergency Response Planning
- Safety Management System assessment

Dangerous good storage notification to WorkCover would be undertaken where required.

Hazard analysis would be undertaken for the future chemicals when further details are known and it is proposed to use the chemicals.

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1 Overview

1.1 Introduction

Riverina Water County Council (RWCC) operates the Wagga Wagga Water Treatment Plant (WTP). RWCC is proposing to replace the existing Wagga Wagga WTP in order to treat water turbidities up to 300 NTU and be capable of maintaining a secure production of water of 40 ML/d from the Murrumbidgee River in the short to medium term, and 55 ML/d by 2026.

This Preliminary Hazard Assessment (PHA) supports a development application for development consent under Part 4, division 4.1 of the *Environmental Planning and Assessment Act* 1979 (EP&A Act) for the proposed development.

A number of Dangerous Goods (DGs) would be stored and handled at the site for the WTP operation. Hence, consideration has been given to the provisions of *State Environmental Planning Policy (SEPP) No.33 - Hazardous and Offensive Development* (SEPP 33 and associated guidelines.

SEPP 33 applies to any proposals which fall under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'. The policy establishes a test by way of a PHA to determine the risk to people, property and the environment at the proposed location and in the presence of controls.

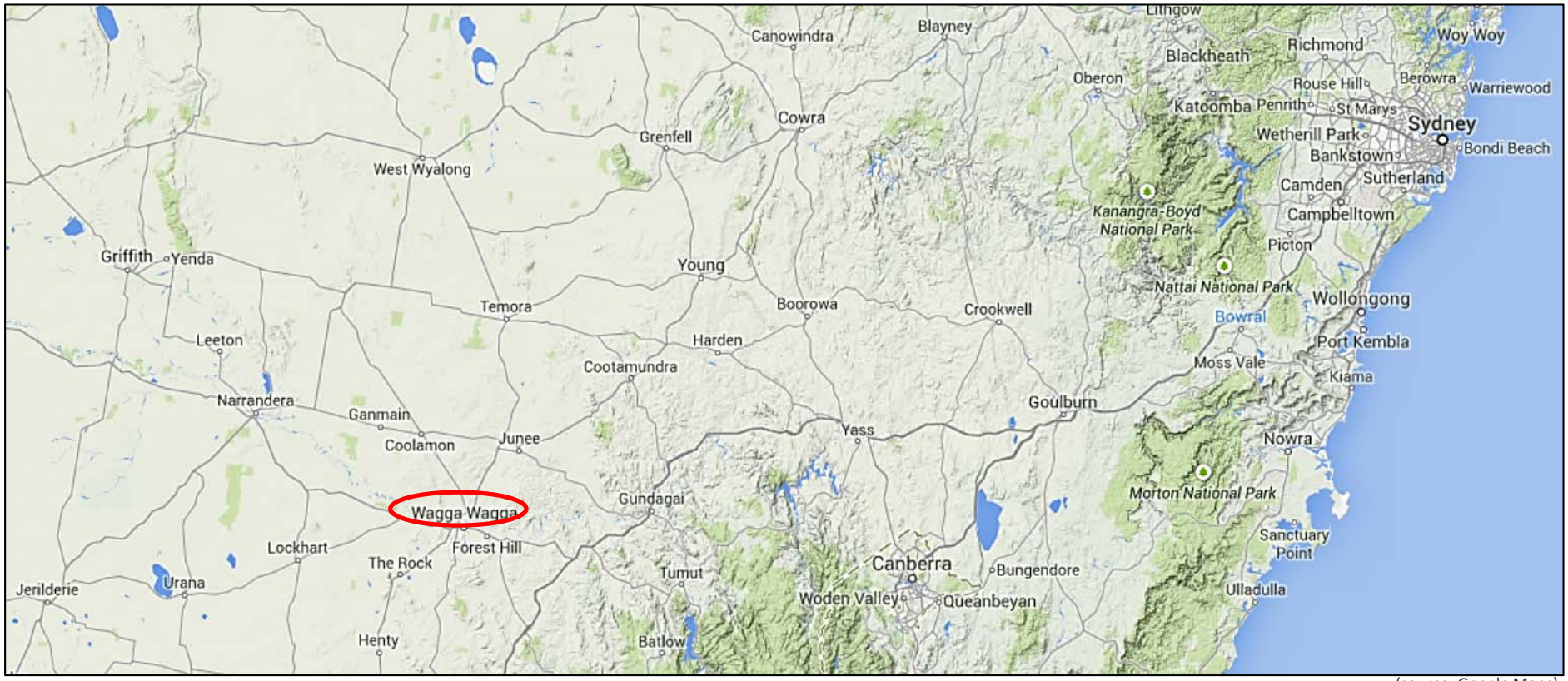
The objective of the hazard analysis is to develop an understanding of the hazards and risks associated with the storage of Dangerous Goods at the WTP and the adequacy of the safeguards. The PHA considers the suitability of a site to accommodate a proposed development of a potentially hazardous in regards to:

- the nature and quantities of hazardous materials stored on the site;
- the type of plant and equipment in use;
- the adequacy of safeguards;
- the surrounding land uses; and
- the interactions of these factors.

Some of the substances that are used in the water treatment processes and that would be stored on the site are potentially hazardous. This PHA documents the process of screening hazardous substances, identifying risks and providing an assessment as to whether the level of risk is acceptable.

1.2 Site Description

The proposed WTP would be constructed within the boundary of the existing Wagga Wagga WTP which is located off the Sturt Highway (Hammond Avenue) (Lot 2, DP 540063) in Wagga Wagga approximately 380 km south west of Sydney (Figure 1-1). The WTP site, which covers an area of 8.43 ha, is shown in Figure 1-2 and Figure 1-3. The proposed WTP replacement also includes construction of a new raw water intake on the south bank of the Murrumbidgee River on Crown Land adjoining the northern boundary of the WTP site.



(source: Google Maps)

Figure 1-1: Location of Wagga Wagga

Figure 1-2: Locality map showing location of Wagga Wagga WTP

Source: SIX Maps, NSW Government

Figure 1-3: Aerial view of WTP site (outlined in red)

Source: SIX Maps, NSW Government

Land uses surrounding the WTP site include:

- Easts Riverview Holiday Park (referred to as 'Holiday Park' in PHA) to the east
- Murrumbidgee River to the north
- Electricity substation to the west
- Wiradjuri Walking Track along the western bank of Marshalls Creek to the west of the site
- Sturt Highway to the south
- Business and light industrial areas
- Residential areas
- Rural land

1.3 Project Description

It is proposed to construct a new WTP. The initial stage of the Proposal would include the following new components:

- Raw water intake and pumping station
- Dosing tanks and static mixers for alum and polymer dosing systems
- Dewatering building with two new centrifuges. The existing centrifuge would be decommissioned once the new plant is in operation.
- Backwash wastewater collection tank and pumping station
- Lamella plate clarifiers or Reactivator clarifiers
- Six dual media filters including backwash pumps and air scour blowers
- Chlorine storage and dosing system and channel-type static mixer for clear water storage
- Clear water system upgrade including a new 3ML clear water storage tank and low level and high level pumping stations each fitted with three pumps

- Electrical works including switchrooms, automation and control infrastructure, electrical substations and 2 new 1500kVA transformers
- Filter wastewater collection sump and transfer pumps
- Fluoride dosing system
- Pipework and valves
- Internal access roads

Once the new WTP had been commissioned and operational for several years, a review of whether any additional chemicals are required to be used for treatment would be undertaken. This would depend on review of raw water quality and the treatment outcomes from the WTP.

1.4 Methodology

The PHA assesses the storage of goods against the thresholds in the SEPP 33 guidelines. Applicable guidelines include:

- *Hazardous and Offensive Development Application Guidelines Applying SEPP 33* (Department of Planning 2011).
- *The Hazardous Industry Planning Advisory Paper No 3 – Risk Assessment* (HIPAP No. 3)
- *The Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Planning* (HIPAP No. 4)
- *The Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis* (HIPAP) No. 4)

The hazard analysis provides a mechanism for:

- formal identification of hazards;
- analysis of the magnitude and likelihood of possible hazardous incidents; and
- consideration of the relevance and adequacy of proposed safeguards.

The methodology adopted for the PHA included:

- Identifying potentially hazardous materials to be stored and used on site and the quantity.
- Identifying dangerous goods classification for each material, the mode of storage and the maximum quantity stored on site.
- Identifying the distance of the stored material from the site boundary (applicable for any of the materials in Dangerous Goods classes 1.1, 2.1 and 3).
- Estimating the average number of annual and weekly road movements of hazardous material to and from the facility, and the typical quantity in each load. The proposed development may be potentially hazardous if the number of generated traffic movements (for significant quantities of hazardous materials entering or leaving the site) is above the annual or weekly cumulative vehicle movements.
- Determining if any of the substances exceed the screening threshold in the SEPP 33 guidelines.
- Establishing the consequence of each identified hazard and assessing their offsite effects and considering the likelihood of occurrence. This process has been undertaken qualitatively.
- Estimating risk to surrounding land use and the environment.
- Identifying risk reduction measures and that the level of risk to the surrounding environment is acceptable.

The *Applying SEPP 33* guideline provides guidance on the appropriate level of assessment to be undertaken, stating:

A qualitative assessment may suffice provided all or most of the following conditions are met:

- *screening and risk classification and prioritisation indicate there are no major off-site consequences and societal risk is negligible;*
- *the necessary technical and management safeguards are well understood and readily implemented; and*
- *there are no sensitive surrounding land uses.*

If the qualitative analysis cannot demonstrate there will be no significant risk, a further level of analysis will be required.

2 Potential Hazard Identification

A number of project related activities require the use of potentially hazardous materials and the transport of these materials to the WTP site for the treatment of water.

2.1 Hazardous Materials

2.1.1 Chemicals Used for Water Treatment at the Existing Plant

Existing chemicals stored on site for the WTP are shown in Table 2-1 for information. This PHA does not include an assessment of the existing storage and handling of Dangerous Goods at the existing WTP as these would be replaced by the new facilities. The existing chemical storage areas would be decommissioned when the new plant is commissioned.

Table 2-1: Existing chemicals used on site

Chemical	Dangerous Good Classification	Packaging number	Volume stored	Frequency of Delivery	Purpose
Alum	Not classified as a Dangerous Good	Not applicable	40 kL	Fortnightly	Coagulant to remove dissolved organic matter and colloidal particles
Activated silica	Not classified as a Dangerous Good	Not applicable	1 kL	2-3 times per year	Coagulant aid
Lime	8	III	10 tonne	Monthly	Alkalinity adjustment
Fluoride (sodium silicofluoride)	6.1	III	6 tonne	Monthly	Fluoridation of water prior to distribution for protection of dental health
Chlorine Gas	2.3 (Subsidiary Risk 5.1 & 8)	-	5 x 920 kg drums = 4.6 tonnes	Every 2-3 weeks	Disinfectant
Polyacrylamide (LT22 Polymer)	Not classified as a Dangerous Good	N/A	500kg	Every ~3 months	Polymer that binds particles together for easier removal

2.1.2 Proposed chemicals for initial operation of the WTP

The proposed chemicals to be stored on site and used for the new WTP are shown in Table 2.2. New chemical storage areas would be constructed for the new WTP. Once the new WTP is operational the storage areas for the chemicals listed in Table 2-1 would no longer be used. Two options are being considered for the plant layout and these are shown on Figures 2.1 and 2.2.

The design assumption is that delivery would occur every 21 days for all chemicals except sodium hypochlorite which would have 28 days storage. The likely frequency of delivery for each chemical would be determined during detailed design.

Aluminium chlorohydrate (ACH, Al2Cl(OH)5) may be used as an alternative to Aluminium sulphate which is listed in Table 2-2. This will be determined during the detailed design phase. Neither Aluminium chlorohydrate nor Aluminium sulphate are classified as Dangerous Goods.

Chemicals classified as Dangerous Goods that are proposed to be stored on site include:

- Sodium hypochlorite (Class 8 Package III)
- Sodium hydroxide (Class 8 Package II)
- Sodium silicofluoride (Class 6.1)

Class 6.1 goods are classified as Dangerous Goods due to being toxic. They are substances that are liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact. Packaging III Substances and preparations present a relatively low toxicity risk (National Transport Commission 2014).

Class 8 substances are classified due to being corrosive substances. These are defined as substances which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport. Packing group II are substances and preparations presenting medium danger and Packing group III is substances and preparations presenting minor danger (National Transport Commission 2014).

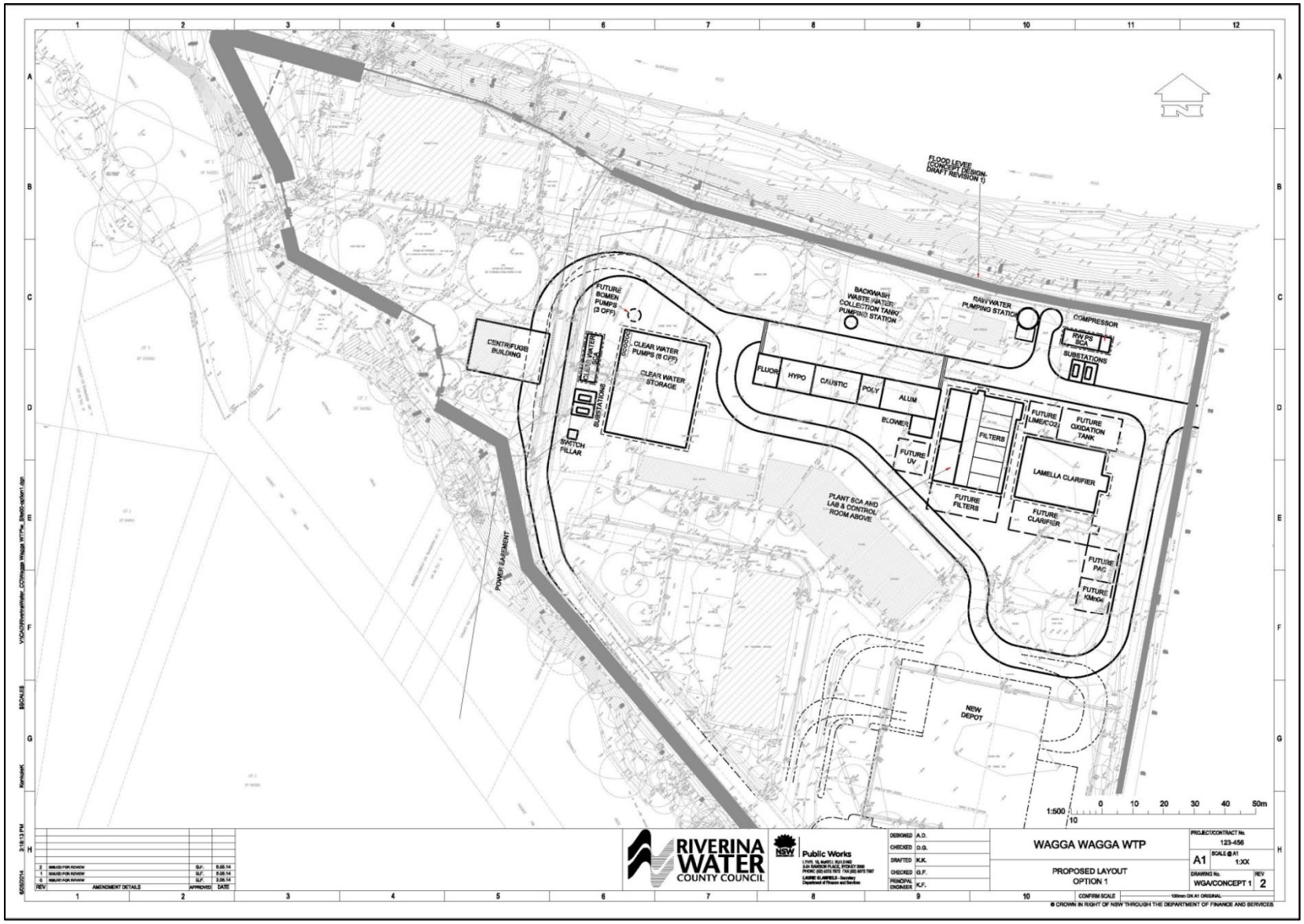


Figure 2-1: Option 1 Proposed Layout

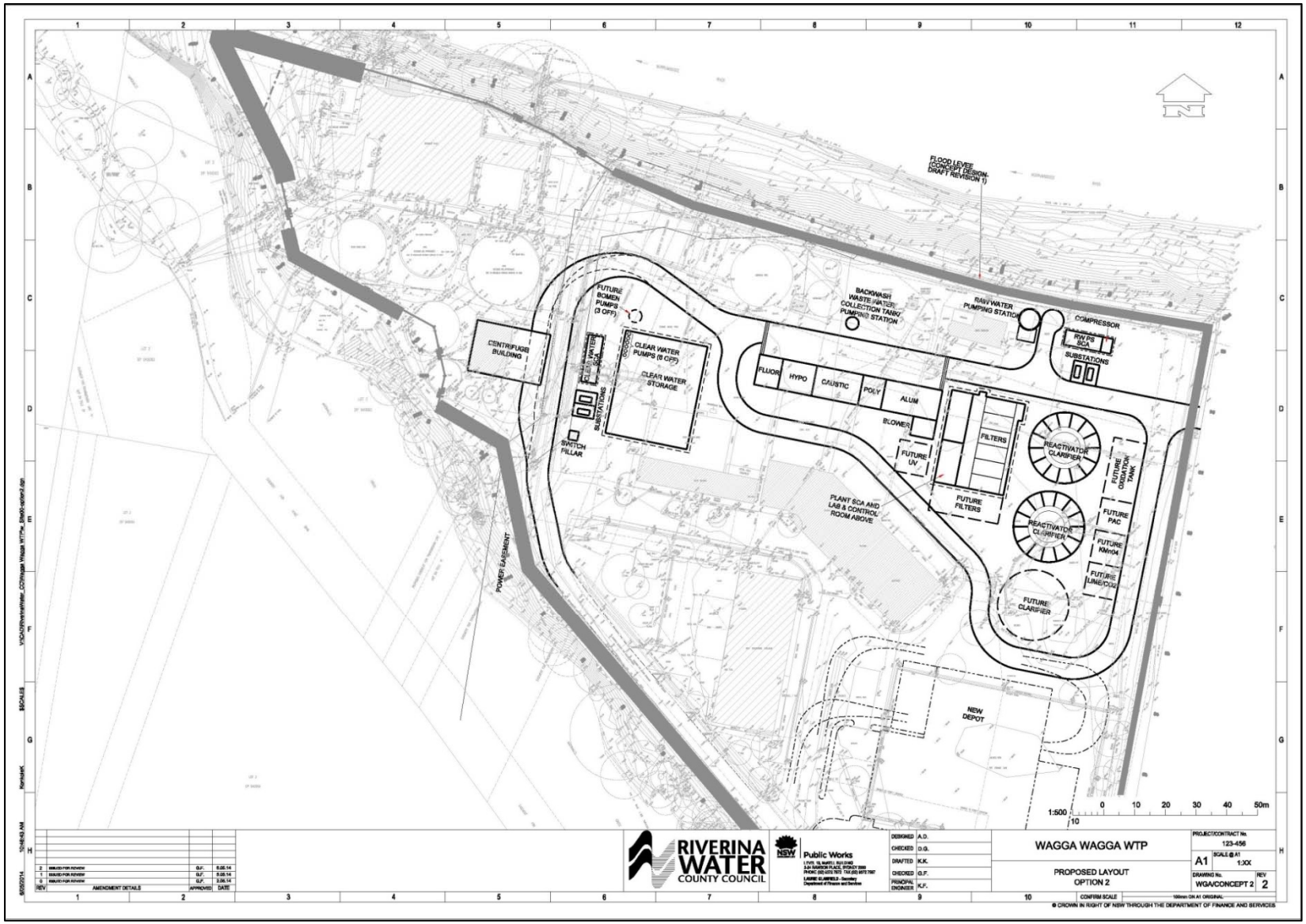


Figure 2-2: Option 2 Proposed Layout

Table 2-2: Chemicals proposed to be stored on site

Chemical Proposed to be used	Dangerous Good Class Classification	Packaging number	UN number	Storage type	Proposed Storage quantity	Delivery frequency*	Purpose	Approximate Distance Holiday Park boundary
Sodium silicofluoride (Na_2SiF_6) - Fluoride	6.1	III	2674	Bulk bags	1000 kg whole bulk bag (1 tonne)	21 days	Fluoridation of water prior to distribution for protection of dental health	140 m
Sodium hydroxide (NaOH) (30%) Caustic soda	8	II	1824	2 tanks - liquid	2 x 56 kL tanks (149 tonnes)	21 days	Alkali to adjust raw water and final water pH	120 m
Sodium hypochlorite (NaOCL)	8	III	1791	2 tanks - liquid	2 x 20 kL tanks (48 tonnes)	28 days	Disinfectant and oxidising agent	130 m
Option 1 Alum - Aluminium sulphate ($AL_2(SO_4)_3$)	Not classified as a Dangerous Good	n/a	n/a	3 tanks - liquid	3 X 37 kL	21 days	Coagulant to remove dissolved organic matter and colloidal particles	100 m
Option 2 – Aluminium chlorohydrate (ACH, $Al_2Cl(OH)_5$	Not classified as a Dangerous Good	n/a	n/a	3 tanks - liquid	3 X 37 kL	21 days	Coagulant to remove dissolved organic matter and colloidal particles	100 m
Polyacrylamide	Not classified as a Dangerous Good	n/a	n/a	Bags- 25 kg	2 X 25 kg bags	21 days	Polymer that binds particles together for easier removal	110 m

2.1.3 Potential Future Chemicals

Once the new WTP had been commissioned and operational for several years, a review of whether any additional chemicals are required to be used for treatment would be undertaken. This would depend on review of raw water quality and the treated water quality outcomes from the WTP. Potential chemicals which may be considered are listed in Table 2.3. The need and volumes proposed are not known at this stage, as it would depend on the outcome of the review of the operation of the plant. Therefore these chemicals have not been considered further in the PHA. The hazards would need to be considered when it is decided that they would be used and further detail is known.

The proposed layout of the WTP has taken into consideration that these chemicals may be used in the future (refer to Figure 2-1 and 2-2).

Table 2-3: Potential chemicals which may be used in future upgrades

Chemical Proposed to be used	Dangerous Good Class Classification	Packaging number	Storage type	Delivery frequency	Purpose
Calcium hydroxide (Hydrated lime, $Ca(OH)_2$)	8	III	Silo	21 days	Adjust raw water pH and alkalinity
Carbon dioxide (CO_2)	2.2	Not applicable	Storage vessel	21 days	Optimise coagulant pH
Potassium permanganate ($KMnO_4$)	5.1	II	25kg pails	21 days	Oxidise manganese so that it can be removed by coagulation
Powdered Activated Carbon (PAC)	4.2	III	Bulky bags	21 days	Reduce taste and odour issues arising from presence of organics and/or algal growth

2.2 Risk Screening

SEPP 33 requires a risk screening to determine whether a PHA is required. The preliminary screening documents the following:

- The class and quantity of dangerous goods to be used, stored or produced on site;
- The distances from site boundaries to areas in which certain classes of dangerous goods are to be stored; and
- Review against the screening threshold quantities contained in *Applying SEPP 33 - Hazardous and Offensive Development Application Guidelines* (2011) (SEPP 33 Guidelines).

A transportation risk screening was conducted with the following documented:

- The class and quantity of dangerous and hazardous goods transported to and from WTP.
- The estimated number of traffic movements of dangerous goods to the WTP.
- Review against the screening threshold quantities contained in the SEPP 33 Guidelines.

2.2.1 Proposed chemicals for initial operation of the WTP

The risk screening and transportation risk screening is included in Appendix A for the proposed chemicals to be used for the initial operation of the WTP. Based on the risk screening, SEPP 33 applies to storage of:

- Caustic soda - Sodium hydroxide (NaOH) (30%)
- Sodium hypochlorite (NaOCL)

2.2.2 Potential Future Chemicals

A risk screening has not been undertaken for the potential future chemicals as the volumes that may be required has not yet been established. Assessment of the likely need for these chemicals would be undertaken once the new WTP is operational and more detail is known about the raw water quality. The potential future chemicals would not be likely to be used until several years after the new WTP has been operational.

3 Hazard Assessment

The hazard assessment has considered risks and consequences through a qualitative method. This is because the hazardous substances being stored on site have been assessed as not having risk to impact offsite from the WTP boundary when stored on the site with the implementation of safeguards.

3.1 Hazards

The risk screening undertaken determined that a PHA was required, based on Dangerous Goods Class 8 being stored on site exceeding the SEPP 33 threshold.

A transport risk screening was conducted identifying predicted movements of Dangerous Goods into and out of the WTP site. The thresholds were not exceeded. It is noted that all Class 6.1 transport is considered to exceed the threshold. However, it is proposed that the Class 6.1 goods would be delivered in a one tonne bag, the quantity at which below this level it is considered that the potential risk according to the SEPP 33 guidelines is unlikely to be significant unless the number of traffic movements is high.

Table 3-1 provides an identification of potential hazards with storage of the proposed Dangerous Goods on the WTP site.

Table 3-1: Hazard Identification

Facility/Area	Possible Event	Possible Results/consequences	Potential off site impact (Yes/No)	Prevention/detection Protection required.
Chemical Unloading Bund Area	Spill during delivery. Cross contamination of products. Rupture of storage vessel due to collision impact. Fittings damaged or inadequately installed. Overfilling of storage vessels.	Spill would have localised consequences only, mostly contained within the combined chemical unloading bund area. Minor fuming, possible burns to operator/tank driver.	No	Unloading area located centrally away from site boundary. Ensure the adjacent Riverside Residence is only used as a site office and not used as a residential dwelling. Each chemical should have its own designed bund to contain at least 110% of the largest tank volume and comply with AS3780 *The Storage and Handling of Corrosive Substances*, including locus limits (height of the tank as specified in the Australian Standard). Bund provides secondary containment in case of spills however protects equipment from vehicle damage. Bund wall connected to the building walls. Dedicated road tanker unloading bay should be provided with bund and dedicated tankers. Acid and alkali bulk storages should be located away from each other and in a well-ventilated area. Chemical building should have a roof to provide protection from the elements. Cross contamination should be eliminated by signage, and different nozzle fittings for each chemical. Tertiary spill containment control on site pumping into the wash water system for treatment and recycle through the process. Speed limits on WTP site to be adhered to.

Facility/Area	Possible Event	Possible Results/consequences	Potential off site impact (Yes/No)	Prevention/detection Protection required.
Aluminium sulphate storage area	Rupture of storage tank and loss of containment of aluminium sulphate	Spill will have localised consequences only, mostly contained within the combined chemical dosing building. Possible burns to operator/tank driver.	No	Storage area located centrally away from site boundary. Ensure the adjacent Riverside Residence is only used as a site office and not used as a residential dwelling. Chemical building should be designed to house and contain all chemicals. Chemical should have its own designed bund to contain at least 110% of the largest tank volume and comply with AS3780, including locus limits. Dedicated road tanker unloading bay should be provided with bund and dedicated tanker.
(Powdered) Coagulant aid/Sludge thickening aid polymer storage areas	Rupture of dosing tank and loss of containment of polymer solution. 25 kg bag burst and loss of polymer granules.	Spill will have localised consequences only, mostly contained within the combined chemical dosing building. Possible slip hazard for operator/tank driver.	No	Storage area located centrally away from site boundary. Ensure the adjacent Riverside Residence is only used as a site office and not used as a residential dwelling. Chemical building should be designed to house and contain all chemicals. Chemical should have its own designed bund to contain at least 110% of the largest tank volume to contain the spill. Solid product limits spill size.
Sodium hydroxide storage area	Rupture of storage tank and loss of containment of sodium hydroxide	Spill will have localised consequences only, mostly contained within the combined chemical dosing building. Potential hydrogen gas fuming if chemical contacts metals.	No	Storage area located centrally away from site boundary. Ensure the adjacent Riverside Residence is only used as a site office and not used as a residential dwelling. Chemical building should be designed to house and contain all chemicals.

Facility/Area	Possible Event	Possible Results/consequences	Potential off site impact (Yes/No)	Prevention/detection Protection required.
		Possible burns to operator/tank driver.		Chemical should have its own designed bund to contain at least 110% of the largest tank volume and comply with AS3780, including locus limits. Dedicated road tanker unloading bay should be provided with bund and dedicated tanker.
Sodium hypochlorite storage area.	Rupture of storage tank and loss of containment of sodium hypochlorite	Spill will have localised consequences only, mostly contained within the combined chemical dosing building. Potential chlorine gas fuming if chemical is heated/as it decomposes. Possible burns to operator/tank driver.	No	Storage area located centrally away from site boundary. Ensure the adjacent Riverside Residence is only used as a site office and not used as a residential dwelling. Chemical building should be designed to house and contain all chemicals. Chemical should have its own designed bund to contain at least 110% of the largest tank volume and comply with AS3780, including locus limits. Dedicated road tanker unloading bay should be provided with bund and dedicated tanker.
(Powdered) Sodium silicofluoride storage area	Rupture of dosing tank and loss of containment of sodium silicofluoride solution. Bulky bag burst and loss of sodium silicofluoride dust particles.	Spill will have localised consequences only, mostly contained within the combined chemical dosing building. Potential hydrogen gas fuming if chemical combines with water and metals. Possible dust inhalation toxic exposure to operator/tank driver.	No	Storage area located centrally away from site boundary. Ensure the adjacent Riverside Residence is only used as a site office and not used as a residential dwelling. Chemical building should be designed to house and contain all chemicals. Chemical should have its own designed bund to contain at least 110% of the largest tank volume and comply with AS3780, including locus limits. Dedicated road tanker unloading bay should be provided with bund and dedicated tanker.

Facility/Area	Possible Event	Possible Results/consequences	Potential off site impact (Yes/No)	Prevention/detection Protection required.
Loss of containment of Treated Water Storage	Pump or pipe damage caused by vehicle contact	Loss of containment of tank would result in chlorinated water flowing around the site and potentially into an adjacent drainage gully/Marshalls Creek, which then flows into the Murrumbidgee River.	Yes	If tanks are constructed of concrete this would minimise the likelihood of catastrophic failure. Vehicle access to tank area should be limited – protection of pipes and designated vehicle access ways should be provided. Water in tank is treated and of potable quality. Tank should have an overflow to the emergency storage lagoon or wash water system. Potential for water leaving site, however consequences do not present any adverse safety or major environmental issues. Low levels of chlorine in water would rapidly decay with contact with ground and organic matter.
Loss of containment of Filtered or Clarified Water from Filters or Clarifiers	Pump or pipe damage caused by vehicle contact	Loss of containment of tank would result in water flowing around the site and potentially into an adjacent drainage gully/ Marshalls Creek, which then flows into the Murrumbidgee River.	Yes	If tanks are constructed of concrete this would minimise the likelihood of catastrophic failure. Vehicle access to tank areas should be limited – protection of pipes and designated vehicle access ways should be provided. Water in tank is similar to the water in the river with the exception of pH which would be slightly different. Filters or Clarifiers should have an overflow to the emergency storage lagoon or wash water system. Potential for water leaving site, however consequences do not present any adverse safety or major environmental issues.

In addition to the above it would be specified to chemical suppliers transporting chemicals to the WTP that all Dangerous Goods would be transported to the site in accordance with the requirements of the *Dangerous Goods (Road and Rail Transport) Act* 2008 and *Dangerous Goods (Road and Rail Transport) Regulation* 2014.

3.2 Risk Assessment

Based on assessment of the hazards contained in Section 3.1 the storage and use of dangerous goods on the site do not present significant risk to individuals and community off site from the WTP with the implementation of safeguards. This is achieved by separation distance, and bunding for storage and unloading and different nozzle sizes for chemical cross-contamination. No potential off site impacts on individuals was identified.

Potential off site risks are from the loss of containment of treated water storage and filtered or clarified water from filters or clarifiers, rather than the type of chemicals proposed to be stored on the site. Safeguards would be in place to minimise risk of loss of storage.

4 Conclusion

It is concluded that there would not be off site risk resulting from the storage of:

- Sodium hypochlorite (Class 8 Package III)
- Sodium hydroxide (Class 8 Package II)
- Sodium silicofluoride (Class 6.1)

Chemical suppliers transporting Dangerous Goods to the WTP would be required to transport goods in accordance with the *Dangerous Goods (Road and Rail Transport) Act 2008* and *Dangerous Goods (Road and Rail Transport) Regulation 2014*.

As the WTP design is developed, it will be necessary to assess the effectiveness of the proposed designs in relation to the PHA assumptions. Therefore the following studies would be completed as part of the ongoing assessment of the design prior to commencement of operations:

- a Hazard and Operability (HAZOP) Study
- Emergency Response Planning
- Safety Management System assessment

Dangerous good storage notification to WorkCover would be undertaken where required.

Hazard analysis would be undertaken for the future chemicals outlined in Section 2.1.3 when further details are known and it is proposed to use the chemicals.

During the detailed design, should any changes occur to the proposed storage of chemicals then the PHA would be updated to be a Final Hazard Analysis (FHA).

5 References

National Transport Commission (2014 Electronic Version) *Australian Code for the Transport of Dangerous Goods by Road & Rail*

Appendix A Risk Screening

Chemicals to be used on Site - General Screening Threshold Quantities

Chemical Proposed to be used	Dangerous Good Class Classification	Packaging number	UN number[1]	Storage type	Proposed Storage quantity	SEPP 33 Threshold	Exceeds SEPP 33 Threshold	Delivery frequency	Purpose
Sodium silicofluoride (Na_2SiF_6) - Fluoride	6.1	III	2674	Bulk bags	1000 kg whole bulk bag (1 tonne)	2.5 tonne	No	21 days	Fluoridation of water prior to distribution for protection of dental health
Sodium hydroxide (NaOH) (30%) Caustic soda	8	II	1824	2 tanks - liquid	2 x 56 kL tanks (149 tonnes)	25 tonne	Yes	28 days	Alkali to adjust raw water and final water pH
Sodium hypochlorite (NaOCL)	8	III	1791	2 tanks - liquid	2 x 20 kL tanks (48 tonnes)	25 tonne	Yes	21 days	Disinfectant and oxidising agent
Option 1 Alum - Aluminium sulphate ($AL_2(SO_4)_3$)	Not classified as a Dangerous Good	n/a	n/a	3 tanks - liquid	3 X 37 kL	n/a	n/a	21 days	Coagulant to remove dissolved organic matter and colloidal particles
Option 2 – Aluminium chlorohydrate (ACH, $Al_2Cl(OH)_5$	Not classified as a Dangerous Good	n/a	n/a	3 tanks - liquid	3 X 37 kL	n/a	n/a	21 days	Coagulant to remove dissolved organic matter and colloidal particles
Polyacrylamide	Not classified as a Dangerous Good	n/a	n/a	Bags- 25 kg	2 X 25 kg bags	n/a	n/a	21 days	Polymer that binds particles together for easier removal

[1] **UN number - A number that identifies hazardous substances. UN numbers are assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods.**

Transportation Screening for Dangerous Good

Chemical Proposed to be used	Dangerous Good Class Classification	Vehicle Movements (cumulative annual)#	Typical quantity transported to site (tonne)#	Screening threshold from SEPP 33				Exceeds SEPP 33 Threshold
				Vehicle movements cumulative annual	Vehicle movements peak weekly	Minimum quantity per load tonne – bulk*	Minimum quantity per load tonne – package*	
Sodium silicofluoride (Na_2SiF_6) - Fluoride	6.1	13	1	All	All	1	3	No – delivery would be 1 tonne bulk
Sodium hydroxide (NaOH) (30%) Caustic soda	8	24	75	>500	>30	2	5	No
Sodium hypochlorite (NaOCl)	8	24	24	>500	>30	2	5	No

Estimated based on the available storage tanks and consumption

*If quantities are below this level, the potential risk is unlikely to be significant unless the number of traffic movements is high.

Appendix B Potential Future Chemicals

General Screening Threshold Quantities

Chemical	Chemical Proposed to be used	Dangerous Good Class Classification	Packaging number	Storage type	Storage volume	SEPP 33 Threshold	Delivery frequency	Purpose
Alkali	Calcium hydroxide (Hydrated lime, $Ca(OH)_2$)	8	III	Silo	Not known at this stage	50 tonnes	21 days	Adjust raw water pH and alkalinity
Carbon dioxide	Carbon dioxide (CO_2)	2.2	Not applicable	Storage vessel	Not known at this stage	Not applicable	21 days	Optimise coagulant pH
Potassium Permanganate	Potassium permanganate ($KMnO_4$)	5.1	II	25kg pails	Not known at this stage	5 tonnes	21 days	Oxidise manganese so that it can be removed by coagulation
PAC	Powdered Activated Carbon (PAC)	4.2	III	Bulky bags	Not known at this stage	1 tonne	21 days	Reduce taste and odour issues arising from presence of organics and/or algal growth

Transportation Screening Thresholds

Chemical Proposed to be used	Dangerous Good Classification	Screening threshold from SEPP 33				Exceeds SEPP 33 Threshold?
		Vehicle movements cumulative annual	Vehicle movements peak weekly	Minimum quantity per load tonne - bulk	Minimum quantity per load tonne – package*	
Calcium hydroxide (Hydrated lime, $Ca(OH)_2$)	8	>500	>30	2	5	Not likely to exceed
Carbon dioxide (CO_2)	2.2	Threshold not specified	Threshold not specified	Threshold not specified	Threshold not specified	
Potassium permanganate ($KMnO_4$)	5.1	>500	>30	2	5	Not likely to exceed
Powdered Activated Carbon (PAC)	4.2	>100	>3	2	5	Not likely to exceed

* If quantities are below this level, the potential risk is unlikely to be significant unless the number of traffic movements is high.

Appendix C: Flora and Fauna Assessment Report

Flora and Fauna Assessment

WAGGA WAGGA WATER TREATMENT PLANT UPGRADE

NOVEMBER 2014

www.nghenvironmental.com.au

Document Verification

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ACRONYMS AND ABBREVIATIONS

Cwth	Commonwealth
DECCW	Refer to OEH
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EIA	Environmental impact assessment
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ESD	Ecologically Sustainable Development
FM Act	*Fisheries Management Act 1994* (NSW)
ha	hectares
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007* (NSW)
KFH	Key Fish Habitat
km	kilometres
LEP	Local Environment Plan
m	Metres
NES	Matters of National environmental significance under the EPBC Act (*c.f.*)
Noxious Weeds Act	*Noxious Weeds Act 1993* (NSW)
NPW Act	*National Parks And Wildlife Act 1974* (NSW)
NSW	New South Wales
NV Act	*Native Vegetation Act 2003* (NSW)
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
REP	Regional Environmental Plan
SEPP	State Environmental Planning Policy (NSW)
SEWPAC	(Cwth) Department of Sustainability, Environment, Water, Population and Communities
SIS	Species Impact Statement
sp/spp	Species/multiple species
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

1 INTRODUCTION

This Biodiversity Assessment has been prepared by **ngh**environmental on behalf of Riverina Water County Council (RWCC). The report assesses the potential biodiversity impacts associated with the proposed upgrade to the Wagga Wagga Water Treatment Plant (WTP).

The Wagga Wagga WTP is located off the Sturt Highway (Hammond Avenue) (Lot 2, DP 540063) in Wagga Wagga. The WTP supplies reticulated water to the City of Wagga Wagga and the Shires of Lockhart and Greater Hume in combination with the West Wagga Wagga WTP, North Wagga WTP and smaller bore systems. The Wagga Wagga WTP has the capacity to produce approximately 44 ML/d of potable water from the Murrumbidgee River under typical river conditions.

The Wagga Wagga WTP was built in stages, commencing in the 1930's with the construction of Clarifier 1, Filters 1 and 2, and Clear Water Storage 1. The final filter (Filter 6) was constructed in the early 1960's. A new wash-water and sludge handling plant was commissioned in 2006. The existing Wagga Wagga WTP site, which covers an area of 8.43 ha is shown in Figure 1-1.

Raw water for the WTP is sourced from the Murrumbidgee River. River water is drawn by means of seven pumps. Six pumps are centrifugal and mounted vertically: four (4) of these are line shaft driven with motors at the top of the well, while two (2) are direct coupled. The seventh pump comprises a submersible unit immersed in the river.

The raw water quality in the Murrumbidgee River at Wagga Wagga can deteriorate significantly with turbidities in excess of 1000 NTU following heavy rain in the region. When turbidity exceeds 100 NTU, the river water is switched off and water is sourced from the East Wagga Borefield. However, as regional demand increases, the system will be unable to rely solely on the East Wagga Borefield and the Murrumbidgee River source will need to be utilised during high turbidity events.

RWCC is therefore proposing to upgrade the existing Wagga Wagga WTP in order to treat water turbidities up to 300 NTU and be capable of maintaining a secure production of 40 ML/d from the Murrumbidgee River in the short to medium term, and 55 ML/d by 2026.

Figure 1-1: Proposal Site

1.1 PROJECT DESCRIPTION

The project involves replacing the WTP with a 55 ML/d Clarification and Dual Media Filtration process. The upgrade will increase the capacity of the plant to 55 ML/d and secure this capacity under raw water turbidities up to 300 NTU. Inclined Plate settlers or Reactivator Clarifiers have been shortlisted as the preferred clarification options.

The scope of works for the proposed upgrade broadly includes the following:

- New raw water pumping station including new intake and infiltration well to be located to the east of the existing raw water pumping station;
- New alum dosing system and static mixer;
- New polymer dosing system;
- Inclined Plate Sedimentation Tanks or Reactivator Clarifiers;
- Dual Media Filters – 6 off including backwash pumps and blowers;
- New sodium hypochlorite storage and dosing system;
- Clear Water System upgrade – including new 3 ML CWS and pumping station;
- Backwash system for filters including air scour and backwash pumps;
- Use of existing Clarifiers 1 & 2 as filter washwater batch thickeners;
- Mechanical dewatering upgrade including the provision of two or three additional centrifuges;
- Switch rooms;
- Addition of automation and control infrastructure;
- General site services and miscellaneous items.

The proposed works would be contained within the existing WTP site and would not encroach into neighbouring land lots.

RIVER INTAKE PIPES

The river intake is to comprise of three intake pipes with sliding screen (Figure 1-2). The intake pipes would include two duty and one stand-by pump.

- Each pipe would be installed below ground and would comprise two sections: the lower section is a 600 millimetre diameter pipe, while the draft tube extending up the river bank is 1000 millimetre in diameter with a pump located inside.
- A minimum of 1.6 metre submergence is required, requiring dredging of the river bed to a depth of 1.7 metre below the bed surface to provide 1.3 metre additional water depth and to accommodate 0.4 metre depth of rock.
- The length of river bed and lower bank affected by the river intake would be around 30 metres and the width would be 4 to 5 metres.
- Rock (300 millimetre nominal size) would be placed around the screens and along the lower bank to protect the intake structure and stabilise the bank and bed of the river at the intake location. Rock would be tapered down to be consistent with the river bed and bank profile.

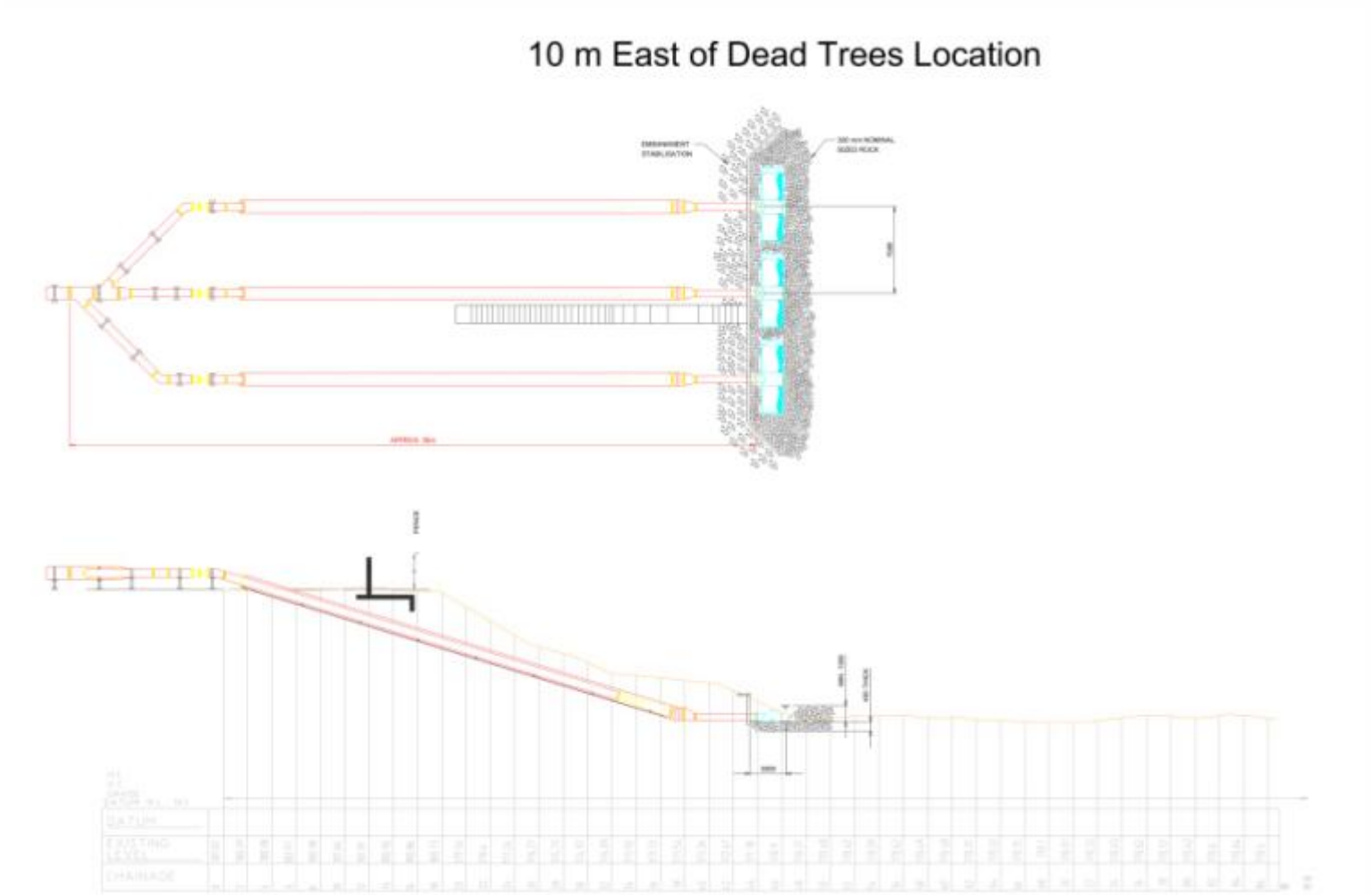

Figure 1-2: River intake pipes design

1.2 STUDY AREA

1.2.1 Definitions

The definitions for the following terms used in this report are:

- Proposal area - the footprint of the proposed works (the existing WTP and the banks of the Murrumbidgee River and Marshall's Creek adjacent to the WTP).
- Study area - inclusive of the proposal area and adjoining riparian zones and exterior land.
- Study locality - inclusive of the proposal area and adjoining lands to a 10 km radius.

1.2.2 Location of the activity

The Wagga Wagga WTP is located off the Sturt Highway (Hammond Avenue) (Lot 2, DP 540063) in Wagga Wagga approximately 380 km south west of Sydney.

The study area is located centrally in the South Western Slopes IBRA bioregion. The NSW South Western Slopes Bioregion is an extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria.

The bioregion consists of a complex series of north to north westerly trending folded bodies of Cambrian to Early Carboniferous sedimentary and volcanic rocks. Granite landscapes are common in the bioregion. Shallow, stony soils are found on the top of ridges and hills, moving down slope the soils are derived from weather rock. Alluvial sand and loams are more common than clays.

The bioregion includes parts of the Murray, Murrumbidgee, Lachlan and Macquarie River catchments. It is located within a temperate climate zone, characterised by hot summers and no dry season. Mean annual temperature increases across the bioregion from mild temperatures in the south and east to higher temperatures in the north and west. Rainfall follows a similar distribution with higher rainfall (1200 millimetres per year) in the south east falling to low rainfall (400 millimetres per year) in the west.

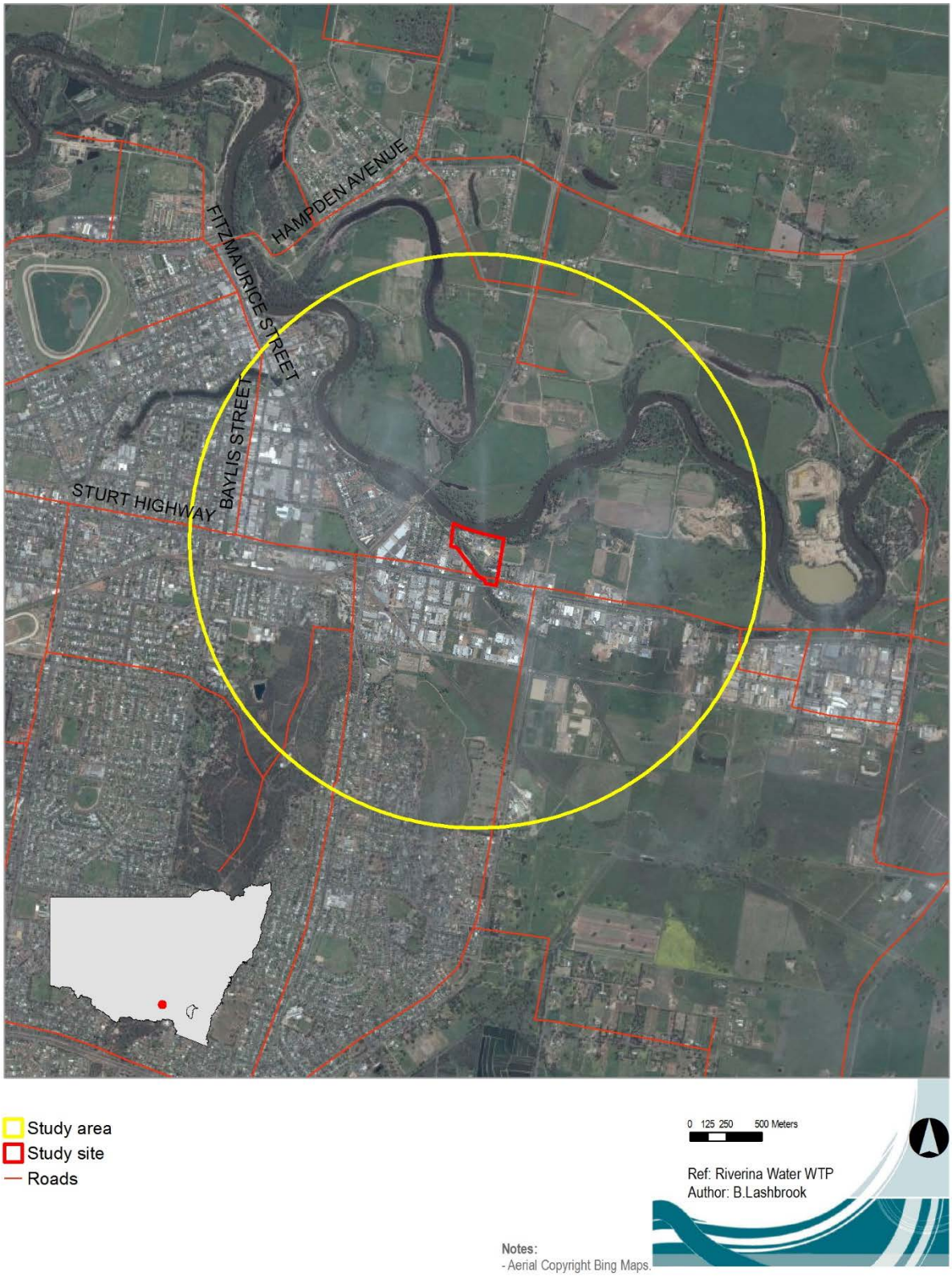

Figure 1-3 Proposal Location

1.3 REPORT STRUCTURE

This Flora and Fauna Assessment:

- Outlines the relevant legislative requirements pertaining to the proposal.
- Describes the survey methodologies and results.
- Outlines the potential impacts to flora and fauna associated with the works.
- Details suitable amelioration measures to mitigate these impacts.

1.4 SCOPE OF THE ASSESSMENT

The scope of the assessment includes:

- Desktop assessment of local ecological characteristics.
- Detailed flora and fauna survey including targeted Grey-headed Flying-fox survey.
- Hollow bearing tree survey.
- General habitat assessment for flora and fauna species.
- Target bird surveys.
- Opportunistic surveys.
- Assessment of likely impacts.

1.5 AIM OF THIS ASSESSMENT

This Biodiversity Assessment (BA) forms part of the environmental assessment required to fulfil the requirements of Part 5 of the *Environmental Planning and Assessment Act 1979*.

Specifically, the aims of this report are to:

- Describe the biodiversity values of the site and surrounding area including identifying protected and threatened flora and fauna species, populations and ecological communities and their habitats.
- Identify the direct and indirect impacts of the possible options on flora and fauna species, populations, ecological communities and critical habitat.
- Address the requirements of relevant legislation including the *Environmental Planning & Assessment Act 1979* (EP&A Act), the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Assess the significance of the impact of the proposal on species, ecological communities and populations listed under the TSC Act and EPBC Act.
- Propose environmental management measures to avoid, minimise, mitigate and, if necessary, offset any impacts.

The BA would be made available during any public consultation, and included as an appendix of the broader Environmental Impact Statement (EIS), that will document all impacts and mitigation measures required to accompany the work if implemented.

2 STATUTORY CONSIDERATIONS

2.1 NSW THREATENED SPECIES CONSERVATION ACT 1995

The TSC Act sets out to:

- Conserve biological diversity and promote ecologically sustainable development.
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities.
- Protect the critical habitat of those species, populations and ecological communities that are endangered.
- Eliminate or manage certain threatening processes.
- Ensure proper assessment of activities impacting threatened species, populations and ecological communities.
- Encourage the conservation of threatened species, populations and ecological communities through co-operative management.

An Assessment of Significance (also known as the Seven-part Test), is a set of factors which must be considered by decision makers regarding the effect of a proposed development or activity on threatened species, populations or ecological communities, or their habitats. These factors form part of the threatened species assessment process under section 5A of the *EP&A Act*.

An assessment of the potential impacts of the proposed activities on threatened species, populations, ecological communities and critical habitat has been completed in Appendix C. Seven-part tests have been completed for one Endangered Ecological Community (EEC) and a number of threatened fauna species. These can be found Appendix D.

2.2 NATIVE VEGETATION ACT (NV) 2003

Sections of the proposed works would remove native vegetation as defined by the NV Act. A small amount of clearing is considered necessary to carrying out the works. Clearing that is excluded from the provisions of Section 25 of the NV Act includes:

(a) any clearing that is, or is part of, an activity carried out by a determining authority within the meaning of Part 5 of the Environmental Planning & Assessment Act 1979 if the determining authority has complied with that Part

(b) any clearing that involves the removal or lopping of any tree or other vegetation in accordance with section 88 of the Roads Act 1993

The proposal would be assessed as Part 5 development (under the *EP&A Act 1979*) and the proposed works would be carried out by Riverina Water County Council (RWCC), a determining authority as defined by the Act. Therefore the project is exempt from the requirements of the NV Act.

2.3 NOXIOUS WEEDS (NW) ACT 1993

This act aims to prevent the establishment, reduce the risk of spread and minimise the extent of noxious weeds. The NW Act guides the management of declared noxious weeds within Local Government Areas

(LGAs). One noxious weed species declared for the Wagga Wagga control areas was observed on site, Willow (Salix sp.). Mitigation measures to ensure that this declared noxious weed is controlled and not spread into unaffected areas as a result of the works are listed in Section 6.

2.4 NSW NATIONAL PARKS AND WILDLIFE (NPW) ACT 1974

This Act aims to conserve nature, habitat, ecosystems, ecosystem processes and biological diversity at the community, species and genetic levels. Under this act all native fauna is protected, threatened or otherwise. Schedule 13 of the act lists protected plants which shall not be harmed or picked on any land either on or off National Park estate.

With regard to threatened species a person must not:

(a) harm any animal that is of, or is part of, a threatened species, an endangered population or an endangered ecological community, or

(b) use any substance, animal, firearm, explosive, net, trap, hunting device or instrument or means whatever for the purpose of harming any such animal.

Mitigation measures have been developed within this assessment to address risks to threatened species, endangered populations and endangered ecological communities.

Ecologically Sustainable Development Principles

The precautionary principle –This assessment has been prepared utilising the precautionary principle. That is, if threats are perceived as possibly leading to serious or irreversible environmental damage, then either the non-development of the proposal would occur, or the development modified to ensure that such threats do not exist.

Inter-generational equity – The proposed works would not impact on natural or cultural features to a level that would compromise the health, diversity or productivity of the environment to a level that would impact on future generations.

Conservation of biological diversity and ecological integrity – The proposed works would require vegetation removal. The assessment has identified that the works would not impact notably on the biological diversity and ecological integrity of the region. Further, safeguards have been developed that would assist in protecting important habitat features at the site.

Improved valuation of pricing of environmental resources – The assessment has been undertaken in recognition of the economic worth of the environment.

Mitigation measures have been developed that would assist in protecting important habitat features at the site.

2.5 NSW FISHERIES MANAGEMENT (FM) ACT 1994

This Act sets out to conserve fish stocks and key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation and biological diversity. Further, it aims to promote viable commercial fishing, aquaculture industries and recreational fishing opportunities.

Part 7 of the FM Act provides for the protection of aquatic habitats. A Part 7 Fisheries Management Act permit is required for:

- Activities involving dredging and reclamation work

- Activities temporarily or permanently obstructing fish passage
- Using explosives and other dangerous substances (where it may impact on aquatic habitat)
- Harming marine vegetation

Marshall's Creek and the Murrumbidgee River surrounding the proposal site are identified as key fish habitat (KFH) on the Department of Primary Industry's KFH maps. The proposed works would involve dredging and reclamation work, and temporary obstruction of fish passage, therefore a Part 7 permit is required.

2.6 ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION (EPBC) ACT 1999 (CWTH)

The EPBC Act introduces an assessment and approvals system for actions that have a significant impact on matters of national environmental significance (NES). Approval of the Environment Minister is required if an action is likely to have a significant impact on NES matters including:

- World Heritage Properties and places of National heritage.
- Wetlands of International Importance.
- Commonwealth Listed Threatened Species and Ecological Communities.
- Commonwealth Listed Migratory Species.
- Nuclear action.
- Commonwealth Marine areas.
- Commonwealth land.

This Flora and Fauna Assessment has determined that the proposed development has potential to impact upon listed threatened species, ecological community or migratory species. Assessments of Significance will be required for a number of fauna species under Section 181 of the EPBC Act (Appendix D).

3 METHODOLOGY

3.1 BACKGROUND REVIEW

Database searches were undertaken for records of Commonwealth and State listed threatened species, populations and ecological communities. Searches were conducted on 14 May 2014 and included the following:

- NSW Office of Environment and Heritage (OEH) Wildlife Atlas data records within a 10 km radius of the study area.
- EPBC Act Protected Matters search tool items with potential to occur within a 10 km radius of the study area.
- Department of Primary Industries (DPI) Threatened & protected species - records viewer

The results of the database searches are provided in Appendix C.

Literature relevant to this assessment was also reviewed and included:

- Office of Environment and Heritage (OEH) Threatened Species Profiles.
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) EPBC Act Species Profiles and Threats Database (SPRAT).
- Draft National Recovery Plan for the Grey-headed Flying-fox
- Construction methodology and concept designs
- Aerial maps

3.2 FIELD SURVEY

3.2.1 Timing and Location

Field investigations were undertaken on 19 May 2014 by two ecologists, Amy Evans and Cameron Radford. The field investigations aimed to identify the ecological characteristics of the study area and describe flora and fauna species present at the site. Weather conditions at the site were cool and dry with a maximum temperature of 23˚C. Two ecologists traversed the study area surveying flora, fauna and fauna habitat.

3.2.2 Flora survey

A detailed flora list for the study area was compiled using the “random meander” method as documented by Cropper (1993). This method provides comprehensiveness in terms of the number of species and variation within vegetation types, and improves opportunities for detecting significant or sparsely distributed plant species. Detailed notes were taken of flora species present, their abundance and cover (Appendix A). Particular attention was paid to mature or dead trees containing hollows.

An assessment and description of the vegetation communities present in the study area was undertaken with reference to the structure and condition of vegetation including past disturbance.

Targeted searches for those species, populations or ecological communities of state or national conservation significance that were identified as a result of background reviews, were undertaken within areas of suitable habitat.

Notes on all native plants and common or significant exotic species, including noxious weeds, were recorded along with their relative abundance. A full list of the flora species recorded in the study area is presented in Appendix A. Field guides and standard texts used during the survey and for later identification purposes are provided in the reference list. The naming of species recorded or known for the region follows the Flora of NSW (Harden 1992-2002) with recent updates provided on PlantNET.

Vegetation communities in the study area have been categorised on the basis of structure and formation using Specht (1970) classification.

3.2.3 Fauna and Habitat Assessment

Opportunistic fauna surveys and a habitat assessment were conducted within the study area.

The fauna survey included:

- An assessment of habitat types and quality in the study area.
- Incidental sightings of fauna.
- Indications of fauna presence including scats, scratch marks, tracks, etc.
- An assessment of the value of the study area as a wildlife corridor.
- An assessment of the extent and type of fauna habitats in the study area with particular reference to threatened species, and the conservation significance of any such habitat.
- Recording of the locations of all hollow-bearing trees within the study area.

A targeted Grey-headed Flying-fox survey was undertaken at dusk to identify (a) the location of roost sites near the proposal site, (b) the abundance of the population, and (c) the direction of fight of bats leaving the roost and if they used the proposal site for foraging.

Field guides and standard texts used as a reference are provided in the reference list. The naming of species recorded or known for the region follows the nomenclature present in these texts. The conservation significance of plants, animals and vegetation communities recorded is made with reference to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Threatened Species Conservation Act 1995* (TSC Act).

4 RESULTS

4.1 LANDSCAPE CONTEXT

The study area is located centrally in the South Western Slopes IBRA bioregion

. The NSW South Western Slopes Bioregion is an extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria.

The bioregion consists of a complex series of north to north westerly trending folded bodies of Cambrian to Early Carboniferous sedimentary and volcanic rocks. Granite landscapes are common in the bioregion. Shallow, stony soils are found on the top of ridges and hills, moving down slope the soils are derived from weather rock. Alluvial sand and loams are more common than clays.

The bioregion includes parts of the Murray, Murrumbidgee, Lachlan and Macquarie River catchments. It is located within a temperate climate zone, characterised by hot summers and no dry season. Mean annual temperature increases across the bioregion from mild temperatures in the south and east to higher temperatures in the north and west. Rainfall follows a similar distribution with higher rainfall (1200mm per year) in the south east falling to low rainfall (400mm per year) in the west.

Land uses within the study locality are mostly urban with a number of industrial and urban properties located along Hammond Avenue. These properties begin to become rural further east. The Murrumbidgee River occurs along the northern boundary to the proposal site and the Marshall's Creek occurs along the south-west border of the proposal site.

4.1.1 Vegetation Mapping

Vegetation mapping for the study area has been completed by the NSW Department of Climate Change and Water (2012) (Now OEH) as part of the NSW BioMetric Vegetation Type Classification and Assessment for the NSW Catchment Management Authorities. The Central Southern NSW (ADS40 E 3884) and the Murrumbidgee CMA (2011 E 3879) map sheets (OEH, 2014) identify the riparian habitat within the study area (including the Murrumbidgee River and Marshall's Creek) to be Inland Riverine Forests. The disturbed vegetation within the proposal site is classified as Cleared. The Inland Riverine Forest is not a threatened community, however, it is part of the '*Aquatic Ecological Community in Natural Drainage System of the Lower Murray River Catchment'* which has been listed as an endangered ecological community under Part 3, Schedule 4 of the *Fisheries Management Act 1994.*

The NSW OEH Vegetation Information System maps two vegetation communities within the study area:

- Inland Riverine Forests;
- Yellow Box Woodland.

Figure 4-1: The NSW OEH Vegetation Information System maps vegetation two plant communities within the study area.

4.1.2 Species of Conservation Significance

Background searches for threatened flora and fauna species revealed a range of species which have previously been recorded in the study locality or which may occur if suitable habitat is present. A list of these species as well as their state and national conservation significance, habitat requirements, location of nearest records, potential to occur in the study area and the likelihood of impact is provided in Appendix C.

NSW OEH Wildlife Atlas searches for threatened species listed on the TSC Act revealed three flora species and 20 fauna species with the potential to occur within a 10 km radius of the study area (Appendix C). The EPBC Act protected matters search tool revealed no threatened flora species, 13 threatened fauna species and nine migratory species and ten marine species with the potential to occur within a 10 km radius of the study area (Appendix C).

NSW OEH Wildlife Atlas database searches for Endangered Ecological Communities (EEC) revealed no EEC with the potential to occur in the study:

The EPBC protected matters search tool revealed three EECs which have the potential to occur within the study area.

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.
- Weeping Myall Woodlands
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

4.1.3 EPBC matters of National Significance

The EPBC Act identifies 28 matters of national environmental significance. These include World Heritage properties, National Heritage places, Ramsar wetlands of international significance, nationally listed threatened species and ecological communities, listed migratory species, Commonwealth marine areas and nuclear actions.

A search of the EPBC databases for items of national environmental significance was conducted to identify significant features within a 10 km radius of the study area. A summary of the results is included in Table 4-1.

Table 4-1: Summary of EPBC results

Matters of national significance	Results	Comment
World Heritage Properties	None	Not applicable.
National Heritage Places	None	Not applicable.
Wetlands of International Importance	3	Are not located in the study area and would not be impacted by the proposed works.
Great Barrier Reef Marine Park	None	Not applicable.
Commonwealth Marine Areas	None	Not applicable.

Matters of national significance	Results	Comment
Threatened Ecological Communities	3	Threatened Ecological Communities have been assessed for potential impacts in Appendix C Impacts are not considered likely to be significant.
Threatened Species	13	Threatened species have been assessed for potential impact in Appendix C. Impacts are not considered likely to be significant.
Migratory Species	9	Migratory species have been assessed for potential impact in Appendix C . Impacts are not considered likely to be significant.

4.2 FLORA

The following provides a summary of the survey results and vegetation characteristics of the study area. The full list and general abundance of species recorded during the flora survey is presented in Appendix A.

4.2.1 Diversity of flora species recorded

A total of 41 species were recorded on site, of which 17 are native and 24 are non-native. One noxious weed as listed for the Wagga Wagga LGA, *Salix sp*, was recorded on site. This species is categorised as Class 4 ("The growth of the plant must be managed in a manner that reduces its numbers, spread and incidence, and continuously inhibits its reproduction").

Within the river and creek corridors, the dominant over storey vegetation containes River Reg Gum (*Eucalyptus camaldulensis),* with occasional Grey Box (*Eucalyptus microcarpa*) individuals present. No dominant canopy species occur elsewhere across the proposal site.

A number of native mid-storey species, although not common throughout, were observed including Silver Wattle (*Acacia dealbata*), Black Wattle (*Acacia decurrens*) and River Oak (*Casuarina cunninghamiana*). Exotic mid-storey species are also present including Canary Island Date Palm (*Phoenix canariensis*) and Black-berry Nightshade (*Solanum nigrum*).

The ground stratum was a mix of both native and non-native herbaceous forbs and grasses. Common natives include Windmill Grass (*Chloris truncata*) and Finger Panic Grass (*Digitaria coenicola*). Common exotic species include Buffalo Grass (*Stenotaphrum secundatum*), Oxalis (*Oxalis pes-caprae*), Pigweed (*Portulaca oleracea*), Clover (*Trifolium* sp.) and Patterson's Curse (*Echium plantagineum*)

4.2.2 Vegetation communities

The study area is within a generally flat topography that tapers down towards the Murrumbidgee River to the north and Marshall's Creek to the south-east of the proposal site. The vegetation on the banks of the Murrumbidgee River and Marshall's Creek is Inland Riverine Forest. This community is represented by River Red Gum (*Eucalyptus camaldulensis*) and Grey Box (*Eucalyptus macrocarpa*). Other vegetation within the proposal site consists of native and exotic garden trees and shrubs, exotic and native grasses and weeds. This community is classed as Cleared Land. These two communities are consistent for other vegetation occurring in the locality. Extensive clearing has resulted in heavily reduced ecological connectivity between remnant vegetation communities and adjacent lands. However, Inland Riverine Forest connectivity occurs along the Murrumbidgee River and Marshall's Creek.

Fieldwork indicated that there are not as many plant communities present as indicated by the VIS data. Instead, one native vegetation communities as defined in the BioMetric Vegetation classification for Murrumbidgee CMA area occurs within the study area:

- Inland Riverine Forests

A detailed community description is given in **Table 4-2**.

Table 4-2: Vegetation community table

Inland Riverine Forests	
Occurrence	Mid and lower reaches of the Murray and Murrumbidgee River floodplains, lower Lachlan, lower Darling and rivers flowing into the northern Darling floodplains. They also extend up-river throughout the western slopes and north along the tributaries of the Darling into southern Queensland. Down-river they follow the Murray and its tributaries into Victoria and South Australia.
Structure	Open eucalypt forest up to 40 m tall with a dense to patchy, species-rich, herbaceous groundcover interspersed with bare ground and scattered shrubs.
Conservation Status	Not threatened.
Common Species	Canopy: *Eucalyptus camaldulensis* (river red gum), occasionally with *E. largiflorens* (black box), *E. melliodora* (yellow box) or *E. microcarpa* (grey box). Mid-storey: *Acacia salicina* (cooba) and *A. stenophylla* (river cooba) occur as emergent small trees. Smaller shrubs of *Chenopodium nitrariaceum* (nitre goosefoot), *Exocarpos strictus* (dwarf cherry) and *Muehlenbeckia florulenta* (lignum). Understorey: *Alternanthera denticulata* (lesser joyweed), *Centipeda cunninghamii* (common sneezeweed), *Chamaesyce drummondii* (caustic weed), *Cotula australis* (common cotula), *Glinus lotoides, Oxalis perennans, Pratia concolor* (poison pratia), *Ranunculus lappaceus* (common buttercup), *Rumex brownii* (swamp dock), *Wahlenbergia fluminalis* (river bluebell), *Marsilea drummondii* (common nardoo), *Agrostis avenacea* var. *avenacea* (blown grass), *Carex appressa* (tussock sedge), *C. inversa, Juncus ingens* (giant rush), *J. radula* (hoary rush), *Paspalidium constrictum* (knottybutt grass), *P. jubiflorum* (warrego grass), *Poa fordeana*.
Equivalent vegetation types	Reference community 74 in Benson et al. (2006)

This vegetation occurs along the banks of the Murrumbidgee River and Marshall's Creek within the study area.

The other vegetation occurring on site has all been planted following disturbance. This vegetation includes a mixture of introduced and native plants, none of which have any important conservation significance within the local area.

The Lower Murray River Aquatic Ecological Community occurs within the study area and has been declared a EEC under the FM Act. This community occurs within the Murrumbidgee River and Marshalls Creek banks.

4.2.3 Threatened flora

Database searches undertaken on the 20th May 2014 identified three threatened flora species occurring within a 10 kilometre radius of the proposal area (refer to Appendix C. These flora species included

- *Brachyscome muelleroides* (Claypan Daisy) – TSC V
- *Senecio garlandii* (Woolly Ragwort) – TSC V
- *Swainsona recta* (Small Purple-pea) – TSC V, EPBC E

No threatened flora species were identified during the field survey. Habitat requirements and an assessment of the likelihood of presence for all threatened flora species are provided in (Appendix C). Ecological information about each species is derived from the NSW OEH Threatened Species profile webpages and the Conservation Advice statements provided by Commonwealth Department of the Environment.

Habitat assessments for all threatened plant species determined that no threatened flora species are likely to be impacted by the proposed works.

Table 4-3: Species with habitat which occurs within the study area and the likelihood of impact from the proposed works.

Species	Presence of habitat	Likelihood of occurrence	Likelihood of impact
Claypan Daisy *Brachyscome muelleroides* TSC-V	Absent - "Only five sites have precise locality details, and four of these are on Morundah Station in NSW. Occurs in seasonally damp situations such as shallow depressions and around the margins of swamps, lagoons and claypans, on heavy grey cracking clays to lighter clay loam soils, in grassland, grassy woodland and open forest habitats, growing in association with various grasses and seasonal aquatic plants such as *Marsilea* species. Associated species include *Pycnosorus globosus, Agrostis avenacea, Austrodanthonia duttoniana*, and *Calotis anthemoides*.."	**None** – this species was not recorded in the study area and there is no suitable habitat.	No
Small Purple-pea *Swainsona recta* – TSC V, EPBC E	Absent - "The range of *S. recta* has contracted to two disjunct clusters in NSW, one between Wellington and Mudgee, and the other from Canberra and Queanbeyan south to Williamsdale. The largest known population has about 3,400 plants, scattered along 22 km of narrow railway easement in NSW from Tralee (south of Queanbeyan) to	**None** – this species was not recorded in the study area and there is no suitable habitat	No

Species	Presence of habitat	Likelihood of occurrence	Likelihood of impact
	south of Williamsdale. Occurs in grassland and open woodland, often on stony hillsides, dominated by one or more of the following: *Callitris endichleri, C. glaucophylla*, *Eucalyptus blakelyi, E. bridgesiana*, *E. dives*, *E. melliodora, E. microcarpa, E. nortonii and E. polyanthemos.* Requires a forb-rich grassy groundlayer dominated by *Themeda triandra, Poa sieberiana* var. *sieberiana or Austrostipa* spp.".		
Woolly Ragwort *Senecio garlandii* TSC-V EPBC-V	Absent - Almost entirely known from the western slopes of the Great Dividing Range in southern NSW. In NSW known from a very localised strip from West Wyalong to the Albury district, in the Central Western Slopes and South Western Slopes regions. The site of greatest abundance appears to be The Rock NR, over 340 ha, about 30 km SE of Wagga Wagga. Has also been collected at Tabletop Range, a site "15 miles ESE of The Rock", Gidginbung, "near Albury", Flowerpot Hill (4 km S of The Rock NR), Ulandra NR (7 km SE of Bethungra), Benambra SF (20 km W of Holbrook), Burrinjuck and near Temora. Occurs in dry sclerophyll forest and open woodland in association with *Eucalyptus macrorhyncha, E. goniocalyx, Acacia doratoxylon, A. implexa* and *Brachychiton populneus*. Grows on the sheltered lower slopes or upper parts of south to east-facing slopes of isolated rocky outcrops.	**None** – this species was not recorded in the study area and there is no suitable habitat	No

Habitat assessments for all threatened plant species determined that no threatened flora species are likely to be impacted by the proposed works.

4.2.4 Vegetation communities of conservation significance

Habitat assessments and field surveys found that none of the remnant vegetation within the study area complies with the definitions of a TEC, however, the Aquatic Ecological Community in Natural Drainage Systems of the Lower Murray River Catchment (AECNDSLMRC) has been observed as occurring within the study area.

4.3 FAUNA

4.3.1 Habitat types and value

The following provides a summary of the fauna habitat characteristics of the study area. A full list and general abundance of fauna species recorded during the survey is presented in Appendix B.

Riparian woodlands comprising of River Red Gum and riparian aquatic are the main fauna habitats. Modified habitat comprises most of the proposal site. Terrestrial and aquatic fauna habitats within the study area include:

- Fallen timber and dead wood (including snags) that could provide habitat for ground dwelling fauna and aquatic fauna on the banks and within the aquatic environment of the Murrumbidgee River.
- River banks which can provide burrowing opportunities for aquatic mammals, reptiles and crustaceans and can be used for access to rivers and streams.
- Mature eucalypts with hollows present that could provide foraging, refuge, roosting and nesting habitat for birds and arboreal mammals. Flying-foxes will also use the trees for foraging.

4.3.2 Diversity of Fauna Species Recorded

Opportunistic observations made during the survey, observed a total of 20 species of birds, two species of mammals and two species of reptiles in the study area (Appendix B). This included a colony of Grey-headed Flying-foxes. No introduced species were detected during surveys. Bird activity during the survey was considered moderate.

4.3.3 Threatened Fauna

Database searches identified 20 threatened fauna species that have been previously recorded within a 10 km radius of the study area. Availability of suitable habitat for these species within the study area was assessed during the site inspection. Of particular interest was the occurrence of a Grey-headed Flying-fox colony within the riparian zone of the study area. Habitat requirements and likelihood of presence for all threatened fauna species can be found in Appendix C.

4.3.4 Groundwater Dependent Ecosystems

The National Atlas of Groundwater Dependent Ecosystems has been developed using remote sensing by the CSIRO. The atlas displays ecological and hydrogeological information on known groundwater dependent ecosystems and ecosystems that potentially use groundwater.

A number of Groundwater Dependent Ecosystems (GDE) have been identified within the study locality (Figure 4-2). Pressure on groundwater resources is unlikely to be increased as part of the proposed work. Similarly no GDE is likely to be impacted as part of the proposed work.

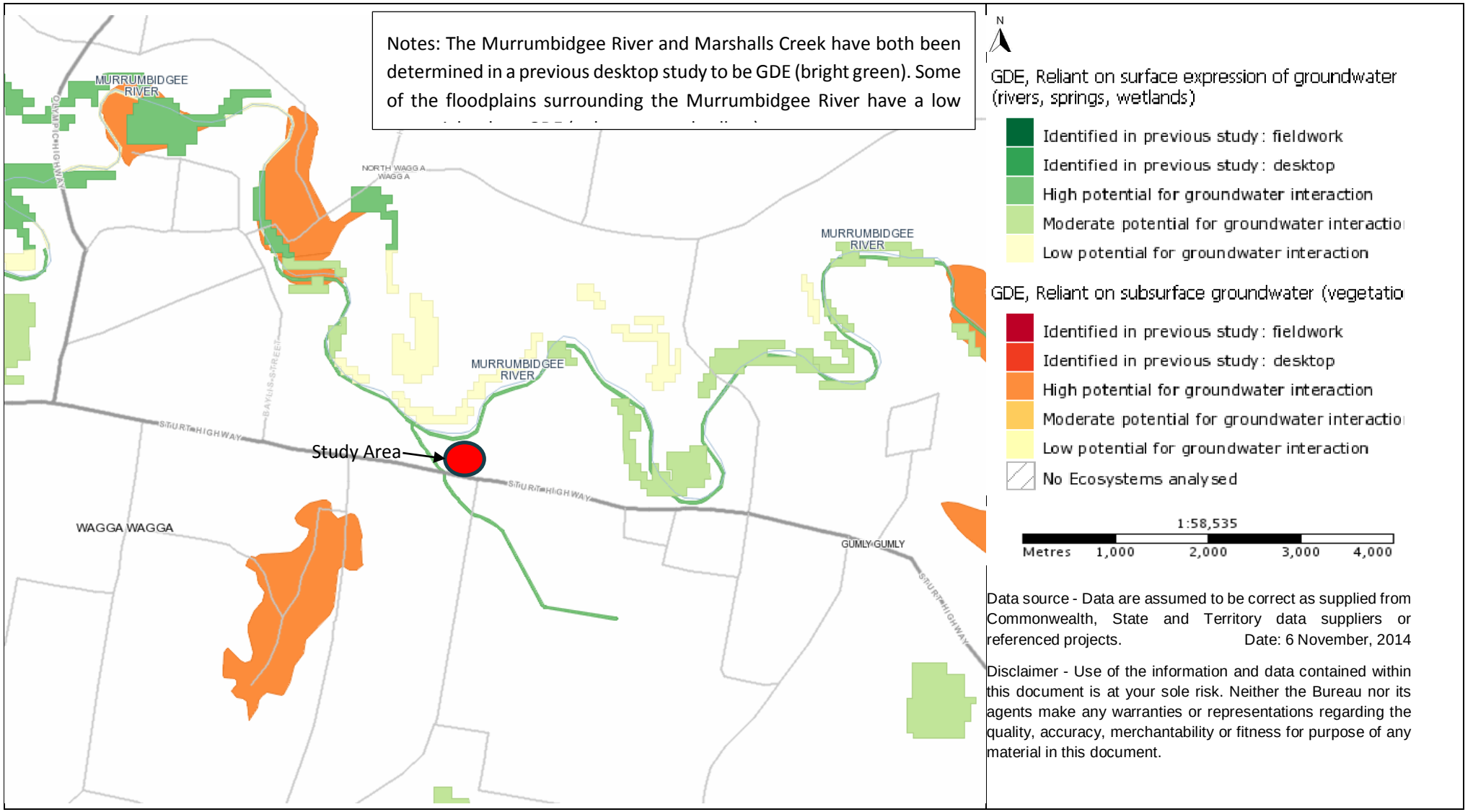

Figure 4-2: Groundwater dependent ecosystems in the locality of the study area (red). The Murrumbidgee River and Marshalls Creek have both been determined in a previous desktop study to be GDE (bright green). Some of the floodplains surrounding the Murrumbidgee River have a low potential to be a GDE (pale green and yellow).

5 ASSESSMENT OF IMPACTS

5.1 GENERAL

The proposal would result in a number of direct and indirect impacts on flora and fauna including:

- Bank erosion impacting on riparian fauna including the Platypus (*Ornithorhynchus anatinus*) and fish species.
- Sedimentation into the Murrumbidgee River impacting aquatic fauna.
- The direct removal of vegetation including trees and ground cover vegetation.
- Incidental disturbances of ground cover vegetation.
- Potential for weeds to be imported and/or distributed terrestrially and aquatically.
- The removal and disturbance of potential habitat for fauna.
- Disturbance of fauna due to construction noise.
- Loss of semi-aquatic habitat in the truck drainage area

The proposed works would require removal of six semi-mature trees in the proposal site. These trees are not threatened species and are not part of an EEC. Direct and indirect impacts would also occur to understorey species through access and construction of the water intake pipes. All flora species recorded in the study area are considered common in the locality and are present in adjacent areas outside of the study area. None of the flora species which would be removed are listed as threatened species, nor are they part of an EEC.

Potential impacts to fauna would include:

- Erosion and sedimentation causing disturbance to aquatic and riparian fauna.
- Disturbance and removal of trees which are foraging habitat for fruit bats and arboreal mammals, and roosting, nesting and foraging habitat for birds.
- Noise impacts causing disturbance to fauna.

The proposal would be unlikely to substantially reduce the availability of terrestrial foraging, refuge, roosting and nesting habitat within the study area as suitable habitat is found in trees on adjacent lands.

The assessment identified a total of two hollow bearing trees (River Red Gums) within 10 metres of the proposed works within the riparian zone of the Murrumbidgee River. These hollows are small (less than ten centimetres). The proposed works will not require the removal of these trees with hollows.

Fauna species likely to utilise the habitat in the study area for movement would be highly mobile and disturbance tolerant, as the site is located in a modified environment. This minor reduction in habitat would not affect the ability for these species to move around the local area.

There is an increased risk that the spread of weeds could occur during the early stages of the works, when vegetation is being cleared and topsoil is being stripped. This could occur from the importation of weed seed and through the spread of weed seed by machinery between infested areas. Furthermore, weed seeds and plant parts entering the riparian system could cause the spread of weeds downstream. One noxious weed (Willow) occurs frequently throughout the study area and surrounding environment in the riparian zones, however, they are likely to be disturbed due to the proposal.

The proposed works may also lead to soil erosion, sedimentation and pollution causing impacts to threatened fish.

Flora

The vegetation within the proposed levy works comprises mainly landscape garden including native and introduced grasses, exotic and native trees and shrubs, and weeds. The riparian vegetation where the proposed water intake construction works will occur comprises mainly native trees, shrubs and ground cover and weeds. A species list recorded during the site visit is shown in Appendix A.

Fauna

Species observed whilst on site are listed in Appendix B. Within the study area there is potential habitat for a number of threatened species including a number of woodland and riparian birds, arboreal mammals, and microbats. A colony of threatened Grey-headed Flying-foxes also occurs within 100 metres of the site and the site contains foraging habitat for this species. The Murrumbidgee River and Marshall's Creek contains habitat for a number of threatened fish occurring in the locality. These habitats are generally widespread and not confined to the proposal site. The proposed works are not likely to cause an impact on any threatened species, except the colony of Grey-headed Flying-foxes occurring within 100 metres of the proposal site in the Murrumbidgee River riparian zone. Construction noise during the proposed works is likely to disturb this colony. The proposed works may also lead to soil erosion, sedimentation and pollution causing impacts to threatened fish (see Appendix D for Assessments of Significance for these species and Section 6 for Mitigation measures).

5.2 THREATENED SPECIES

5.2.1 Flora

No threatened flora species were identified as occurring in the study area. Habitat assessments determined that no threatened flora species are likely to be impacted by the proposed works.

5.2.2 Endangered Ecological Communities

One Endangered Ecological Community was identified within the study area, that being the Aquatic Ecological Community in Natural Drainage System of the Lower Murray River Catchment. An Assessment of Significance determined that this EEC is not likely to be impacted by the proposed works due to:

- Natural river flows will not be permanently altered;
- The proposal will not cause changes in thermal temperatures of the Murrumbidgee River;
- The introduction of pest species will not occur due to the proposal;
- Sedimentation controls will be in place to prevent sedimentation into the river;
- Snags will not be removed due to the proposal;
- Agricultural practices will not be occurring; and
- Fishing will not be occurring.

5.2.3 Fauna

The proposal would potentially impact upon a Grey-headed Flying-fox colony situated within 100 metres of the proposal site. The colony occurs in two separate groups (one occurring on the northern bank of the Murrumbidgee River and the other occurring on 'Bear Island' which is situated within the Murrumbidgee River, north-east of the proposal site). Approximately 350 individuals currently roost in this colony, although the fruit bats usually leave the site during winter months (May – August) every year (pers. comm.

Matt Cameron, OEH). The greatest impact that the proposal would have on this species is noise produced by construction of the new levy, specifically the pile driving activities. Loud noises are commonly used to deter Flying-foxes from areas. Indeed, loud noises can cause a significant impact on a roosting colony (DoE, 2014). However, the proposal is not likely to have a significant impact on this species if it is undertaken during winter months when the Grey-headed Flying-fox is usually absent from the local area. The Grey-headed Flying-fox colony is particularly vulnerable to disturbance during the breeding season when juvenile flying-foxes are dependent on mothers. During this period, mother flying-foxes may abandon their young if disturbed, potentially leading to juvenile deaths.

The proposal would also potentially impact upon three threatened fish species occuring in the Murrumbidgee River within the study area. These inlcude the Murray Cod (*Maccullochella peelii*), Macquarie Perch (*Macquaria australasica*) and Silver Perch (*Bidyanus bidyanus*). The proposal would potentially impact these species through sedimention caused by erosion, impacts to habitat features including snag removal and dredging and reclamamtion of the river bed, changes in water flow, obstructions causing blocked passage and chemical contamination of the Murrumbidgee River.

A Seven Part Test (TSC Act) and Assessment of Significance (EPBC Act) was undertaken for these threatened species (Appendix D).

The Assessment of Significance found that the potential for significant impacts to occur due to the proposal is low, if noise-generating piling works are undertaken outside of the breeding season of the Grey-headed Flying Fox. The assessment of significance found that any impacts on threatened species are unlikely to be significant because:

- only a minimal amount of tree foraging habitat will be cleared;
- aquatic habitat features will not be disturbed; and
- water conditions and flow will not be changed significantly.

5.2.4 Key Threatening Processes (TSC Act and EPBC Act)

The Key Threatening Processes triggered by the proposal include the following:

- Clearing of native vegetation – Works would involve the removal of native vegetation. The vegetation which would be removed is common and widespread. Potential habitat which would be removed is small in the context of the locality. Impacts to flora and fauna as a result of the works would be minor.
- Removal of dead wood– Dead wood would be removed as a result of the proposal. Considering the small size of the clearing area and the presence of intact extents of native vegetation adjacent to the road reserve the removal of this small amount of dead wood is unlikely to increase the impact of this key threatening process.

5.3 OPERATIONAL IMPACTS

Operational impacts that may occur following construction of the upgraded WTP include the following:

- Increased soil erosion from the water intake pipes construction
- Weed growth on the upgraded WTP

Weed invasion can prevent the revegetation of natural vegetation communities and can assist in the spread of noxious weeds. Being adjacent to a major river system, these impacts are increased due to the high dispersive forces of the river. Immediately following the construction of the water intake pipes, soil erosion

from the river banks can become an impact due to a lack of vegetation cover or erosion control measure being established.

6 MITIGATION MEASURES

nghenvironmental proposes the following safeguards to mitigate impacts to flora and fauna at the proposal site and in the study area. Appropriate safeguards would assist in reducing impacts of the proposed activity and can be mitigated through appropriate construction and rehabilitation practices on site.

6.1 CONSTRUCTION MITIGATION MEASURES

The following construction mitigation measures would be put in place to ensure the protection and sustainability of all flora and fauna and their ecosystems occurring within the study area:

- Construction workers would be educated about the environmental risks of construction processes via toolbox meetings
- No pile driving or high noise generating construction works are to occur during the breeding months of the Grey-headed Flying-fox to ensure construction noise does not disturb breeding. Therefore, construction time is limited to between April and October.
- All noxious weeds would be disposed of at landfill and not mixed with soil to be re-used on site or anywhere else. Any noxious weeds (for example Willow) should be dealt with as per the noxious weed declarations for Wagga Wagga City Council.
- Appropriate erosion and sediment control procedures should be implemented for all construction works near riparian areas such as the banks of Marshalls Creek and the Murrumbidgee River to avoid erosion of the river banks and sedimentation of covering vegetation.
- A spill management plan would be developed before construction begins and implemented throughout construction.
- A two-stage vegetation clearing procedure should be undertaken if hollow-bearing trees are to be cleared. This involves clearing all non-habitat vegetation first, followed by a second stage of hollow-bearing tree clearing. The hollow bearing trees should be knocked one day before they area cleared to allow wildlife to escape.
- River and creek banks would be checked for large burrows before any construction work commences there, and regularly throughout any works undertaken on these banks. If burrows are present, they would be investigated for occupancy by a qualified ecologist. If the burrow is occupied by an animal such as a Platypus, construction work should cease until the burrow is certified as unoccupied by a qualified ecologist.
- Any stags to be removed during the construction works would be replaced further downstream. This would be in areas where the stags can be attached to solid structures within and on the banks of the water systems, such as already existing stags or pipes.

6.2 OPERATIONAL IMPACTS AND MITIGATION MEASURES

The following mitigation measures would be put in place to ensure the protection and sustainability of all flora and fauna and their ecosystems occurring within the study area:

- Erosion and sediment controls should be put in place before construction works begin.
- Regular monthly monitoring of the site for six months after the WTP upgrade and removal of weeds using appropriate methods. This includes any noxious weeds occurring on site to be managed according to legal requirements for the Wagga Wagga City Council area.

7 CONCLUSION

This Flora and Fauna Assessment indicates that impacts to biodiversity would be minor as a result of the proposed works. The primary impact is from the proposed construction works causing noise disturbance to the nearby colony of Grey-headed Flying-foxes and the impact to threatened fish due to the water intake pipes construction. Residual impacts can be further reduced or mitigated by implementing the mitigation measures listed in Section 6.

Vegetation within the study area comprises disturbed modified gardens and Inland Riverine Forests. Very minimal disturbance will occur to the vegetation on site (six maturing *Eucalypts*) and some introduced and native shrubs on the river bank.

Fauna habitat values at the site include vegetation canopy, fallen timber and aquatic. Any impact to fauna at the site would be minor as the proposal area is located in a disturbed environment, only six maturing *Eucalypts* will be removed, sediment and erosion controls will be used, no snags will be removed and water flow in the Murrumbidgee River will only be temporarily and slightly altered. Whilst the proposal area provides some suitable foraging and breeding habitat for fauna, similar habitats exist in the study area and adjacent lands and aquatic environments.

An assessment of the significance of impacts on state and federally listed threatened biota has concluded that the proposal is unlikely to have a significant impact on threatened species, their habitats, or endangered ecological communities, due to the limited extent of such impacts. A Species Impact Statement or Referral to the federal Environment Minister is not required.

The works are required to upgrade the Wagga Wagga Water Treatment Plant. The benefits of carrying out the works are considered to outweigh the ecological impact and risk associated with the works. The implementation of mitigation measures would minimise the risk of any ecological impacts.

8 REFERENCES

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APPENDIX A FLORA SPECIES LIST

Species recorded during the site survey on the 19 May 2014

LEGEND

C = Common, abundant

O = Occasional

U = Uncommon

* = Denotes introduced species (weeds)

\# = Denotes threatened species

CLASS Family	Scientific Name	Common Name	Occurrence
MAGNOLIOPSIDA - DICOTYLEDONS			
Amaranthaceae	**Alternanthera pungens*	Khaki Weed	U
Arecaceae	**Phoenix canariensis*	Canary Island Date Palm	O
Asteraceae	**Arctotheca calendula*	Capeweed	O
Asteraceae	**Cirsium vulgare*	Spear Thistle	O
Asteraceae	**Conyza bonariensis*	Flaxleaf fleabane	C
Asteraceae	**Hypochaeris radicata*	Catsear	C
Asteraceae	**Lactuca serriola*	Prickly Lettuce	O
Asteraceae	**Silybum marianum*	Variegated thistle	U
Asteraceae	*Sonchus oleraceus*	Common Sow thistle	C
Boraginaceae	**Echium plantagineum*	Patterson's Curse	C
Caprifoliaceae	**Lonicera japonica*	Japanese Honeysuckle	O
Casuarinaceae	*Casuarina cunninghamiana*	River Oak	U
Cyperaceae	**Cyperus eragrostis*	Umbrella Sedge	U
Fabaceae	**Medicago sp*	Medic	O
Fabaceae *Fabiodeae*	**Trifolium sp.*	Clover	C
Fabaceae *Mimosoideae*	*Acacia dealbata*	Silver Wattle	U
Fabaceae *Mimosoideae*	*Acacia decurrens*	Black Wattle	O
Fumariaceae	*Fumaria muralis subsp. muralis*	Wall Fumitory	C
Juncaceae	*Juncus sp.*	Rush	U
Lamiaceae	** Marrubium vulgare*	Horehound	O

Malvaceae	*Brachychiton populneus*	Kurrajong	O
Malvaceae	*Malva parviflora*	Small-flowered mallow	C
Myrtaceae	*Eucalyptus camaldulensis*	River Red Gum	C
Myrtaceae	*Eucalyptus microcarpa*	Grey Box	C
Myrtaceae	*Eucalyptus* spp.	Young Eucalypts	O
Oxalidaceae	*Oxalis pes-caprae*	Oxalis	C
Portulacaceae	*Portulaca oleracea*	Pigweed	C
Polygonaceae	*Rumex brownie*	Swamp Dock	O
Polygonaceae	**Rumex crsipus*	Curled Dock	O
Rosaceae	**Rosa sp.*	Rose Bush	U
Salicaceae	**Salix x pendulina* *(Class 4)*	Weeping Willow	C
Solanaceae	**Solanum nigrum*	Black-berry Nightshade	U
Verbenaceae	**Verbena sp.*	Purpletop	O
Urticaceae	**Urtica urens*	Small nettle	O
MAGNOLIOPSIDA - MONOCOTYLEDONS			
Poaceae	**Avena fatua*	Wild Oats	O
Poaceae	*Chloris truncata*	Windmill Grass	C
Poaceae	*Digitaria coenicola*	Finger Panic Grass	C
Poaceae	**Cynodon dactylon*	Couch	C
Poaceae	*Panicum effusum*	Hairy Panic	O
Poaceae	**Paspalum dilatatum*	Paspalum	O
Poaceae	** Stenotaphrum secundatum*	Buffalo Grass	C

Noxious weeds on the DPI Wagga Wagga LGA list – Accessed 22 May 2014

Control Class	Weed Type	Control Requirements
Class 1	Plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.
Class 2	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not	The plant must be eradicated from the land and the land must be kept free of the plant. The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.

	present in the region or are present only to a limited extent.	
Class 3	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.	The plant must be fully and continuously suppressed and destroyed.*
Class 4	Declared Class 4 Noxious weed for the Wagga Wagga Local Government Area (LGA). Plants that pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.	The growth of the plant must be managed in a manner that reduces its numbers, spread and incidence and continuously inhibits its reproduction.
Class 5	Species classified as a Class 5 Noxious Weed for the Narrandera Local Government Area (LGA). Plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.	There are no requirements to control existing plants of Class 5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists.

APPENDIX B FAUNA SPECIES LIST

Species recorded during the site survey on the 19 May 2014

LEGEND

O = Observed

H = Heard

X = Scat

\# = Denotes introduced species

* = Denotes threatened species

Common Name	*Scientific Name*	*Observation Type*
AVES		
Acrocephalidae **- Reed warblers and Allies**		
Australian Reed-warbler	*Acrocephalus australis*	O
Alcedinidae **- Kingfishers**		
Laughing Kookaburra	*Dacelo novaeguineae*	H
Anatidae **- Ducks, Geese and Waterfowl**		
Australian Wood Duck	*Chenonetta jubata*	O
Ardeidae **- Herons, Egrets and Bitterns**		
White-faced Heron	*Egretta novaehollandiae*	O
Artamidae **- Woodswallows**		
Dusky Woodswallow	*Artamus cyanopterus*	O
Cacatuidae **- Cockatoos**		
Sulphur-crested Cockatoo	*Cacatua galerita*	H
Cracticidae **- Bellmagpies and Allies**		
Australian Magpie	*Gymnorhina tibicen*	O
Pied Currawong	*Strepera graculina*	O
Hirundinidae **- Swallows**		
Welcome Swallow	*Hirundo neoxena*	O
Maluridae **- Fairywrens**		
Variegated Fairywren	*Malurus lamberti*	O
Meliphagidae **- Honeyeaters**		
White-plumed Honeyeater	*Lichenostomus penicillatus*	O
Monarchidae **- Monarch Flycatchers**		

Magpie-lark	*Grallina cyanoleuca*	O
MAMMALS		
Phalangeridae		
Brush-tail Possum	*Trichosurus vulpecula*	X
Pteropodidae		
Grey-headed Flying-fox	*Pteropus poliocephalus*	O

APPENDIX C THREATENED SPECIES EVALUATIONS

The tables in this appendix present the habitat evaluation for threatened species, ecological communities and endangered populations recorded from within a 10 km radius around the Proposal site. Records are from a search of the OEH *Atlas of NSW Wildlife*, and the Commonwealth EPBC *Protected Matters Search Tool*, for the Department of Sustainability, Environment, Water, Populations and Communities.

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

Presence of habitat:

Present: Potential or known habitat is present within the study area

Absent: No potential or known habitat is present within the study area

Likelihood of occurrence

Unlikely: Species known or predicted within the locality but unlikely to occur in the study area

Possible: Species could occur in the study area

Present: Species was recorded during the field investigations

Possible to be impacted

No: The proposal would not impact this species or its habitats. No Assessment of Significance (AoS) is necessary for this species

Yes: The proposal could impact this species or its habitats. An AOS has been applied to these entities.

C.1 EVALUATION OF THE LIKELIHOOD AND EXTENT OF IMPACT ON THREATENED FLORA SPECIES AND ECOLOGICAL COMMUNITIES

The tables in this appendix present the habitat evaluation for threatened species, ecological communities and endangered populations listed for Noorong in the *Atlas of NSW Willdife*[1] and those identified as potentially occurring in the area according to the Commonwealth EPBP *Protected Matters Search Tool*[2].

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

Presence of habitat:

Present: Potential or known habitat is present within the Study Area

Absent: No potential or known habitat is present within the Study Area

Likelihood of occurrence

Unlikely: Species known or predicted within the Study Locality but unlikely to occur in the Study Area

Possible: Species could occur in the Study Area

Present: Species was recorded during the field investigations

Possible to be impacted

No: The proposal would not impact this species or its habitats. No Assessment of Significance (AoS) is necessary for this species

Yes: The proposal could impact this species or its habitats. An AOS has been applied to these entities.

[1] The *Atlas of NSW Wildlife* is administered by the NSW Office of Environment and Heritage and is an online database of fauna and flora records that contains over four million recorded sightings.

[2] This online tool is designed for the public to search for matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is managed by the Commonwealth Department of the Environment, Water, Heritage and the Arts.

EVALUATION OF THE LIKELIHOOD AND EXTENT OF IMPACT ON THREATENED FLORA SPECIES AND THREATENED ECOLOGICAL COMMUNITIES

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
FLORA					
Brachyscome muelleroides Claypan Daisy TSC - V	The Claypan Daisy is an annual herb that grows to 14 cm tall. Occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River). Only five sites have precise locality details, and four of these are on Morundah Station in NSW. Occurs in seasonally damp situations such as shallow depressions and around the margins of swamps, lagoons and claypans, on heavy grey cracking clays to lighter clay loam soils, in grassland, grassy woodland and open forest habitats, growing in association with various grasses and seasonal aquatic plants such as *Marsilea* species. Associated species include *Pycnosorus globosus, Agrostis avenacea, Austrodanthonia duttoniana*, and *Calotis anthemoides*. Victorian collections have generally come from open positions on the Murray River floodplain, swampy River Red Gum (*Eucalyptus camaldulensis*) Forest and damp depressions. Flowers September to October.	**Absent**	Within 5km of the proposal site	**None** – this species was not recorded in the study area and there is no suitable habitat	**No**
Senecio garlandii Woolly Ragwort TSC - V	An erect perennial herb or subshrub growing to 2 m high but generally around 1 m high. Almost entirely known from the western slopes of the Great Dividing Range in southern NSW. In NSW known from a very localised strip from West Wyalong to the Albury district, in the Central Western Slopes and South Western Slopes regions. The site of greatest abundance appears to be The Rock NR, over 340 ha, about 30 km SE of Wagga Wagga. Has also been collected at Tabletop Range, a site "15 miles ESE of The Rock", Gidginbung, "near Albury", Flowerpot Hill (4 km S of The Rock NR), Ulandra NR (7 km SE of Bethungra), Benambra	**Absent**	Within 5km of the proposal site	**None** – this species was not recorded in the study area and there is no suitable habitat	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	SF (20 km W of Holbrook), Burrinjuck and near Temora. Occurs in dry sclerophyll forest and open woodland in association with *Eucalyptus macrorhyncha, E. goniocalyx, Acacia doratoxylon, A. implexa* and *Brachychiton populneus*. Grows on the sheltered lower slopes or upper parts of south to east-facing slopes of isolated rocky outcrops. Primarily flowers in spring in NSW.				
Swainsona recta Small Purple-pea TSC-E EPBC-E	A slender, erect perennial plant with few stems 20 - 30 cm high. The range of *S. recta* has contracted to two disjunct clusters in NSW, one between Wellington and Mudgee, and the other from Canberra and Queanbeyan south to Williamsdale. The largest known population has about 3,400 plants, scattered along 22 km of narrow railway easement in NSW from Tralee (south of Queanbeyan) to south of Williamsdale. Occurs in grassland and open woodland, often on stony hillsides, dominated by one or more of the following: *Callitris endichleri, C. glaucophylla*, *Eucalyptus blakelyi, E. bridgesiana*, *E. dives*, *E. melliodora, E. microcarpa, E. nortonii and E. polyanthemos.* Requires a forb-rich grassy groundlayer dominated by *Themeda triandra, Poa sieberiana* var. *sieberiana or Austrostipa* spp. Resprouts in autumn and winter from a woody root. It flowers in spring, peaking over two to three weeks in October.	**Absent**	Within 5km of the proposal site	None – this species was not recorded in the study area and there is no suitable habitat	**No**
Threatened ecological communities					
White box yellow box Blakely's red gum grassy woodland and derived native grassland EEC EPBC CE	White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation) , in which the most obvious species are one or more of the following: White Box *Eucalyptus albens*, Yellow Box *E. melliodora* and Blakely's Red Gum *E. blakelyi*. Intact sites contain a high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs. Characterised by	**Absent** – The characteristic tree species of this community were not recorded within the Study Area.	Known to Occur within the LGA	**None** – This community was not recorded within the Study Area	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	the presence or prior occurrence of White Box, Yellow Box and/or Blakely's Red Gum. The trees may occur as pure stands, mixtures of the three species or in mixtures with other trees, including wattles. The understorey in intact sites is characterised by native grasses and a high diversity of herbs; the most commonly encountered include Kangaroo Grass (*Themeda australis*), Poa Tussock (*Poa sieberiana*), Wallaby Grasses (*Austrodanthonia spp.*), and Spear-Grasses (*Austrostipa spp.*).				
Grey Box *(Eucalyptus microcarpa)* Grassy woodlands and derived native grasslands of South-eastern Australia EPBC E	Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species, *Eucalyptus microcarpa* (Inland Grey Box), is often found in association with *E. populnea* subsp.*bimbil* (Bimble or Poplar Box), *Callitris glaucophylla* (White Cypress Pine), *Brachychiton populneus* (Kurrajong), *Allocasuarina luehmannii*(Bulloak) or *E. melliodora* (Yellow Box), and sometimes with *E. albens* (White Box). Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. The community generally occurs as an open woodland 15–25 m tall but in some locations the overstorey may be absent as a result of past clearing or thinning, leaving only an understorey.	**Absent** – Individual specimens of *E. microcarpa* are present however River Red Gum (*E. camaldulensis*) is the dominant and most characteristic overstorey species present.	Known to Occur within the LGA	**None** – This community was not recorded within the Study Area	**No**
Weeping Myall Woodlands EPBC E	This ecological community is scattered across the eastern parts of the alluvial plains of the Murray-Darling river system. Typically, it occurs on red-brown earths and heavy textured grey and brown alluvial soils within a climatic belt receiving between 375 and 500 mm mean annual rainfall. The structure of the community varies from low woodland and low open woodland to low sparse woodland or open shrubland, depending on site	**Absent** – The characteristic tree species of this community were not recorded within the Study Area	**Known to Occur within the LGA**	**None** – This community was not recorded within the Study Area	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	quality and disturbance history. The tree layer grows up to a height of about 10 metres and invariably includes *Acacia pendula* (Weeping Myall or Boree) as one of the dominant species or the only tree species present. The understorey includes an open layer of chenopod shrubs and other woody plant species and an open to continuous groundcover of grasses and herbs. The structure and composition of the community varies, particularly with latitude, as chenopod shrubs are more prominent south of the Lachlan River district, while other woody species and summer grasses are more common further north. In some areas the shrub stratum may have been reduced or eliminated by clearing or heavy grazing.				

C.2 EVALUATION OF THE LIKELIHOOD AND EXTENT OF IMPACT ON THREATENED FAUNA

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
FAUNA					
AMPHIBIANS					
Crinia sloanei Sloan's Froglet TSC - V	Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. It has not been recorded recently in the northern part of its range and has only been recorded infrequently in the southern part of its range in NSW. At a number of sites where records are verified by museum specimens, the species has not been subsequently detected during more recent frog surveys in the vicinity (e.g. Holbrook, Nyngan, Wagga Wagga and Tocumwal). The low number of sites, low number of recorded individuals per site, and the low proportion of records of this species in regional surveys all indicate that a moderately low number of mature individuals exist. The apparent loss from previous recorded sites and decline in recording rates indicates that this is not just a rare or uncommonly encountered species, but that there has been a reduction in population size and range. It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats.	**Marginal** – This species has not been detected during recent surveys in Wagga Wagga. It prefers periodically inundated areas away from rivers.	Known to occur within LGA	Unlikely	**No**
Litoria raniformis Southern Bell Frog TSC-E	In NSW the species was once distributed along the Murray and Murrumbidgee Rivers and their tributaries, the southern slopes of the Monaro district and the central southern tablelands as far north as Tarana, near Bathurst. Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few yet unconfirmed records have also been made in the Murray Irrigation	**Absent** – Suitable habitat not present onsite.	Known to occur in LGA	Unlikely	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
EPBC – V	Area in recent years. The species is also found in Victoria, Tasmania and South Australia, where it has also become endangered. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat.				
BIRDS					
Anthochaera phrygia Regent Honeyeater EPBC – E TSC - E	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region although breeding has been observed outside these areas. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheaok. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises : *E. microcarpa, E. punctata, E. polyanthemos, E. mollucana, Corymbia*	**Absent** - Suitable habitat not present onsite.	Species has not been recorded within a 25km radius of the site	**Unlikely**- Study area does not support habitat for this species.	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	robusta, E. crebra, E. caleyi, Corymbia maculata, E.mckieana, E. macrorhyncha, E. laevopinea, and *Angophora floribunda*. Nectar and fruit from the mistletoes *A. miquelii, A. pendula, A. cambagei* are also eaten during the breeding season. When nectar is scarce lerp and honeydew comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings. A shrubby understorey is an important source of insects and nesting material. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak.				
Botaurus poiciloptilus Australasian Bittern TSC – E EPBC - E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. They favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleoacharis spp.). During the day they hide amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Breeding occurs in summer from October to January with nests built in secluded places of densely-vegetated wetlands on a platform of reeds.	**Absent -** Suitable habitat not present onsite.	Species has not been recorded within a 25km radius of the site	**Unlikely**	**No**
Calidris ferruginea Curlew Sandpiper TSC – E EPBC - MM	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh. This species does not breed in Australia.	**Marginal**	Known to occur in LGA	**Unlikely** – Only recorded in lake habitat in Wagga Wagga which does not suit the study area	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	This species forages mainly on invertebrates, including worms, molluscs, crustaceans, and insects, as well as seeds.				
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies) TSC-V	The Brown Treecreeper (eastern subspecies) is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. The population density of this subspecies has been greatly reduced over much of its range, with major declines recorded in central NSW and the northern and southern tablelands. Declines have occurred in remnant vegetation fragments smaller than 300 hectares that have been isolated or fragmented for more than 50 years. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understory, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understory of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	**Present**	Species recorded within 5km of proposal site in 2012.	**Possible –** Study site consist of poor quality River Red Gum woodland.	**No –** The proposed levy will not disturb any useful habitat for this species.
Epthianura albifrons White-fronted Chat TSC – V	The White-fronted Chat is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands or lightly timbered lands (Higgins *et al.* 2001). Along the coastline, White-fronted Chats are found in estuarine and marshy grounds with vegetation less than 1 m tall. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the White-fronted Chat is often observed in open grassy plains, saltlakes and saltpans that are along the margins	**Absent -** Suitable habitat not present onsite.	Known to occur in LGA	**Unlikely –** Has not been recorded in the LGA since 1992 and habitat is unsuitable. Sensitive to	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	of rivers and waterways (North 1904; Higgins *et al.* 2001; Barrett *et al.* 2003). The species is sensitive to human disturbance and is not found in built areas (Jenner 2008).			human disturbance.	
Falco subniger Black Falcon TSC - V	Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres. Inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees. Usually associated with streams or wetlands, visiting them in search of prey and often using standing dead trees as lookout posts. Habitat selection is generally influenced more by prey densities than by specific aspects of habitat floristics or condition, although in agricultural landscapes the Black Falcon tends to nest in healthy, riparian woodland remnants with a diverse avifauna. Feeds mostly on other birds, especially flocking, ground-feeding granivores such as pigeons and parrots, but also some small mammals, large insects and occasionally carrion. Home range is likely to be more than 100 km^2.	**Marginal**	Known to occur in LGA	**Unlikely –** Has not been recorded in LGA since 1980.	**No**
Glossopsitta pusilla Little Lorikeet TSC – V	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs.	**Marginal**	Known to occur in LGA	**Unlikely –** Study site consist of poor quality River Red Gum woodland. Lack of breeding habitat on site.	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
Hieraaetus morphnoides Little Eagle TSC-V	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	**Marginal**	Known to occur in LGA	**Possible**	**No** The species is highly mobile and if present on site, it would only be in passing. No breeding habitat in study area.
Lathamus discolor Swift Parrot EPBC-E TSC - E	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to home foraging sites on a cyclic basis depending on food availability.	**Marginal** – Flowering River Red Gums may be used for foraging in winter.	Known to occur in LGA	**Unlikely** - Species may flyover the Study Area. No favoured feed trees in study area.	**No**
Leipoa ocellata Malleefowl TSC - E EPBC - V	The stronghold for this species in NSW is the mallee in the south west centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary, and is part of a larger population north of the Murray River in South Australia. Malleefowl predominantly inhabit	**Absent**	Species has not been recorded within a 25km radius of the site	**None**	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 – 450 mm mean annual rainfall) areas. They prefer areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers.				
Lophocroa leadbeateri Pink Cockatoo TSC - V	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres.	**Marginal** – Prefers arid and semi-arid habitat	Known to occur in LGA, rarely.	**Unlikely** – Has not been recorded in LGA since 1999 and prefers arid and semi-arid habitat.	**No**
Melithreptus gularis gularis Black-chinned Honeyeater (eastern sub-species) TSC - V	The subspecies is widespread, from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond River district. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*Eucalyptus albens*), Grey Box (*Eucalyptus microcarpa*), Yellow Box (*Eucalyptus melliodora*) and Forest Red Gum (*Eucalyptus tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks,	**Marginal**	Known to occur in LGA	**Possible** – Prefers larger remnant patches away from riparian zones	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	ironbarks and tea-trees. A gregarious species usually seen in pairs and small groups of up to 12 birds. Feeding territories are large making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares. Moves quickly from tree to tree, foraging rapidly along outer twigs, underside of branches and trunks, probing for insects. Breeds solitarily or co-operatively, with up to five or six adults, from June to December. The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. It is a compact, suspended, cup-shaped nest. Two or three eggs are laid and both parents and occasionally helpers feed the young.				
Ninox connivens Barking Owl TSC - E	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Dense vegetation is used occasionally for roosting. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as *Acacia* and *Casuarina* species, or the dense clumps of canopy leaves in large *Eucalypts*. Feeds on a variety of prey, with invertebrates predominant for most of the year, and birds and mammals such as smaller gliders, possums, rodents and rabbits becoming important during breeding. Live alone or in pairs. Territories range from 30 to 200 hectares and birds are present all year. Three eggs are laid in nests in hollows of large, old eucalypts including River Red Gum (*Eucalyptus camaldulensis*), White Box (*Eucalyptus albens*), (Red Box) *Eucalyptus polyanthemos* and Blakely's Red Gum (*Eucalyptus blakelyi*). Breeding occurs during late winter and early spring.	**Present**	Known to occur in LGA	**Possible –** No hollows occur on site.	**No –** The area of impact is very small compared to the home range of this species. No hollow bearing trees in the study area.

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
Petroica boodang Scarlet Robin TSC - V	The Scarlet Robin's range includes all state capitals. Occurs in forests, woodlands; and heavier vegetation when breeding. During autumn and winter occurs in more open and cleared areas. It has dispersive or locally migratory seasonal movements. Is conspicuous in open and suburban habitats (Morcombe 2003).	**Marginal**	Known to occur in LGA	**Possible**	**No** – Prefers non-riparian woodlands and breeds on upland ridges and slopes.
Petroica phoenicea Flame Robin TSC - V	The Flame Robin is endemic to SE Australia, and ranges from near the Queensland border to SE South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands.	**Marginal**	Known to occur in LGA	**Possible**	**No** – Prefers non-riparian woodlands and breeds on upland ridges and slopes.
Polytelis swainsonii Superb Parrot EPBC - V TSC - V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-	**Present -** Site is surrounded by River Red Gum, with foraging sites within 25km.	Known to occur in LGA	**Likely –** Foraging habitat only, no suitable tree hollows for breeding.	**No** – The proposed levy will not disturb any hollow bearing trees or any other useful habitat for this species.

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. May forage up to 10 km from nesting sites, primarily in grassy box woodland.				
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies) TSC-V	The eastern subspecies (*temporalis)* occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Flight is laborious so birds prefer to hop to the top of a tree and glide down to the next one. Birds are generally unable to cross large open areas. Live in family groups that consist of a breeding pair and young from previous breeding seasons. A group may consist of up to fifteen birds. Feed on invertebrates, either by foraging on the trunks and branches of eucalypts and other woodland trees or on the ground, digging and probing amongst litter and tussock grasses. Build and maintain several conspicuous, dome-shaped stick nests about the size of a football. A nest is used as a dormitory for roosting each night. Nests are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of low branches of large eucalypts. Nests are maintained year round, and old nests are often dismantled to build new ones. Breed between July and February. Usually two to three eggs are laid and incubated by the female. Territories range	**Marginal**	Known to occur in LGA	**Unlikely** – not usually associated with riparian habitat	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	from one to fifty hectares (usually around ten hectares) and are defended all year.				
Rostratula benghalensis australis Painted Snipe (Australian subspecies) EPBC – V EPBC - M TSC - E	Generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (DEWHA).	**Marginal** – rivers and streams are not preferred.	Species has not been recorded within a 25km radius of the site	**Unlikely**	**No**
Stagonopleura guttata Diamond Firetail TSC - V	Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities.	**Marginal -** Marginal foraging habitat is present.	Species has not been recorded within a 25km radius of the site	**Possible**	**No**
Strictonetta naevosa Freckled Duck TSC - V	The Freckled Duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. The duck is forced to disperse during extensive inland droughts when wetlands in the Murray River basin provide important habitat. The species may also occur as far as coastal NSW and Victoria during such times. Prefer permanent freshwater swamps and creeks with heavy growth of	**Marginal** - This species may use Marshall's Creek for habitat, although dense vegetation is lacking	One record of this species has been recorded in Wagga Wagga City (2003).	**Possible**	**No** – A rare visitor to Wagga Wagga. Marshall's Creek is marginal habitat and the proposal will only cause a

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	Cumbungi, Lignum or Tea-tree. The largest numbers of Freckled Ducks occur in brackish to hyposaline wetlands that are densely vegetated with Lignum. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Generally rest in dense cover during the day, usually in deep water. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates. Nesting usually occurs between October and December but can take place at other times when conditions are favourable. Nests are usually located in dense vegetation at or near water level.				minimal impact to this creek.
MAMMALS					
Miniopterus schreibersii oceanensis Eastern Bentwing-bat	Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops.	**Absent -** Suitable habitat not present onsite.	Known to occur in LGA	**Unlikely**	**No**
Myotis macropus Southern Myotis TSC-V	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching	**Present**	Known to occur in LGA	**Likely**	**No** – The proposal will not disturb foraging aquatic surfaces for this species. No tree hollows

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December.				or other roosting habitat in study area.
Nyctophilus corbeni South - eastern Long - eared Bat EPBC - V	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark. Slow flying agile bat, utilising the understorey to hunt non-flying prey - especially caterpillars and beetles - and will even hunt on the ground. The South-eastern long eared bat is most common where the vegetation has a distinct canopy and a dense understorey.	**Absent** - Suitable habitat not present onsite.	Species has not been recorded within a 25km radius of the site	**Unlikely**	**No**
Petaurus norfolcensis Squirrel Glider TSC – Endangered Population in the Wagga Wagga LGA and V NSW.	The Squirrel Glider is sparsely distributed along the east coast and immediate inland districts from western Victoria to north Queensland. The species is found inland as far as the Grampians in Victoria and the Pilliga and the Coonabarabran areas of NSW. Inhabits dry sclerophyll forest and woodland and is generally absent from rainforest and closed forest. In NSW, potential habitat includes Box-Ironbark forests and woodlands in the west, the River Red Gum forests of the Murray Valley and the eucalypt forests of the northeast. Requires abundant hollow-bearing trees and a mix of eucalypts, acacias and banksias. Nightly movements are estimated at between 300 and 500m. Home-ranges have been estimated at between 0.65 and 8.55ha. Smooth-barked eucalypts are preferred as these eucalypts form hollows more readily than rough-barked and support	**Present** Possible suitable nesting hollows onsite and suitable foraging trees (River Red Gum and Acacias).	Known to occur in LGA	**Possible**	**No – habitat is likely to be affected for this species.**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	a greater diversity of invertebrates. Squirrel Glider's forage in the upper and lower forest canopies and in the shrub understorey.				
Phascolarctos cinereus Koala TSC – V EPBC – V (Combined population of Qld, NSW and ACT)	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. It was briefly historically abundant in the 1890s in the Bega District on the south coast of NSW, although not elsewhere, but it now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands. This species inhabits eucalypt woodlands and forests and feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Thier home range size varies with quality of habitat however they spend most of their time in trees, but will descend and traverse open ground to move between trees.	**Marginal** Regrowth River Red Gum adjacent to site. No characteristic feed trees onsite.	Species has not been recorded within a 25km radius of the site	**Unlikely**	**No**
REPTILES					
Aprasia parapulchella Pink-tailed Legless Lizard TSC - V EPBC – V	Only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda australis*). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants	**Absent**	Known to occur in LGA	**Unlikely**	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	and termites. Feeds on the larvae and eggs of the ants with which it shares its burrows. It is thought that this species lays 2 eggs inside the ant nests during summer; the young first appear in March. Best detected from September to February.				
RAY-FINNED FISHES					
Macquaria australasica Macquarie Perch FM - E EPBC - E	The distribution and abundance of Macquarie Perch has declined considerably since the mid-1900s across Victoria, NSW and the ACT. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Spawning occurs just above riffles (shallow running water). Populations may survive in impoundments if able to access suitable spawning sites.	**Absent** – Prefers upper reaches of streams and rivers	Species has not been recorded recently within a 25km radius of the site	**Unlikely**	**No**
Bidyanus bidyanus Silver Perch FM – V EPBC	Silver Perch grows to a maximum size of 500mm. Were once widespread and abundant throughout most of the Murray-Darling river system. The most abundant remaining natural population occurs in the central Murray River downstream of Yarrawonga Weir as well as several of its anabranches and tributaries (including the Edward River, an anabranch of the Murray which flows through Deniliquin, and the Murrumbidgee River). The central Murray population is considered secure and self-sustaining. There have also been reports of self-sustaining populations in other rivers, including the MacIntyre and Macquarie Rivers in northern NSW and the Warrego River in Queensland, mostly from recreational anglers. Little is currently known about the status of these populations. Silver Perch seem to prefer fast-flowing, open waters, especially where there are rapids and races, however they will also inhabit warm, sluggish water with cover provided by large woody debris and reeds. They are	**Present**	Species has not been recorded recently within a 25km radius of the site	**Possible**	**Yes**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	omnivorous, feeding on small aquatic insects, molluscs, earthworms and green algae. Adults migrate upstream in spring and summer to spawn. Juveniles also sometimes move upstream in response to rising water temperatures and levels.				
Maccullochella macquariensis Trout Cod FM - E EPBC - V	The Trout Cod is endemic to the southern Murray-Darling river system, including the Murrumbidgee and Murray Rivers, and the Macquarie River in central NSW. The species was once widespread and abundant in these areas but has undergone dramatic declines in its distributional range and abundance over the past century. The last known reproducing population of trout cod is confined to the Murray River below Yarrawonga downstream to Tocumwal. A conservation stocking program has seen the species restocked into the Murrumbidgee and Macquarie Rivers over the last decade, but it is yet to be determined if these fish have established reproducing populations. Trout cod are often found close to cover and in relatively fast currents, especially in fairly deep water close to the bank, and often congregate around large woody debris (snags). They tend to remain at the one site and to have small home ranges. They are carnivores, preying mainly on other fishes as well as crustaceans and aquatic insects. Trout cod reach sexual maturity at 3-5 years, when approximately 35cm (males) or 43cm (females) in length, and 0.75 to 1.5kg in weight. They form pairs and spawn during spring and early summer.	**Present**	Known to occur in LGA	**Likely**	**Yes**
Maccullochella peelii peelii Murray Cod EPBC - V	The Murray Cod is found extensively throughout the Murray Darling Basin in the south-eastern region of Australia. *Maccullochella peelii peelii* occurs in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are	**Present**	Known to occur in LGA	**Likely**	**Yes**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	considered too cold to contain suitable habitat. Within the large range of habitats, the Murray Cod is usually found near complex structural cover such as large rocks, snags, overhanging vegetation and other woody structures. The Murray Cod is considered a main channel specialist as it is frequently found in the main river channel and larger tributaries. It is found in floodplain channels when they contain water; although this usage appears limited. Juveniles are most commonly found in the main river channel until about one year of age, after which they branch out.				
***OTHER LISTED SPECIES**					
MIGRATORY TERRESTRIAL SPECIES BIRDS					
Haliaeetus leucogaster White-bellied Sea-Eagle EPBC - MT	The White-bellied Sea-Eagle is distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. Breeding has also been recorded at some sites further inland, e.g. around the Murray, Murrumbidgee and Lachlan Rivers in northern Victoria and south-west NSW, and at other large drainage systems and water storages. Although known breeding sites are widely dispersed, the species could potentially breed throughout much of its range. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water. Birds have been recorded at or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs, saltmarsh and sewage ponds. The species can occupy habitats up to 1400 m above sea level on the Northern	**Absent**	Species has not been recorded within a 25km radius of the site	**Unlikely** Species may fly over site from time to time.	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	Tablelands of NSW and up to 800 m above sea level in Tasmania and South Australia.				
Hirundapus caudacutus White-throated Needletail EPBC - MT	The White-throated Needletail is widespread in eastern and south-eastern Australia. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland.	**Absent**	Species has not been recorded within a 25km radius of the site	**Unlikely** Species may fly over site from time to time.	**No**
Merops ornatus Rainbow Bee-eater EPBC - MT	The Rainbow Bee-eater is distributed across much of mainland Australia, and occurs on several near-shore islands. It is not found in Tasmania, and is thinly distributed in the most arid regions of central and Western Australia. The extent of occurrence, area of occupancy, and number of locations of the Rainbow Bee-eater has not been estimated because of its widespread distribution and its ability to undertake long-distance movements. The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands (including mallee, and forests that are usually dominated by eucalypts), and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in various other habitat types including heathland, sedgeland, vine forest and vine thicket, and on beaches. It also occurs	**Absent**	Species has not been recorded within a 25km radius of the site	**Unlikely** Species may fly over site from time to time.	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	in grasslands and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages.				
MIGRATORY WETLAND SPECIES **BIRDS**					
Calidris acuminate Sharp-tailed Sandpiper EPBC – MW EPBC - MM	The Sharp-tailed Sandpiper is found throughout most of Australia and mostly found in the wetlands of Victoria, South-western New South Wales and eastern South Australia. This species prefers non-tidal wetlands, especially freshly exposed mudflats in drying lakes and on intertidal mudflats. This species feeds in mud or shallow water from saline wetlands to freshwater wetlands and therefore eats a variety of food, including aquatic and terrestrial insects, small shellfish and grass seeds and polychaete worms.	**Absent**			
Ardea alba Great Egret EPBC – MW EPBC - MM	In Australia, the largest breeding colonies, and greatest concentrations of breeding colonies, are located in near-coastal regions of the Top End of the Northern Territory. The Channel Country of south-western Queensland and north-eastern South Australia have at least 12 breeding colonies, and colonies are also known in the Darling Riverine Plains region of NSW and the Riverina region of NSW and Victoria. Minor breeding sites are widely scattered across the species' distribution and include sites in western Cape York Peninsula, the central coast of Queensland, north and north-eastern NSW, south-eastern South Australia, south-western Western Australia, the Kimberley region of Western Australia and the Barkly Tablelands in the Northern Territory. The Eastern Great Egret has been reported in a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and	**Absent**	Species has not been recorded within a 25km radius of the site	**Unlikely** Species may fly over site from time to time.	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	vegetated, large and small, natural and artificial). These include swamps and marshes, margins of rivers and lakes, damp or flooded grasslands, pastures or agricultural lands, reservoirs, sewage treatment ponds, drainage channels, salt pans and salt lakes, salt marshes, estuarine mudflats, tidal streams, mangrove swamps, coastal lagoons and offshore reefs. The species usually frequents shallow waters.				
Ardea ibis Cattle Egret EPBC – MW EPBC - MM	The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass. It has been recorded on earthen dam walls and ploughed fields and is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer. The Cattle Egret is known to follow earth-moving machinery and has been located at rubbish tips. It uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora. They have sometimes been observed in swamps with tall emergent vegetation. This species roosts in trees, or amongst ground vegetation in or near lakes and swamps. It has also been recorded roosting near human settlement and industrial areas in Murwillumbah, NSW.	**Absent**	Species has not been recorded within a 25km radius of the site	**Unlikely** Species may fly over site from time to time.	**No**
Gallinago hardwickii Latham's Snipe EPBC - MW	Latham's Snipe is a non-breeding visitor to south-eastern Australia, and is a passage migrant through northern Australia. In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water,	**Absent**	Species has not been recorded within a 25km radius of the site	**Unlikely** Species may fly over site from time to time.	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	in modified or artificial habitats, and in habitats located close to humans or human activity.				
Plegadis falcinellus Glossy Ibis EPBC - MW	The Glossy Ibis is the smallest ibis known in Australia. The neck is reddish-brown and the body is a bronze-brown with a metallic iridescent sheen on the wings. The Glossy Ibis has a distinctive long, downwards curved bill that is olive-brown in colour. The Glossy Ibis is found singularly, in pairs or in small flocks. Breeding is colonial and often with or near other ibis, herons and egrets (Marchant & Higgins 1990). Within Australia, the Glossy Ibis is generally located east of the Kimberley in Western Australia and Eyre Peninsula in South Australia. The species is also known to be patchily distributed in the rest of Western Australia. The species is rare or a vagrant in Tasmania (Beehler et al. 1986; Coates & Bishop 1997; Marchant & Higgins 1990). The Glossy Ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons (del Hoyo et al. 1992; Hancock et al. 1992; Marchant & Higgins 1990). Within Australia, the largest contiguous areas of prime habitat is inland and northern floodplains. The Glossy Ibis is commonly in largest numbers in drying Top End grass/sedge swamps and Channel Country grass/forb meadows. The species is sometimes recorded in wooded swamps, artificial wetlands (such as irrigated fields), and in mangroves for breeding (Chatto 2000; Marchant & Higgins 1990). The species may retreat to permanent wetlands and/or coastal areas (including tidal wetlands) during drought (Marchant & Higgins 1990). Glossy Ibis roost in trees or	**Absent**	Species is not likely to be found in the study area.	**Unlikely** Species may fly over site from time to time.	**No**

Species & Listing*	Ecology	Presence of Habitat	Nearest Records	Likelihood of Occurrence	Possible Impact?
	shrubs usually near, but sometimes far, from water bodies (Brown et al. 1982; Marchant & Higgins 1990).				
Rostratula australis Australian Painted Snipe TSC - E EPBC – V EPBC - MW	The Painted Snipe inhabits inland and coastal shallow freshwater wetlands, occurring in both ephemeral and permanent wetlands, particularly where there is grass. Individuals have been spotted in artificial dams, sewage ponds and waterlogged grasslands.	**Absent**	Species has not been recorded within a 25km radius of the site	**Unlikely** Species may fly over site from time to time.	**No**
Apus pacificus Fork-tailed Swift EPBC - MM	*Apus pacificus* is a non-breeding visitor to all states and territories of Australia. This species breeds in Siberia and the Himalayas to Japan and southeast Asia. It is a regular summer migrant arriving in northwest Australia in early October extending through WA to SA. Occasional mass movements associated with late summer low-pressure systems into eastern Australia and Tasmania where they are otherwise uncommon. Most leave Australia by Mid-April. They are aerial over open country from semi-deserts to coasts, islands and sometimes over forests or cities.	**Absent**	Species has not been recorded within a 25km radius of the site	**Unlikely** Species may fly over site from time to time.	**No**

APPENDIX D THREATENED SPECIES ASSESSMENTS OF SIGNIFICANCE

D.1 THREATENED SPECIES CONSERVATION ACT SEVEN-PART TEST

NSW Threatened Species Conservation Act

Section 5A of the *Environment Planning and Assessment Act 1979* (EP&A Act) specifies seven factors to be taken into account in deciding whether a development is likely to significantly affect threatened species, populations or ecological communities, or their habitats, listed at the state level under the *Threatened Species Conservation Act 1995*.

This *Seven-part Test* characterises the significance of likely impacts associated with the proposal on the following species:

Grey-headed Flying-fox (*Pteropus poliocephalus*) (GHFF), TSC – V, EPBC – V

A colony of Grey-headed Flying-foxes (GHFF) occurs in the riparian vegetation of the Murrumbidgee River approximately 120 metres to the north - east of the proposal site. The colony occurs on the north side of the river and on an island in the river locally known as 'Bat Island'. Approximately between 350 and 500 individuals are present within the colony. The riparian habitat within the proposal area also supports potential habitat for the GHFF. Individuals were recorded leaving the roost site after dusk. The direction of flight from the roost site included SW towards the proposal site, however, none of the six maturing *Eucalypts* proposed to be removed were observed to be foraged by the GHFF.

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Grey-headed Flying-fox
The proposal would remove a small amount (six immature *Eucalyptus* trees within the proposal area of habitat for the GHFF. Given the abundance of this type of habitat in the broader locality, the removal of this small area of vegetation is not likely to lead to any impacts on the life cycle of the species such that they would be placed at risk of extinction. The proposal will disturb the colony of GHFF due to construction noise during the proposal. This would occur on the banks of the Murrumbidgee River in the proposal site, within 100 metres of the Grey-headed Flying-fox colony. This disturbance may cause GHFF individuals to leave the roost site, possibly resulting in juvenile bats to be abandoned when they are left at the roost site. Therefore, the proposal is likely to have an adverse effect on the local population near the proposal site, such that it is placed at risk of extinction. However, if the proposed works are carried out during a period when the GHFF are not in the local area or breeding (breeding occurs between November and March), the proposal will not have an adverse effect on the population.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.
Grey-headed Flying-fox
Not applicable

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or **ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Grey-headed Flying-fox
Not applicable

d) In relation to the habitat of a threatened species, population or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and** **ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and** **iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**
Grey-headed Flying-fox
i. The extent to which the proposal would remove or modify habitat for the GHFF is considered to be low, given the small size of the disturbance to habitat in relation to the entire study area and adjacent riparian vegetation that can be used for foraging habitat and the likely home ranges of this species. Only six maturing *Eucalypts* will be removed. These trees were observed to be used by the GHFF during surveys. ii. The proposed works are unlikely to fragment or isolate the potential habitat including breeding and foraging habitats for the GHFF, given the removal of vegetation would not separate areas of potential habitat. Furthermore, due to the aerial navigation of this species when foraging for food, any fragmented areas are easily negotiated. iii. The *Eucalypt* trees which would be removed represents only a small area of habitat, and in context with the entire area is not considered particularly important.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).
Grey-headed Flying-fox
No areas of critical habitat have been declared for GHFF.

f) Whether the action proposed is consistent with the objectives or actions of a Recovery Plan or Threat Abatement Plan.
Grey-headed Flying-fox
A draft recovery plan has been developed by DECCW, 2009. The following objectives are not consistent with the proposal: - Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes across their range - To protect and increase the extent of key winter and spring foraging habitat (River Red Gums) of Grey-headed Flying-foxes - To protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes

The proposal will possibly remove two GHFF foraging trees and deter them away from their roosting site through loud noises from proposal construction noise. If the proposed works are carried out during a period when the GHFF colony is absent from the site then they will not be disturbed.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.
Grey-headed Flying-fox
The proposal may constitute or may be part of the following key threatening processes: - Clearing of native vegetation - Invasion and establishment of exotic vines and scramblers - Invasion of native plant communities by exotic perennial grasses - Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants - Loss of hollow-bearing trees - Removal of dead wood and dead trees None of threatening processes are relevant to the GHFF.

Conclusion

The potential for major impacts to occur due to the proposal is high if the works are carried out when the GHFF is present. This is because high-pitched construction noise may disturb the GHFF colony enough to cause them to abandon the site and possibly abandon their young. Therefore, it has been recommended that the proposed works be carried out during April to November when the GHFF is not breeding/present at the site (see Mitigation Measures – Section 6). The assessment of significance has found that any impacts of the proposal are unlikely to be significant for the GHFF if these recommendations are adhered to.

Silver Perch (*Bidyanus bidyanus*) FM - V, EPBC – CE, Trout Cod (*Maccullochella macquariensis*) FM –E, EPBC - E

Silver Perch prefer faster waters but may also be found in slower sluggish waters like that found in the Murrumbidgee in the proposal site. They use large woody debri such as snags for cover. They spawn upstream in spring and summer.

The last known reproducing population of the Trout Cod is confined to the Murray River below Yarrawonga downstream to Tocumwal, so is unlikely to be using the Murrumbidgee River within the proposal site for habitat. It also prefers faster moving currents and uses snags for cover. They spawn during spring and early summer.

h) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Silver Perch
The proposal will unlikely have an effect on breeding for this species as it moves upstream to spawn and the proposal site is in a more downstream location. With mitigation recommendations in place, the proposal is unlikely to adversely affect the life cycle of this species such a viable population is likely to be placed at risk of extinction.

Trout Cod
The Trout Cod will remain within its territory to spawn where the female will likely the eggs on the bottom of the river bed. They use snags regularly for refuge and an ambush site as they are predatory. The proposal will avoid the removal of snags from the river bank which will conserve this habitat if this species is present within the proposal site. The dredging and reclamation works may affect breeding for this species as they spawn on the river bed. However, with the mitigation recommendations in place, the proposal is unlikely to adversely affect the life cycle of this species such that a viable population within the proposal site is likely to be placed at risk of extinction.

i) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.
Silver Perch
Not applicable
Trout Cod
Not applicable

j) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **iii. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **iv. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Silver Perch
Not applicable
Trout Cod
Not applicable

k) In relation to the habitat of a threatened species, population or ecological community: **iv. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and** **v. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and** **vi. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**
Silver Perch
iv. Some sedimentation due to the proposal may cause water degradation for this species, however, with mitigation recommendations in place, and the avoidance of removal of snags, the proposal will not result in any major removal modification of this species habitat. v. No area of habitat is likely to become fragmented or isolated for this species due to the proposal. vi. Water degradation caused by sedimentation may affect migration and feeding for this species, however, with mitigation measures in place, this should be avoided.
Trout Cod

vii. Some sedimentation due to the proposal may cause water degradation for this species, however, with mitigation recommendations in place, and the avoidance of removal of snags, the proposal will not result in any major removal modification of this species habitat.

viii. No area of habitat is likely to become fragmented or isolated for this species due to the proposal.

ix. Water degradation caused by sedimentation may affect migration and feeding for this species, however, with mitigation measures in place, this should be avoided.

l) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Silver Perch

No areas of critical habitat have been declared for the Silver Perch.

Trout Cod

No areas of critical habitat have been declared for the Silver Perch.

m) Whether the action proposed is consistent with the objectives or actions of a Recovery Plan or Threat Abatement Plan.

Silver Perch

A NSW recovery plan has been prepared for this species (DPI, 2006a). This recovery plan is consistent with the proposal. Water degradation will be nullified by appropriate sediment and erosion controls.

Trout Cod

A NSW recovery plan has been prepared for this species (DPI, 2006b). This recovery plan is consistent with the proposal. In stream woody habitat (snags) within the proposal site will not be removed.

n) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Silver Perch

The proposal may constitute or may be part of the following key threatening processes:

- Clearing of native vegetation
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands
- Invasion, establishment and spread of *Lantana camara*
- Invasion and establishment of exotic vines and scramblers
- Invasion of native plant communities by exotic perennial grasses
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Removal of dead wood and dead trees

The proposal will cause a minimal alteration in flow regime of the Murrumbidgee River due to the construction of the water intake pipes, however, this will be minor and only temporary.

The location of the proposed water intake pipes is away from woody snags, therefore, they won't be removed.

Trout Cod

The proposal may constitute or may be part of the following key threatening processes:

- Clearing of native vegetation

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands
- Invasion, establishment and spread of *Lantana camara*
- Invasion and establishment of exotic vines and scramblers
- Invasion of native plant communities by exotic perennial grasses
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Removal of dead wood and dead trees

The proposal will cause a minimal alteration in flow regime of the Murrumbidgee due to the construction of the water intake pipes, however, this will be minor and only temporary.

The location of the proposed water intake pipes is away from woody snags, therefore, they won't be removed.

Conclusion

The proposal will not cause any adverse effects to the life cycle or habitat of the Silver Perch or Trout Cod. No further assessments are required for these species.

D.2 ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT SEVEN-PART TEST

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects the environment, particularly Matters of National Environmental Significance (Protected matters). It streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places. The Matters of National Environmental Significance are:

- Listed threatened species and ecological communities;
- Migratory species protected under international agreements;
- Ramsar wetlands of international importance;
- The Commonwealth marine environment;
- World Heritage properties;
- National Heritage places; and
- Nuclear actions.

An action will require approval if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

- Extinct in the wild;
- Critically endangered;
- Endangered; or
- Vulnerable.

An action will also require approval if the action has, will have, or is likely to have a significant impact on an ecological community listed in any of the following categories:

1. Critically endangered; or
2. Endangered.

D.2.1 Grey-headed Flying-fox (EPBC-V)

Grey-headed Flying-fox (*Pteropus poliocephalus*) (GHFF), TSC – V, EPBC – V

A colony of Grey-headed Flying-foxes (GHFF) occurs in the riparian vegetation of the Murrumbidgee River approximately 120 metres to the north - east of the proposal site. The colony occurs on the north side of the river and on an island in the river locally known as 'Bat Island'. Approximately between 350 and 500 individuals are present within the colony. The riparian habitat within the proposal area also supports potential habitat for the GHFF. Individuals were recorded leaving the roost site after dusk. The direction of flight from the roost site included SW towards the proposal site, however, none of the six maturing *Eucalypts* proposed to be removed were observed to be foraged by the GHFF.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of an important population of a species**

N/A. An important population does not occur on-site.

- **reduce the area of occupancy of an important population**

N/A

- **fragment an existing important population into two or more populations**

N/A

- **adversely affect habitat critical to the survival of the species**

No critical habitat will be removed due to the proposal.

- **disrupt the breeding cycle of an important population**

N/A

- **modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The proposal will only remove six maturing *Eucalypt* trees. No GHFF individuals were observed foraging on these trees during surveys. The removal of these trees will not cause the species to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

The works have potential to facilitate the spread of weeds which could impact on habitat quality by preventing regeneration of native *Eucalypts*. However weed control measures would be put in place during construction and ongoing management to ensure that the risk of weed spread is minimised.

- **introduce disease that may cause the species to decline**

No

- **interfere with the recovery of the species**

There is a National Recovery Plan for the GHFF (DECC 2010). Two of the 12 objectives of the recovery plan are relevant to this proposal which include:

- Objective 1. To identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range

No critical foraging habitat will be removed due to the proposal.

- Objective 2. To protect and increase the extent of key winter and spring foraging habitat of Grey-headed Flying-foxes

Key winter and spring foraging habitat will not be removed due to the proposal.

Conclusion

The Assessment of Significance has concluded that the proposal is not likely to significantly affect the Grey-headed Flying-fox in the local area, given that the proposal will only remove six *Eucalypt* trees. Many more foraging trees are available in the locality, including in proximity to the proposal site.

Murray Cod (*Maccullochella peelii*) EPBC - V

The Murray Cod is a top order predator using a variety of habitats including clear rocky streams to slow flowing, turbid rivers and billabongs. It relies heavily on cover such as snags and rocks close to river banks for shelter during the day and spawning in late spring to early summer. Spawning is cued by a change in water temperature of between 16 and 21°C.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of an important population of a species**

An important population for this species occurs in the Murrumbidgee River between Wagga Wagga and Hay. This includes the study area. The proposal will only temporarily and slightly alter flow regimes of the Murrumbidgee River and will not disturb snag habitat. Therefore, the proposal will not lead to a long-term decrease of this population.

- **reduce the area of occupancy of an important population**

The proposal will not reduce the area of occupancy of this population.

- **fragment an existing important population into two or more populations**

The proposal will not fragment th existing population into two or popuations.

- **adversely affect habitat critical to the survival of the species**

No critical habitat has been described for this species.

- **disrupt the breeding cycle of an important population**

The proposal will not remove snag habitat which could be used by this species for spawning, nor will affect water temperatures or long-term water flow. Therefore, the proposal will not disrupt breeding cycles for this species.

- **modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The proposal will only temporarily and slightly change water flow and will not remove snags. The addition of the water intake pipes may also be used by this species for cover. Therefore, changes in habitat that will be place this species at risk of decline will not occur.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat**

The proposal will not result in invasive species harmful to the Murray Cod in the study area.

- **introduce disease that may cause the species to decline**

No

- **interfere with the recovery of the species**

There is a National Recovery Plan for the Murray Cod (Vic 2010). The proposal will not interfere with the recovery of this species.

Conclusion

The Assessment of Significance has concluded that the proposal is not likely to significantly affect the Murray Cod in the local area, given that the proposal will remove snag habitat and only temporarily and slightly alter river flow. Further referral is not required.

Trout Cod (*Maccullochella macquariensis*) FM –E, EPBC – E

The last known reproducing population of the Trout Cod is confined to the Murray River below Yarrawonga downstream to Tocumwal, so is unlikely to be using the Murrumbidgee River within the proposal site for habitat. It also prefers faster moving currents and uses snags for cover. They spawn during spring and early summer.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population**

The threats to the Trout Cod Murrumbidgee River population associated with the proposal include poor water quality, desnagging, barriers and thermal pollution. The proposal will not lead to any of these threats such that a long term decrease in the size of this population will occur.

- **reduce the area of occupancy of the species**

The proposal will not reduce the area of occupancy of this species.

- **fragment an existing population into two or more populations**

The proposal will not fragment the existing population into two or populations.

- **adversely affect habitat critical to the survival of the species**

No critical habitat has been described for this species.

- **disrupt the breeding cycle of a population**

The proposal will not remove snag habitat which could be used by this species for spawning, nor will affect water temperature or create barriers blocking movement patterns. Therefore, the proposal will not disrupt breeding cycles for this species.

- **modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The proposal will only temporarily and slightly change water flow and will not remove snags. The addition of the water intake pipes may also be used by this species for cover. Therefore, changes in habitat that may place this species at risk of decline will not occur.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat**

The proposal will not result in invasive species harmful to the Trout Cod in the study area.

- **introduce disease that may cause the species to decline**

No

- **interfere with the recovery of the species**

There is a National Recovery Plan for the Murray Cod (Vic 2010). The proposal will not interfere with the recovery of this species.

Conclusion

The Assessment of Significance has concluded that the proposal is not likely to significantly affect the Trout Cod in the local area, given that the proposal will remove snag habitat and only temporarily and slightly alter river flow. Further referral is not required.

Silver Perch (*Bidyanus bidyanus*) FM - V, EPBC – CE

Silver Perch prefer faster waters but may also be found in slower sluggish waters like that found in the Murrumbidgee in the proposal site. They use large woody debri such as snags for cover. They spawn upstream in spring and summer.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of a population**

The proposal will unlikely have an effect on breeding for this species as it moves upstream to spawn and the proposal site is in a more downstream location. Water degradation will not occur with sediment and erosion controls in place. Therefore, the proposal will not lead to a long-term decrease in the size of a population.

- **reduce the area of occupancy of the species**

The proposal will not reduce the area of occupancy of this species.

- **fragment an existing population into two or more populations**

The proposal will not fragment the existing population into two or populations.

- **adversely affect habitat critical to the survival of the species**

No critical habitat has been described for this species.

- **disrupt the breeding cycle of a population**

The proposal will unlikely have an effect on breeding for this species as it moves upstream to spawn and the proposal site is in a more downstream location. Therefore, the proposal will not disrupt breeding cycles for this species.

- **modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**

The proposal will only temporarily and slightly change water flow. Riverbed habitat used for spawning will likely be disturbed, however, this spawning is more likely to occur upstream. Therefore, changes in habitat that may place this species at risk of decline will not occur.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat**

The proposal will not result in invasive species harmful to the Trout Cod in the study area.

- **introduce disease that may cause the species to decline**

No

- **interfere with the recovery of the species**

A national recovery plan has been advised but not prepared for this species.

Conclusion

The Assessment of Significance has concluded that the proposal is not likely to significantly affect the Silver Perch in the local area, given that the proposal will only temporarily and slightly alter river flow, and only disturb riverbed habitat in a non-spawning area. Further referral is not required.