

4 Strategic Justification for Proposal

4.1 Water Demand

The population of Wagga Wagga is increasing steadily. It is predicted that by 2031, the population of the Wagga Wagga City will be 77,968 persons, an increase of 18,305 persons (30.68%) from 2006 (id, 2013). This represents an average annual growth rate of 1.18% (id, 2013). Although RWCC have implemented demand management strategies (see below) which will reduce water consumption, demand for potable water will continue to grow in line with population growth, albeit at a reduced rate.

The NSW Office of Water (NOW) encourages all NSW local water utilities (LWU) to continually improve their water supply businesses in accordance with the NOW *Guidelines for Best-Practice Management of Water Supply and Sewerage 2007*. The guidelines require LWUs to prepare and implement a sound 30-year Integrated Water Cycle Management (IWCM) Strategy. IWCM is a means by which LWUs manage their water systems to maximise benefits, and involves the integration of the LWUs three main services – water supply, sewerage and stormwater – so that water is used optimally. It also involves the integration with other services (e.g. roads and drainage and waste collection) and with various external requirements, particularly the NSW Water Reform process.

Preparation of an IWCM Strategy is undertaken in accordance with the *Integrated Water Cycle Management Guidelines 2004* and the *Integrated Water Cycle Management Checklist* (Appendix F of the *Guidelines for Best-Practice Management of Water Supply and Sewerage 2007*). The purpose of the Strategy is to address the complex linkages between elements of the urban water cycle (water supply, sewage and stormwater) and community expectations.

In 2009, an Integrated Water Cycle Management (IWCM) Evaluation Study was commenced by RWCC in partnership with its four constituent councils (being Urana Shire, Lockhart Shire, Greater Hume Shire and Wagga Wagga City Councils). Based on the results of the IWCM study, RWCC adopted a demand of 115 ML/day for the year 2040, adopting low level demand management which utilises a range of programs involving the community such as ‘Water Wise’ factsheets, residential nature strip lawn replacement, school education, shower head replacement, and prohibiting the use of sprinklers and fixed hoses between 10am and 5pm daily.

In 2012, HydroScience Consulting were engaged by RWCC to prepare a Demand Management Plan to comply with the guidelines and to ensure safe and secure supply of potable water. RWCC have implemented an ongoing program of demand management to reduce consumption through the more efficient use of water. This includes permanent restrictions on the use of fixed sprinklers and rebates for re-landscaping nature strips. RWCC are committed to undertaking additional works and programs to reduce water consumption in accordance with the Plan (HSC, 2012).

4.2 Australian Drinking Water Guidelines

The 2011 Australian Drinking Water Guidelines (ADWG) were developed by the National Health and Medical Research Council (NHMRC) in collaboration with the Natural Resource Management Ministerial Council (NRMMC) and are subject to rolling revision to ensure they remain up-to-date with the latest scientific research on the production and supply of good quality drinking water. The

ADWG are designed to provide an authoritative reference to the Australian community and the water supply industry on what defines safe, good quality water, how it can be achieved and how it can be assured. The guidelines were developed after consideration of the best available scientific evidence and provide a framework for good management of drinking water supplies to ensure safety at point of use. They address both the health and aesthetic quality aspects of supplying good quality drinking water. Drinking water quality targets set for the Wagga Wagga WTP are presented in Section 6.14.1 of this EIS.

In 2012, HWA were engaged by RWCC to undertake a Feasibility Study of the upgrade of the Wagga Wagga WTP. One of the key objectives of the HWA (2012) study was to identify potential process trains that are capable of producing drinking water quality which meets or exceeds the ADWG as well as RWCC's own targets and specifications, independent of the quality of the Murrumbidgee River water, and with a capability of ultimately producing 55ML/day of treated water under these conditions. The Feasibility Study includes a report on the Raw Water Quality Risk Assessment which was undertaken to identify and quantify raw water quality risk and develop the process options to address these risks. From this assessment, it was determined that the key raw water quality risks for the Wagga Wagga WTP were microbial pathogens (*E. coli*, *Cryptosporidium* and *Giardia*) and turbidity.

4.3 Need for the WTP replacement

Infrastructure on the WTP site has been added in a largely ad hoc manner since construction of the WTP buildings and structures in 1930. The existing WTP is ageing and much of the existing infrastructure components are nearing the end of their serviceable life.

The existing Raw Water Pumping Station would not be reliable in the longer term due to the age of the pumping station equipment and the condition of the suction lift pipework. The current pumping station with the combination of seven pumps is complex and would require a convoluted pipework system to connect to the new WTP. The current pumping station inlet structure is prone to capturing river debris and maintenance is difficult to undertake. Therefore it has been identified that a new river intake is required.

In its current state, the WTP is constrained in its ability to meet current (and projected future) water demands as the plant is unable to treat raw water with turbidity levels greater than 100 NTU. The Murrumbidgee River is subject to high turbidity particularly during storm or flood events. Monitoring data provided by RWCC indicates that turbidity levels can remain between 500 and 1,500 NTU for a number of days following a storm event (NSW Public Works 2013). Under typical conditions however, the turbidity of the river water varies between approximately 20 NTU and 40 NTU (HWA 2012).

Periods of high river turbidity generally occur during periods of high rainfall when water demands are low. At present, water demands during these high turbidity events can be met by the East Wagga Wagga Borefield. However, as water demands increase with population growth, the borewater supply will be unable to meet the growing demand for potable water. In addition, pumping from the borefield is subject to extraction limitations associated with the existing water access licences. The inability of the Wagga Wagga WTP to treat higher turbidity levels is restrictive, and presents a high risk to the Wagga Wagga potable water supply in the event that the borefield is taken offline.

The North, East and West Wagga Wagga Borefields can provide 60 ML/day. The upgraded Wagga Wagga WTP would therefore need to provide 55 ML/day to meet the adopted demand of 115 ML/day. The replacement of the existing WTP provides the benefit of ensuring a secure supply of 55 ML/day of treated water sourced from the Murrumbidgee River, ensuring access to a safe and reliable potable water source in the long term for consumers in the greater Wagga Wagga area.

The proposed works are consistent with Wagga Wagga City Council's Spatial Plan 2013 to 2043 which acknowledges that new residential and employment development in Wagga Wagga will need to be supplied by a reliable and secure water source.

The estimated cost for constructing and operating the new WTP is currently being undertaken as part of the design process including identification of measures in the design to optimise cost, such as appropriate sizing of infrastructure.

4.4 Assessment of Ecologically Sustainable Development Considerations

Sustainable development refers to development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Australia's *National Strategy for Ecologically Sustainable Development 1992* (NSED) defines ecologically sustainable development (ESD) as "using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased".

One of the objects of the EP&A Act is to encourage ESD and is defined under Section 4 of the EP&A Act as having the same meaning as section 6(2) of the *Protection of the Environment Administration Act 1991* (POEA Act). The principles of ESD and their application to the Proposal are provided in Table 4-1.

Table 4-1: Consideration of ESD Principles

ESD Principle	Consideration in Proposal
The Precautionary Principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and (ii) an assessment of the risk-weighted consequences of various options.	This EIS presents the environmental assessment of the Proposal, and recommends appropriate mitigation measures to prevent and control situations which may cause environmental degradation. Threats of serious or irreversible environmental damage are not expected to result from the Proposal.
Inter-Generational Equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations	There would be some environmental impacts associated with construction of the Proposal, however, these would be short-term and would be

ESD Principle	Consideration in Proposal
	managed through implementation of appropriate mitigation measures. The Proposal would benefit the community by providing a reliable water supply service with water quality compliant with the <i>Australian Drinking Water Guidelines</i> (2011).
Conservation of biological diversity and ecological integrity - namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration	The EIS has considered the impact of construction and operation of the new WTP on terrestrial and aquatic ecology, including threatened species and endangered ecological communities. Assessments of significance of impact undertaken as part of this assessment conclude that impacts on biodiversity are likely to be low, provided the mitigation measures presented in this report are implemented.
Improved valuation, pricing and incentive mechanisms - namely, that environmental factors should be included in the valuation of assets and services. Including: (i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.	The Proposal has been designed to avoid or minimise environmental impacts where possible. With the exception of the new river intake, the proposed works would be located within existing cleared/ disturbed areas. Environmental factors, such as impacts on potential habitat for threatened fish, have been taken into consideration during selection of the preferred river intake location. As described in 4.1, RWCC has prepared an IWCM Strategy which utilises a range of programs to minimise demand on water. Costing of the WTP has been developed following consideration of demand management measures. Costing of the WTP includes pricing for implementation of environmental management measures. Sections 6 and 7 of this EIS identify mitigation measures such as noise reduction consideration in design, fish screens incorporated into river water intake design, and timing of construction of river water intake to avoid the breeding period of Grey-headed Flying-fox. The longer term development of the new WTP would include return of supernatant to the head of the WTP rather than discharge to Marshalls Creek.

5 Agency and Stakeholder Consultation

5.1 Key Agencies and Stakeholders

During preparation of the EIS, consultation letters were sent to the following key agencies/stakeholders relevant to the Proposal:

- Wagga Wagga City Council
- Lockhart Shire Council
- Urana Shire Council
- Greater Hume Shire Council
- NSW Office of Water – Planning and Assessment
- NSW Office of Water – Urban Water Unit
- NSW Office of Environment and Heritage
- NSW Department of Primary Industries - Fisheries
- NSW Environment Protection Authority
- NSW Ministry of Health
- Local Land Services
- NSW Roads and Maritime Services
- Essential Energy (adjoins the western side of Marshalls Creek)
- Easts Riverview Holiday Park (adjoins WTP site)
- Trade and Investment Crown Lands

Where provided, responses from the above agencies and stakeholders are presented in Appendix E of this EIS, and summarised in Table 5-1.

In addition to the above consultation, RWCC has undertaken community consultation and information dissemination such as:

- Preparation of an Integrated Water Cycle Management (IWCM) study in 2009 and a meeting to review the findings of the IWCM study. Members of the public were invited to participate in the Program Reference Group during the development of the IWCM Study.
- Numerous discussions and meetings with the WTP's immediate neighbours, namely Essential Energy and Easts Riverview Holiday Park. Both neighbours are aware that RWCC are planning to build a new WTP.
- Presentations to local PROBUS and ROTARY groups on Wagga Wagga's water supply and the proposed new WTP.
- Newspaper article in the local paper justifying the increase in fees due to capital works program and WTP replacement.
- Newsletter to all customers with information on upcoming projects including the new WTP. The newsletter is also available on the RWCC website. The newsletter included contact details should any person require further information. A copy of the newsletter is included in Appendix E.
- NSW Public Works and RWCC have consulted with Bill Ho, Manager Urban Water Unit of NSW Office of Water as part of the consultation process for the Section 60 approval for construction of the new WTP required under the *Local Government Act 1993* and have provided a copy of Concept Design Report (KBR 2014).

A letter was sent to the Wagga Wagga Local Aboriginal Lands Council (WWLALC) for their input into the Due Diligence process. At the time of writing a response had not been received.

RWCC have commenced discussion with the EPA regarding the potential change to their current EPL for discharging to Marshalls Creek.

Table 5-1: Consultation responses

Agency / Stakeholder	Response	How Addressed in the EIS
Urana Shire Council	Council has no objection to either option proposed.	
NSW Office of Water – Planning and Assessment	No comment at this stage further to the previous advice provided for the preparation of the DGRs. NSW Office of Water will review the EIS via Department of Planning and Environment.	
NSW Office of Environment and Heritage	Noted that the area of impact of the proposed development has been moved toward the eastern boundary of the WTP site, but that this alteration would not require amendments to previous advice provided for the preparation of the Director-General Requirements (DGR's) dated 19 th December 2013 and issued to the then Department of Planning and Infrastructure. As the two proposed options appear to occur within the same development footprint, OEHL have no further comments with regard to flooding, biodiversity (including threatened species) or Aboriginal cultural heritage. Noted that the Preliminary Environmental Assessment (PEA) identified that the locally significant heritage buildings ('Riverside residence') and the original pump house on the site would not be impacted by the development and that a Historic Heritage Assessment would be undertaken. However, if the Historic Heritage Assessment identifies potential impacts to heritage buildings, the OEHL Heritage Division is to be contacted.	Refer to Section 6.4 (flooding); Section 6.5 and Appendix C (biodiversity); Section 6.6 and Appendix D (Non-indigenous heritage); Section 6.7 and Appendix G (Aboriginal heritage);
Dept Primary Industries - Fisheries	Requested that EIS be forwarded to Fisheries NSW for review and comment before the works commence and that adequate time be given for consultation between RWCC and Fisheries NSW on the design and construction of the water treatment plant upgrade works to be undertaken.	
	State that any dredging and reclamation works or blockage of fish passage as defined under s198A of the <i>Fisheries Management Act 1994</i> would require a permit under s200 and s219 of the Act.	Refer to Sections 2.2 and 2.5.5
	EIS should assess whether there is likely to be any significant impacts on listed aquatic threatened species, populations or communities. A Seven Part Test as per s5A of the <i>Environmental Planning & Assessment Act 1979</i> should be	Refer to Section 6.5 and Appendix C

Agency / Stakeholder	Response	How Addressed in the EIS
	undertaken for aquatic threatened species potentially impacted on by the Proposal.	
	EIS should outline any Key Threatening Processes (KTP) that are going to be undertaken as part of, or as a result of, the works. These may include the degradation of native riparian vegetation (including aquatic vegetation), removal of large wood debris, or the installation and operation of instream structures that alter the natural flow regimes of rivers or streams.	Refer to Section 6.5 and Appendix C
	Information should also be presented outlining any mitigation measures that are to be undertaken as part of the Proposal (i.e. revegetation).	Refer to Section 6.5 and Appendix C
	The EIS will need to include details on how the entry and entrainment of fish by the raw water intakes will be managed, including consideration of the recommendations provided in Boys et. al. 2012.	Refer to Section 6.5 and Appendix C
	Include in the EIS any mitigation measures that will be undertaken before, during and after the proposed works are completed including sediment and erosion control and site rehabilitation measures.	Refer to Section 6.5 and Appendix C
Environment Protection Authority	Specific issues considered by EPA to be critical to an assessment of the proposed development include: • Treatment and disposal of backwash from the treatment plant. • Storage and handling of chemicals used at the premises. • Adequate assessment of noise impacts, particularly on the adjoining Easts Riverview Holiday Park. • Noise mitigation measures to be utilised during construction and operation of the augmentation works to meet the NSW Industrial Noise Policy limits.	Refer to Sections 3.5.2 and 6.12 (treatment and disposal of backwash); Section 6.14 and Appendix B (chemical storage and handling); Section 6.9 and Appendix F (noise assessment)
NSW Roads and Maritime Services	Advised that traffic-related issues should be addressed in two distinct stages: • Establishment phase – the transport of materials and equipment/components for the establishment of the facility and	Refer to Section 6.10

Agency / Stakeholder	Response	How Addressed in the EIS
	ancillary infrastructure, the movement and parking of construction related vehicles, including personal vehicles, during construction. Operational phase – the ongoing traffic generation due to the operation, maintenance and servicing of the various elements of the project. Acknowledges that changes to the current traffic generation may be minimal during the operational phase of the proposal. Noted that currently access to the site is available from Hammond Ave only, via a single driveway. Vehicular access to and from the site needs to be carefully addressed and managed as the existing driveway is located in close proximity to the existing two lane bridge due to the limited frontage of the subject site to Hammond Ave. Options for alternative access arrangement to the subject site should be considered. A Traffic Management Plan outlining measures to manage vehicular access to the site, particularly work vehicles, should be prepared. The plan shall detail the potential impacts associated with operational aspects of the development, the measures to be implemented to maintain the standard and safety of the road network, and procedures to monitor and ensure compliance. Emphasis the need to minimise the impacts of any development on the existing road network and maintain the level of safety, efficiency and maintenance along the road network. Advised that a Traffic Impact Assessment (TIA) should be submitted with the Development Application. Any TIA needs to address the impacts of traffic generated by the development upon the nearby road network, particularly access points. Refer to the RTA 'Guide to Traffic Generating Developments', and Austroads 'Guide to Traffic Management Part 12: Traffic Impacts of Development. The TIA should contain information such as the expected traffic generation, vehicle numbers and types of vehicles, and travel routes for vehicles accessing the development site.	

Agency / Stakeholder	Response	How Addressed in the EIS
Crown Lands	Requested further details of the Proposal including: • Current licencing arrangements (if any) for access to Crown Land and any changes to access requirements. • Does the proposal require the installation of a new pipeline in to the river, or will it involve upgrading the existing pipeline; • If the Proposal requires the installation of a new pipeline, what would be the specifics on the new pipe (size etc), and any associated expected excavation; • Any specifics on potential asset / buffer zones, and excavation zones. • Is it expected that any native vegetation would be removed from the bank during construction; • Construction methodologies; • Materials to be used; • Access requirements during construction; • Any on-going maintenance access/ construction issues.	Addressed in Section 6.3 (access to Crown Land) and Section 3 (proposal description)

6 Existing Environment, Assessment of Impacts and Mitigation Measures

6.1 Environmental Risk Analysis

An environmental risk analysis has been undertaken to identify key environmental issues for the Proposal and assess the risk posed by construction of the Proposal, before and after application of environmental controls (also referred to as mitigation measures or environmental safeguards). The analysis was based on:

- Consideration of aspects identified in the Preliminary Environmental Assessment for the proposed works (Public Works 2013).
- Review of the issues identified in the Director-General Requirements (DGRs) for the preparation of the EIS.
- Review of environmental risks identified during the preparation of the EIS (presented in Sections 6.3 to 6.14).
- Application of the Risk Assessment Matrix presented below as Figure 6-1.

			CONSEQUENCE				
			Insignificant	Minor	Moderate	Major	Extreme
			1	2	3	4	5
LIKELIHOOD	Almost Certain	A	Medium	High	High	Extreme	Extreme
	Likely	B	Low	Medium	High	Extreme	Extreme
	Possible	C	Low	Medium	Medium	High	High
	Unlikely	D	Low	Low	Medium	Medium	High
	Rare	E	Low	Low	Low	Medium	Medium
Consequences, likelihoods and levels of risk will depend on the controls that are in place and their effectiveness. Source "HB 89-2012, Risk management – Guidelines on risk assessment techniques Part 3.4 Risk Analysis"							

Figure 6-1: Risk Assessment Matrix

Table 6-1: Environmental Risk Analysis

Environmental Issue	Relevant proposal element / activity	Environmental Impact	Without controls / safeguards			With controls/ safeguards	
			Likelihood	Consequence	Potential impact	Relevant EIS section	Residual Impact
Surface Water	Excavations	Stormwater conveying sediment being washed off-site.	Likely	Moderate	High	6.4.3	Low
	Construction of new river intake works	Failure of coffer dam around river intake site (releasing silt-laden water into river, causing turbidity and sedimentation impacts of aquatic environment).	Possible	Moderate	Medium	6.4.3	Low
	Removal of existing river intake works	Failure of coffer dam around river intake site (releasing silt-laden water into river, causing turbidity and sedimentation impacts of aquatic environment).	Possible	Moderate	Medium	6.4.3	Low
	Chemical storage on-site	Stormwater conveying chemicals off-site.	Rare	Moderate	Low	6.4.5	Low
	Overflow from tanks	Release chlorinated water or filter backwash water to the environment.	Rare	Minor	Low	6.4.5	Low
Groundwater	Excavations	Quality and/or quantity impacts to groundwater during construction	Possible	Minor	Medium	6.4.3	Low
	Raw water intake pumping	Quantity impacts to groundwater during operation	Rare	Minor	Low	6.4.5	Low
	Chemical storage on-site	Quality and/or quantity impacts to groundwater during operation	Rare	Minor	Low	6.4.5	Low
Hydrology	Waste stockpiling	Construction waste washing off-site	Possible	Moderate	Medium	6.4.3	Low
	Flooding during construction activities	Damage to plant infrastructure	Rare	Major	Medium	6.4.3	Low
	Construction of river water intake	Failure of coffer dam around river intake	Possible	Moderate	Medium	6.4.3	Medium (short-term)

Environmental Issue	Relevant proposal element / activity	Environmental Impact	Without controls / safeguards			With controls/ safeguards	
			Likelihood	Consequence	Potential impact	Relevant EIS section	Residual Impact
	Removal of existing intakes	Failure of coffer dam around river intake	Possible	Moderate	Medium	6.4.3	Low
	Operation of the plant	Flooding during operation of the new plant causing damage to infrastructure	Rare	Major	Medium	6.4.5	Low
Land use	Construction activities	Disruption to recreational enjoyment of Easts Riverview Holiday Park residents/visitors during construction	Likely	Moderate	High	6.3.3, 6.8.3, 6.9.5, 6.11.4	Medium
	Plant operations	Disruption to recreational enjoyment of Easts Riverview Holiday Park residents/visitors during operation	Possible	Minor	Medium	6.3.5, 6.9.6, 6.11.5	Low
Public Health	System not operating as designed	Lowering of Drinking water quality	Rare	Moderate	Low	6.14.2.4	Low
	Raw water quality	Treated water quality does not meet ADWG targets	Rare	Moderate	Low	6.14.1	Low
Air Quality	Excavations, traffic and equipment moving over unsealed surfaces, stockpiles	Dust generated during construction moving off-site.	Likely	Moderate	High	6.8.3	Low
	Construction activities	Vehicle and machinery emissions during construction	Almost certain	Moderate	High	6.8.3	Medium
	Plant operation	Odours from operation of the WTP e.g. chemicals	Unlikely	Minor	Low	6.8.4	Low
Noise and vibration	Noise-generating plant and machinery – construction	Construction activities impacting sensitive noise receivers	Likely	Moderate	High	6.9.5	Medium
	Plant operations	Operational impacting sensitive noise receivers	Likely	Moderate	High	6.9.6	Low

Environmental Issue	Relevant proposal element / activity	Environmental Impact	Without controls / safeguards			With controls/ safeguards	
			Likelihood	Consequence	Potential impact	Relevant EIS section	Residual Impact
	Vibration-generating plant and machinery – construction	Vibration structurally impacting heritage items	Possible	Minor	Medium	6.9.5	Low
	Vibration-generating plant and machinery – construction	Vibration structurally impacting adjacent land uses	Unlikely	Minor	Low	6.9.5	Low
Visual	Permanent infrastructure	Visual impacts to adjoining residents/business due to new infrastructure at the WTP	Almost certain	Moderate	High	6.11	Low to Medium (depending on location of receiver)
Flora and Fauna – aquatic	Construction of river water intake	Loss of benthic habitat for aquatic species i.e. macroinvertebrates and foraging habitat for fish and Platypus.	Likely	Minor	Medium	6.5.4	Low
	Operation of river water intake.	Impact to aquatic species e.g. entrainment of fish (including larval stages) in intake.	Likely	Moderate	High	6.5.6	Low
Flora and Fauna – terrestrial	Construction of new WTP (excluding river water intake)	Loss of foraging habitat provided by semi-mature eucalypts.	Possible	Minor	Medium	6.5.4	Low
	Construction of new WTP (excluding river water intake)	Noise impacts to fauna, including Grey-headed flying Fox colony on Bat Island.	Possible	Minor	Medium	6.5.4	Low
	Construction of river water intake	Noise impacts to fauna, including Grey-headed flying Fox colony on Bat Island.	Likely	Major	Extreme	6.5.4	Medium
	Operation of new WTP and river intake	Noise impacts to fauna, including Grey Headed flying Fox	Possible	Minor	Medium	6.5.6	Low

Environmental Issue	Relevant proposal element / activity	Environmental Impact	Without controls / safeguards			With controls/ safeguards	
			Likelihood	Consequence	Potential impact	Relevant EIS section	Residual Impact
Aboriginal Heritage	Excavation works for new WTP and river water intake	Damage or destruction of unknown Aboriginal sites	Unlikely	Moderate	Medium	6.7	Low
European Heritage	Excavation works for new WTP and river water intake	Impacts to listed heritage items e.g. vibration impacts.	Unlikely	Minor	Low	6.6.3	Low
	Excavation works for new WTP and river water intake	Excavating unknown sites during construction	Rare	Moderate	Low	6.6.3	Low
Traffic and access	Construction traffic entering and exiting WTP site	Disruption to traffic flow	Likely	Minor	Medium	6.10.3	Medium
	Deliveries to site during operation	Disruption to traffic flow	Unlikely	Minor	Low	6.10.4	Low
Hazards	Chemical storage	Spillage on-site	Possible	Moderate	Medium	6.14.2.3	Low
	Chemical delivery	transport of chemicals to site	Unlikely	Moderate	Medium	6.14.2.3, Appendix B	Medium
Energy Use	During construction	Release of Greenhouse Gases	Likely	Minor	Medium	6.13.3	Medium
	During operation of new WTP and river intake	Release of Greenhouse Gases	Likely	Minor	Medium	6.13.4	Low

6.2 Assessment Approach

The assessment of environmental impacts has been based on information obtained from the following sources:

- Searches of relevant databases and registers such as OEH's Atlas of NSW Wildlife database, Contaminated Land Register, Aboriginal Heritage Information Management System (AHIMS) database, Heritage Databases, Wagga Wagga LEP 2010, EPBC Act Protected Matters Search Tool.
- Air photograph interpretation.
- A review of existing literature relevant to the Proposal and to the local area, including previous options assessments and environmental assessments.
- Field investigations.
- Specialist investigations undertaken for the purpose of this Proposal including for noise, heritage and ecological aspects.

6.3 Land Uses

6.3.1 Existing Environment

This section considers the impacts on the use of land within and surrounding the Proposal site. The land uses within or immediately adjacent to the WTP are shown in Figure 6-2 and include:

- Utility operation/water treatment: infrastructure and buildings associated with the existing WTP. A RWCC maintenance depot and administration offices are also located on the site.
- Easts Riverview Holiday Park / Big 4 Wagga Wagga Holiday Park.
- Commercial and light industrial premises along the Sturt Highway.
- Great Southern Railway to the west of the site.
- Recreational: Wiradjuri Walking Trail (to the west of Marshalls Creek), managed by Crown Lands.
- Utility operation: Essential Energy depot, offices and substation.
- Crown Land: bank and bed of the Murrumbidgee River.
- Residential development: 75 m west of the western boundary of the WTP site.

Sensitive receivers immediately adjacent to the Proposal include tourists and permanent residents occupying the adjoining Easts Riverview Holiday Park.

RWCC does not have any current access agreements in place for the existing river water intakes. RWCC would be required to arrange a lease agreement with Crown Land to construct the river intake structure on the bank and bed of the river as well as to maintain access during operation of the new structure. It is expected that the lease area would be around 60 m wide x 40 m long (2400 m²) which includes a buffer strip 10 m either side of the pipeline structure. The consultation response from Crown Lands is included in Appendix E of the EIS.

6.3.2 Construction Impacts

With the exception of the new river intake, which would be constructed within Crown Land associated with the Murrumbidgee River, the Proposal would be constructed wholly within the lot that contains the existing WTP.

The Wagga Wagga WTP in conjunction with the West Wagga Wagga WTP, North Wagga Wagga WTP and smaller bore systems, supplies reticulated water to the City of Wagga Wagga and the Shires of Lockhart, Greater Hume and Urana. During construction works, the WTP would be kept online at all times, except for when specific tie-ins between new and existing plant and infrastructure are required. Although shutdowns for specific activities would be undertaken, potable water supply to Wagga Wagga residential, commercial and industrial customers would not be disrupted at any time during construction. Other uses of the site, e.g. offices, maintenance facilities for water supply reticulation, use of Riverside Residence as an office, would continue throughout the construction period.

Construction of the proposed WTP replacement has the potential to impact the recreational amenity or enjoyment of the adjacent holiday park through a range of environmental issues, principally noise, vibration, traffic and visual amenity. Impacts on adjacent land users have therefore been addressed, where relevant, in Sections 6.9 to 6.11. It is noted that utilisation of the adjacent holiday park mainly occurs in the southern part of the park (see Figure 1-3), while construction of the new WTP would occur towards the northern boundary of the WTP site, providing some separation distance from the source of impacts to the receivers.

6.3.3 Construction Mitigation Measures

- A lease agreement with Crown Lands is to be sought prior to commencement of construction.

To ensure continuity of potable water supply, the following aspects would be considered during any WTP shutdowns for tie-ins to connect existing infrastructure and new infrastructure and for commissioning of the new WTP:

- Each work activity would be planned with contingency and risk mitigation measures considered and ready for implementation.
- All stakeholders would be informed of the planned works and kept informed of progress against the plan.
- There would be sufficient potable water stored within the system downstream of the WTP to ensure continuity of potable water supply can be achieved within the timeframe of the planned works whilst also allowing for contingencies and risk.
- Work would be scheduled to occur considering the likely potable water demand and volume of stored potable water in the system (i.e. working overnight when there is lower demand or during time periods when the WTP is off-line may be required).
- The construction contractor would abandon or reschedule works at the direction of RWCC if changes in conditions necessitate e.g. change in demand profile of potable water customers.

In addition to the above, the following measure is required to minimise disruption to personnel or activities occurring on-site that are not associated with the construction works:

- All employees at the existing WTP, maintenance depot and administrative office, would be notified of construction works and briefed on the impact to their daily operations.

- Adjoining landholders would be informed of the construction scheduling, prior to construction commencing.

6.3.4 Operational Impacts

Operation of the Proposal would not alter from current operations in terms of land use as the WTP would be contained within the current WTP boundary, with the exception of the river water intake. WTP infrastructure would be closer to the boundary of the Easts Riverview Holiday Park. Impacts on adjacent land users, e.g. through noise, vibration, traffic and visual amenity, are addressed in Sections 6.9 to 6.11.

Typically RWCC use less than 50 per cent of their surface water allocation and do not propose to increase their extraction limit for the new Wagga Wagga WTP. Hence, it is unlikely that the Proposal would adversely affect other licenced water users and/or basic landholder rights

6.3.5 Operational Mitigation Measures

Maintenance and emergency repairs would be required for the lifetime of the Proposal when necessary and would be undertaken in accordance with operational procedures for the WTP.

RWCC would be required to arrange a lease agreement with Crown Lands to maintain access to the river bank and bed during operation of the new river intake structure.



Figure 6-2: Land Uses within and adjacent to the Proposal site (red outline)

6.4 Water Quality, Hydrology and Soils

6.4.1 Existing Environment

Topography and soils

The WTP site is generally flat, with the existing water treatment plant, RWCC maintenance depot and administrative building and other associated infrastructure, together with hard-stand areas occupying around 6 ha of the 8.43 ha site. The proposed river intake site, however, comprises a moderately steep upper bank leading down to a gently sloping river terrace, followed by a moderately steep lower bank (see Figure 6-3). The width of the Murrumbidgee River in the vicinity of the WTP is around 150 m between the top of the southern and northern banks.

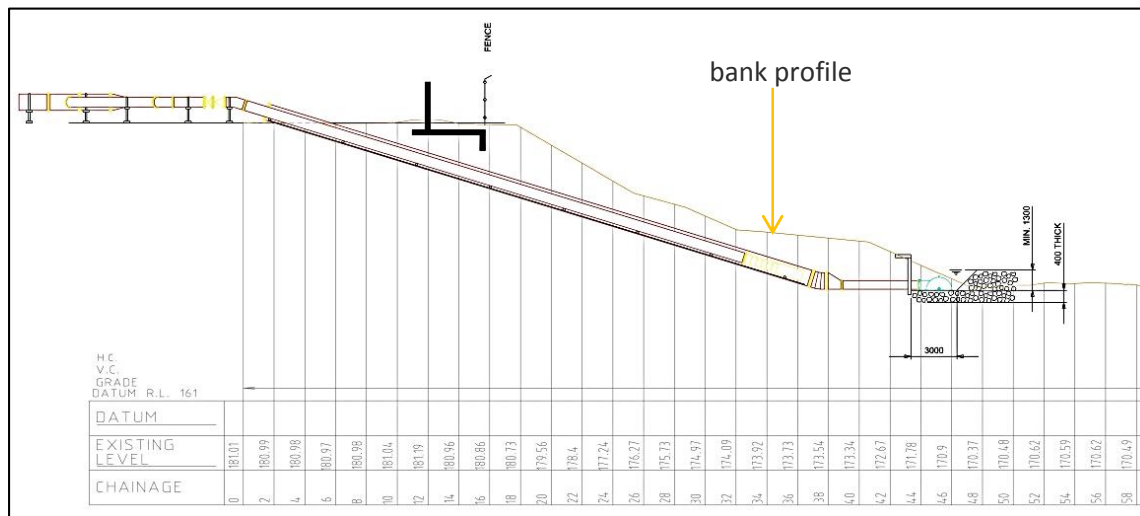


Figure 6-3: Bank profile at proposed river water intake location

Reference to the 1:250,000 scale geological map of the Wagga Wagga region indicates the site locality is underlain by Quaternary Alluvium associated with the adjacent Murrumbidgee River. Subsurface conditions across the site generally comprise a relatively thin fill layer overlying alluvium. The upper alluvium comprises interbedded fine grained soils, generally silts and clays. The lower alluvium is sand and gravel. Most areas of the WTP site are paved and/or have a granular fill layer (Coffey 2013). Reference to acid sulfate soil mapping held by the Australian Soil Resource Information System (ASRIS) indicates there is a low probability of excavation works encountering acid sulfate soils.

A search of the EPA *Contaminated Land: Record of Notices* and the *List of NSW Contaminated Sites notified to EPA* revealed no contaminated sites within or adjacent to the WTP site. No contaminated soil has previously been identified on the site.

Surface Water

The WTP site has a western frontage to Marshalls Creek of around 450 m and a northern frontage to the Murrumbidgee River of approximately 320 m. The Murrumbidgee River is the second largest river in the Murray-Darling system (MDBA, 2014). Rising in the Snowy Mountains in NSW, the river flows for 1,609 km in a generally westerly direction until it discharges into the Murray River (see Figure 6-4). The mean daily flow in the river at Wagga Wagga is 10,326 ML. Average annual rainfall at Wagga Wagga is 518 mm (based on 112 years of data from 1898 to 2010). The wettest year on record was 1950 (882 mm) and the driest year in this time period was 1914 (231 mm). On average, rainfall at Wagga Wagga is fairly evenly distributed throughout the year with a slight increase during the winter and early spring months when the average monthly rainfall is around 50 mm (NOW 2011a).

The natural flow regime of the Murrumbidgee River was characterised by low average flows in summer and autumn and higher average flows in winter and spring. River regulation from the operation of dams on the Murrumbidgee River and tributaries has changed the natural flow regime in terms of total volume and seasonal patterns of discharge. In the section of Murrumbidgee River between Burrinjuck Dam (near Yass) and Wagga Wagga, typically high storage releases occur during summer and autumn and lower flows during winter/spring due to storage replenishment (MDBA, 2012).

The City of Wagga Wagga is situated on the south bank of the river with the village of North Wagga Wagga, the first settlement, on the north. There have been several large flood events in Wagga, the largest of these being in 1891, 1925, the 1950s and 1974 (Green et. al., 2011). The main commercial area of Wagga Wagga is protected by a levee which was constructed in the early 1960's. It was upgraded in the late 1970's and again in 1983 in response to issues identified from the flood that occurred in the 1974, to a 1 in 100 year standard (Wagga Wagga City Council website).



Figure 6-4: Extent of Murrumbidgee River

source: Murray Darling Basin Authority web-site

Marshall's Creek is a minor tributary of the Murrumbidgee River entering the river immediately downstream of the north-western corner WTP site. Surface water across the site drains to Marshall's Creek, and subsequently to the Murrumbidgee River, via the on-site stormwater drainage system. Given its proximity to the Murrumbidgee River and Marshall's Creek, the WTP site is subject to floodwater from Marshall's Creek or the Murrumbidgee River or both the creek and the river, combined (WMAwater 2013).

Being located adjacent to the southern bank of the Murrumbidgee River, the WTP is prone to inundation during floods. RWCC is proposing to upgrade the existing 1 in 20 year (180.5m Australian Height Datum) flood levee around the entire WTP site to provide 1 in 100 year (182.1m AHD) flood protection. This would be undertaken as a separate project and is being assessed under Part 5 of the EP&A Act through a Review of Environmental Factors. It is proposed that the upgraded levee would be constructed prior to the commencement of the upgrade works. All new infrastructure proposed as part of the WTP replacement has been designed based on this assumption. The levee would provide 1% Annual Exceedance Probability flood protection for the WTP. The installation of the upgraded levee would mean there is a 1% probability in a given year that the site of the new WTP would be impacted by floodwaters. The WTP would be protected from more intense floods, compared to the current situation where the existing 1 in 20 year flood levee only provides protection from minor floods.

Groundwater

The Mid Murrumbidgee Alluvial Groundwater Source consists of unconsolidated sediments associated with the Murrumbidgee Valley from Gundagai to Narrandera, and the lower sections of the tributaries of Tarcutta and Kyeamba Creeks. The WTP site is underlain by the Wagga Wagga Alluvial groundwater source, which is defined as the unconsolidated alluvial deposits associated with the Mid Murrumbidgee River and which covers an area of 111 km². The system consists of two aquifers, the lower being the Lachlan formation and the upper the Cowra formation. The Lachlan aquifer is high yielding, contains low salinity water and consists of quartz sands and gravel. This aquifer is used as a town water supply for Wagga Wagga and many towns and villages in the Riverina. The overlying Cowra formation contains

mostly clays and silts with minor sand and gravel lenses. It is a low yielding formation suitable for mostly stock and domestic purposes. The Lachlan formation is a confined aquifer system while the overlying Cowra formation is a semi confined to unconfined aquifer system. The Lachlan formation commences from near Oura east of Wagga Wagga and increases in thickness to about 120 m at Narrandera (37 to 160 m below ground surface). The Cowra formation extends from ground surface down to varying depths. The formation increases in thickness from Gundagai, where it extends to a depth of about 25 m, to about 40 m around Narrandera (NOW 2011).

The rise in groundwater levels caused by a large flood which occurred in 1974 indicated that the Murrumbidgee River was closely linked to the groundwater system, and that large flood events are a major recharge source for the aquifer around Wagga Wagga. From 1997 to 2010, groundwater and river levels experienced a constant declining trend. Groundwater levels respond to river height variations, and during 1997 to 2010 there were generally lower river level heights and a measurable increase of groundwater extraction from the Lachlan aquifer, resulting in a lowering of the groundwater level (NOW 2011).

For the purposes of water management and planning, the Wagga Wagga Alluvial Groundwater Source has been separated out from the Mid Murrumbidgee Alluvial Groundwater Source by NOW because it is hydro-geologically constrained, is highly stressed compared to the rest of the water source, has a high proportion of town water supply usage and is experiencing declines in groundwater levels in both the deep and shallow aquifers as a result of extraction and drought (NOW 2011).

Groundwater and surface water sources are defined as 'highly connected' if 70% or more of groundwater pumped in an irrigation season is derived from stream flow. While there is significant connectivity between the Murrumbidgee River and the aquifer, the leakage is from the river into the upper Cowra aquifer, and the majority of extraction is from the lower Lachlan aquifer. There is a time lag for the river water to leak down into the lower Lachlan aquifer, and this lag is greater than an irrigation season which results in the aquifer not being classified as "highly connected" based on the NOW definition (NOW 2011).

Results of groundwater investigations presented in Coffey (2013) indicate that groundwater underlying the WTP site occurs at between 8 m and 10 m beneath existing ground surface and is likely to be hydraulically connected to the adjacent river (Coffey 2013).

Water Sharing Plan for the Murrumbidgee Regulated River Water Source

The Murrumbidgee River is subject to the *Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2003* (WSP) which sets the rules for the management of water access licences, water allocation accounts, the extraction of water, the operation of dams and the management of water flows in the Murrumbidgee regulated river catchment. The WSP also includes rules for protecting the environment, managing licence holders' water accounts, and water trading in the plan area.

RWCC currently holds a water access licence issued under the WM Act to extract 7,805 ML/year from the Murrumbidgee River (Water Access Licence 40AL400024). RWCC also has a 1,000 ML high security licence number 40AL405344. A high security licence provides that a licence holder receives their full allocation in all but severe drought periods. Typically RWCC use less than 50% of their water allocation and do not propose to increase their extraction limit any further for the new Wagga Wagga WTP.

6.4.2 Construction Impacts

River Water Intake

Construction of the new river water intake would require excavation of the bed and lower bank of the Murrumbidgee River (see Figure 6-5 for intake location) and therefore poses a potentially high risk of impacts on the water quality and aquatic environment of the river. Excavation of the bed to a depth of 1.7 m below the surface of the river bed would be required to achieve adequate submergence of the intake pipes. Around 255 m² of material is expected to be excavated from the lower bank and bed of the river to construct the new river water intake. Works within the river would require construction of a coffer dam within the river to keep the work area dry during construction. During the construction of the coffer dam, river water would be required to be pumped from the area within the dam to keep the area dry.

Coffer dams would also be required around each of the existing intakes to facilitate their removal once the new intake becomes operational. Potential risks associated with the coffer dams include release of silty water into the river during construction of the dam, failure of the dam during storm or flood events and release of sediment during removal of the coffer dam.

Downstream flows would be subject to only minor impact during construction works, with coffer dams altering flows slightly. Each coffer dam would extend no more than 10 m into the river. The main river channel is approximately 100 m wide in this area (see Figure 6-5) and would not result in complete obstruction of the river. River water would continue to flow down the river and there would be no impacts to downstream users of river water.

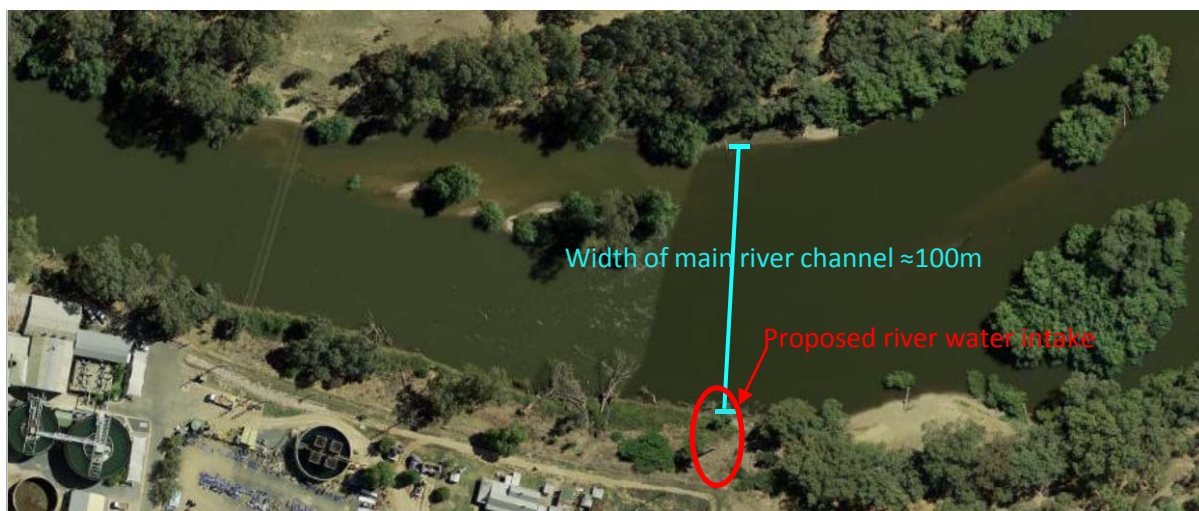


Figure 6-5: Width of river at river water intake location

Construction of the river water intake would involve excavation of the river bank from the top of the bank down to the river bed over a length of 40 m and up to a depth of around 2 m to install the three draft pipes (see Figure 3-6). From the top of the bank to the bed of the river, site elevation drops from 180.73 AHD to 170.37 AHD, indicating that the existing level of the river bed is around 10 m below the top of bank. As shown in Figure 6-3, the pipes would be covered by clean fill post-installation. The area would be revegetated in accordance with a Vegetation Management Plan. Restoration of the river bank would be undertaken in accordance with Office of Water's *Controlled Activities Guidelines*, including *Guidelines for Vegetation Management Plans on Waterfront Land* (see Section 6.4.3 for further details).

Based on results of groundwater investigations presented in the geotechnical investigation undertaken by Coffey (2013), it is indicated that groundwater underlying the WTP site occurs at between 8 m and 10 m beneath existing ground surface. Groundwater is not expected to be encountered when constructing the intake pipes, however it is expected that groundwater would be intercepted when constructing at the river bed (screens, headwall etc). Groundwater would be managed by constructing a coffer dam and

continuous pumping. The amount of groundwater that would be encountered would depend on the prevailing conditions at the time of construction. Under s120 of the POEO Act, it is an offence to pollute waters, and groundwater would need to be managed accordingly, so that any discharges do not pollute waters.

WTP

Due to the generally flat ground surface across the WTP site, cut and fill requirements would be minimal, however, excavations up to a depth of 5 m would be required to construct the Clear Water Storage and Filter Wastewater Collection Tank, and up to 4 m depth for the clarifiers, filters and related structures which would be constructed on imported fill. It is unlikely that groundwater would be intercepted at these depths.

Excavation activities have the potential to impact soil and water resources through sedimentation, encourage localised erosion, create a dust nuisance and compact soil. The underlying soils generally comprise fine grained soils (silts and clays) that would be susceptible to disturbance if they are exposed, become saturated and carry construction traffic (Coffey 2013). In addition, dust and alkaline waste water would be generated if concrete batching were to be undertaken on-site.

It is unlikely that contaminated soil would be encountered as there is no history of contaminated land on the WTP site.

Measures to mitigate such impacts on adjacent waterways such as Marshalls Creek and the Murrumbidgee River are provided in Section 6.4.3.

6.4.3 Construction Mitigation Measures

Measures to mitigate potential impacts relating to soils, hydrology and water quality are provided below.

- An Erosion and Sediment Control Plan (ESCP) is to be prepared in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004). The ESCP would be consistent with Section 6.4 of this EIS and any recommendations provided in the Geotechnical Investigation Report (Coffey 2013), and is to be developed as part of a Construction Environmental Management Plan (CEMP), and would detail the measures to minimise pollution, soil erosion and sedimentation impacts.
- All onsite employees and contractors (including sub-contractors) would be trained in accordance with the Erosion and Sediment Control Plan.
- A spill management plan would be developed before construction begins and implemented throughout construction.
- Sediment and erosion control measures would be installed prior to excavation and construction works and would be maintained in an effective condition until earthworks have been completed and the sites are rehabilitated.
- If a temporary concrete batch plant is to be used on-site, measures for effectively managing wastewater from the concrete batch plant in the CEMP would be included so that discharge of pollution into Marshalls Creek and the Murrumbidgee River does not occur.
- Wastewater from the concrete batch is to be diverted, captured, treated and reused to prevent release to waterways and soils.
- Sediment and erosion controls are to ensure runoff is diverted around the WTP construction site.
- Sediment and erosion control devices would be inspected regularly and after rainfall events, maintained to ensure effectiveness over the entire duration of the Proposal, and cleaned out before 30% capacity is reached.
- Sediment control devices would be placed at the entry points to any culverts and stormwater channels to prevent sediment entering the stormwater system.
- Sediment control devices (e.g. silt fences, straw bales wrapped in geotextile etc.) would be installed parallel with the contours of the site and immediately downslope of any areas where the natural ground surface has been disturbed.

- No waste or materials would be stored or placed on or adjacent to sediment fences.
- Rainfall and any encountered groundwater seepage would be permitted to evaporate or if required, pumped and passed through erosion and sediment controls (sediment filters and traps, barley bales) and across grassed areas prior to discharge. No discharge would occur directly to waterways.
- Any spoil storage areas or stockpiles would have appropriate erosion control devices installed to control runoff and prevent sedimentation. Silt barriers/sediment filters/traps around any stockpiles of soil would be provided to prevent the loss of material.
- Dust suppression techniques would be employed where required.
- Removed topsoil and vegetation would be stockpiled separately. They would be stockpiled so that material will not enter drainage lines or water courses and will maintain existing drainage flow. Appropriate erosion and sedimentation control should include silt fencing installed around the entire perimeter of any stockpiles, and on the downside of any exposed stripping and excavations.
- Measures would be in place to ensure mud is not tracked onto public roads.
- The CEMP is to include notification procedures to be followed under the POEO Act in the event that there is potential material risk of harm if a spill occurs.

River Water Intake

Measures to mitigate potential soil, hydrology and water quality impacts specifically relating related to construction of the River Water Intake include:

- Construction of the river water intake would take into consideration NSW Office of Water's *Controlled Activities Guidelines*, including but not limited to:
 - Preparing a rehabilitation plan for areas of river bed and banks disturbed by the works, including the removal of the existing raw water intakes.
 - Ensuring the trench is open for a minimal length of time.
 - Incorporating permanent bed and bank stabilisation works for scour protection.
- Preparation of a Vegetation Management Plan (VMP) by a suitably qualified person detailing how restoration of the river bank would be undertaken. The VMP is to be prepared in accordance with Office of Water's *Guidelines for Vegetation Management Plans on Waterfront Lands*, addressing the following criteria:
 - The VMP should consider the full width of the riparian corridor – in this case, from the river intake structure to the pump station.
 - The VMP is to include maps or diagrams which clearly identify the riparian corridor; the existing vegetation; the vegetation to be retained; the vegetation to be cleared; the footprint of construction activities; and areas of proposed revegetation.
 - Photographs of the site should be supplied and photo points should be identified. To assist with future monitoring and reporting requirements, the photo points should be identified by GPS coordinates or by survey. This is particularly important for large scale earthworks or extractive industries.
 - Measures for controlling long term access and encroachments (bollards, fences, etc.) into the riparian corridor should be identified.
 - Vegetation species composition, planting layout and densities should be identified. Species should comprise a mix trees, shrubs and groundcovers species representative of River Red Gum woodland. Planting densities should achieve quick vegetative cover and root mass to maximise bed and bank stability along the subject watercourse. Note that costs associated with high density planting would be recovered through reduced maintenance costs for weeding or replacement planting in the maintenance period
 - Seed or plant sources should be identified. Where possible, native plants and seed sources of local provenance should be used.
 - Exotic vegetation should be avoided. The use of exotic species for temporary soil stabilisation is permitted provided they are sterile, non-invasive and easily eradicated when permanent vegetation is established.

- Details of the planting program, rehabilitation methods and staging should be provided. Techniques such as hydro-seeding, direct seeding, brush matting or assisted natural regeneration may be considered.
- Maintenance requirements should extend for a minimum of two years after the completion of works or until such time as a minimum 80 per cent survival rate of each species planted and a maximum 5 per cent weed cover for the treated riparian corridor controlled activity is achieved.
- Project tasks should be defined and described, including a schedule detailing the sequence and duration of works necessary for the implementation of the VMP.
- Costings for the implementation of all components and stages of the work including materials, labour, watering, maintenance which includes plant replacement, monitoring and reporting should be prepared.
- Processes for monitoring and review, including a method of performance evaluation should be identified. This should include replacing plant losses, addressing deficiencies, problems, climatic conditions and successful completion of works.
- The height of each coffer dam should provide protection for a 1 in 10 year flood event, if possible. This would be subject to the construction contractor design of the coffer dam.
- Instream silt curtains are to be installed around each coffer dam to contain sediment which may be displaced from the coffer dam area.
- Water removed from the coffer dams is not to be discharged directly into the river if considered to be a pollutant under the POEO Act. This water is to be discharged to a vegetated area at least 100 m from the river and filtered through sandbags, or the like. If any waters extracted from the proposed coffer dams are proposed to be discharged to the river it must be certified that is of appropriate quality and treated as required prior to release.
- Coffers dams are to be inspected regularly and immediately repaired, as required. A thorough inspection is to be undertaken following flood events.
- Weather forecasts are to be monitored to anticipate the occurrence of high flow events, and work operations adjusted to accommodate possible overtopping of the coffer dams.
- Silt curtains are to remain in place until the coffer dams have been removed.
- Encroachment of the coffer dam into the river is to be minimised as far as possible.
- All debris, construction waste and accumulated sediment is to be cleared away from the site before the removal of the coffer dam.
- Stabilisation of the river bank is to be undertaken in accordance with NSW Office of Water's *Controlled Activities Guidelines* to provide long-term stabilisation and mitigation of erosion and sedimentation impacts.

6.4.4 Operational Impacts

Operation of the new WTP has the potential to impact on surface waters, including the adjacent waterways of Marshalls Creek and the Murrumbidgee River, through:

- Conveyance of sediment from unsealed/ unvegetated ground surfaces into waterways during storms or flooding. With mitigation measures this would be unlikely.
- Chemical contamination in the event of a chemical spill/ structure overflow on-site: controls have been included in the WTP design and would be implemented during operation to minimise any risk.
- Overflow from structures storing water: controls have been included in the WTP design and would be implemented during operation to minimise any risk.
- Ongoing release of supernatant to Marshalls Creek. The design of the new WTP is such that although the volume of supernatant discharged to the creek would increase, the TSS levels would be kept to below 30mg/L, as is currently the case. Although the concentration of TSS is not proposed to be increased, the total volume will be higher as a result of higher volumes of supernatant.
- Cessation of water input to Marshalls Creek (future).

Provisions for overflows of chlorinated water from the CWS and supernatant from the thickened sludge holding tank have been included in the design for the new WTP and would only occur during an emergency situation or when the process system is not operating correctly.

With regard to potential drawdown on groundwater sources during operation of the new WTP, the river has been shown to recharge the aquifers, rather than the aquifers recharging the river. In addition, once the new river water intake becomes operational, the existing river water intakes, which are located around 200 m downstream of the proposed intake location would no longer be operating. As RWCC is not intending to increase its extraction limit, it is considered unlikely that the operation of the new WTP would adversely affect existing groundwater recharge rates.

6.4.5 Operational Mitigation Measures

Measures to mitigate impacts on adjacent waterways include:

- Maintaining sealed and vegetated areas to reduce sediment being conveyed off-site.
- On-site containment of chemical spills e.g. bunds with 110% capacity around delivery points.
- Maintaining native plantings on the bank at river water intake site to facilitate long-term bank stabilisation.
- EPL to be updated to reflect higher volumes of supernatant expected to be discharged during normal high flows.
- Operation of the WTP is to be undertaken in accordance with EPA requirements.

Controls/ safeguards that would be incorporated into the upgraded water treatment process at the WTP to mitigate the risk of accidental release of chemicals into the environment include:

- Liquid storage tanks would be fitted with level indicators connected to local alarms and the WTP Supervisory Control And Data Acquisition (SCADA) system.
- Each liquid chemical storage area would have a local filling panel that controls the chemical storage filling process and includes local and remote alarms and hard-wired interlocks to prevent overfilling storage tanks.
- Relevant chemical systems and unloading areas would have sunken bunds to contain the chemical in the event of a spillage with bunds designed in accordance with AS3780 *The Storage and Handling of Corrosive Substances*. Bund drain valves would be normally closed and when opened, contents would be drained to an on-site chemical waste tank for later removal. Roofing over chemical storage bunds would substantially exclude rainwater.
- All chemical dosing lines would be laid in chemical trenches or trays where appropriate. The trenches would be covered with removable covers and have drains that divert to the wastewater system.
- All equipment (including injection equipment and dosing lines) would allow for easy and safe isolation, to facilitate quick repairs without total closure of the plant.
- Adequate access and roadway would be provided to allow for the delivery of chemicals into relevant vessels/storage spaces. This would include concrete or bitumen roadway and hardstand delivery areas adjacent to chemical storage units.
- Chemical delivery and storage areas would be bunded to contain accidental chemical spills.
- Turbidity analysers on the clarified water line from each clarifier would monitor individual clarifier performance monitoring. In addition, a clarified water sample would be sent to the laboratory for remote water quality analysis.
- Water quality sampling points would be located on various lines/ inlets/ outlets, such as raw water, pre-dosed water, flocculated water, clarified water and filtered water. Final water would be sampled at the outlet of the Clear Water Storage and tested for on-line Chlorine, pH and turbidity.

6.5 Flora and Fauna

6.5.1 Existing Environment

6.5.1.1 Terrestrial Flora

Existing Vegetation Mapping

To gain an overview of vegetation likely to occur within the study area, reference was made to vegetation mapping completed by the NSW Department of Climate Change and Water (2012) (now Office of Environment and Heritage (OEH)) as part of the NSW BioMetric Vegetation Type Classification and Assessment. The Central Southern NSW and the Murrumbidgee Catchment Management Authority vegetation map sheets (OEH, 2014) indicates the riparian habitat within the study area (i.e. the remnant vegetation along the Murrumbidgee River and part of Marshalls Creek) to be Inland Riverine Forests (see Figure 6-6). The mapping further indicates that the WTP site and surrounding areas on the southern floodplain was once dominated by Yellow Box Woodland, however, due to a history of disturbance, clearing and invasion by introduced species, this community is no longer represented on-site.



Figure 6-6: OEH vegetation mapping for local area

Flora Survey

This section provides a summary of the flora survey results and vegetation characteristics of the study area. The full list of species recorded during the flora survey is presented in the Flora and Fauna Assessment Report included as Appendix C to this EIS.

The study area was traversed on foot by two ecologists on the 19 May 2014 to identify ecological characteristics, describe flora and fauna species and habitats present. The 'random meander' method (Cropper 1993) was used to assess flora species and vegetation communities. Searches for threatened species, populations and communities were also undertaken. The study area included the proposal site as well as the banks of the Murrumbidgee River and Marshalls Creek adjoining the WTP site.

The study area is of generally flat topography tapering down towards the Murrumbidgee River along the northern side of the study area and Marshalls Creek along the western side of the study area. Vegetation on the banks of the Murrumbidgee River and Marshalls Creek comprises Inland Riverine Forest dominated by River Red Gum (*Eucalyptus camaldulensis*), with Grey Box (*Eucalyptus macrocarpa*) occurring as a sub-dominant. The understory comprises native shrubs including Silver Wattle (*Acacia dealbata*) and Black Wattle (*Acacia decurrens*) and juvenile eucalypts (including Lemon-scented Gum (*Eucalyptus citriodora*)) and a ground layer dominated by native and exotic species. One declared noxious weed species was observed onsite, namely Willow (*Salix* sp.).

Other vegetation within the proposal site consists of native and exotic garden trees including Kurrajong (*Brachychiton populneus*) and Canary Island Date Palm (*Phoenix canariensis*), shrubs and vines (including Rose Bush *Rosa* sp. and Japanese Honeysuckle *Lonicera japonica*), exotic and native grasses (including Couch *Cynodon dactylon* and Windmill Grass *Chloris truncata*) and weeds (see Appendix C). This vegetation is classed as Cleared Land and is not consistent with any native vegetation community type. Ecological connectivity within the study area is limited to linear corridors of riparian vegetation along the Murrumbidgee River and Marshalls Creek.

The level of disturbance to vegetation was found to vary across the study area, ranging from cleared (dominated by exotic grasses and weeds), landscape plantings (a mix of exotic and native species) through to riparian vegetation containing a mixture of native and exotic vegetation. The riparian zone along Marshalls Creek is dominated by exotic groundcover species and canopy trees (predominantly River Red Gums). In some section along the creek, such as under the overhead power transmission lines, canopy and understorey layers are absent. The various levels of disturbance are due to previous clearing activities to facilitate road and infrastructure works in the WTP.

Threatened Flora

A search of the Atlas of NSW Wildlife (accessed 20th May 2014) revealed three threatened flora species listed on the NSW *Threatened Species Conservation Act 1995* (TSC Act) have been recorded within a 10 km radius of the study area (Figure 6-7). Reference to the EPBC Act Protected Matters Search Tool Report revealed no threatened flora species listed on the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) have potential to occur within a 10 km radius of the study area (Appendix C).

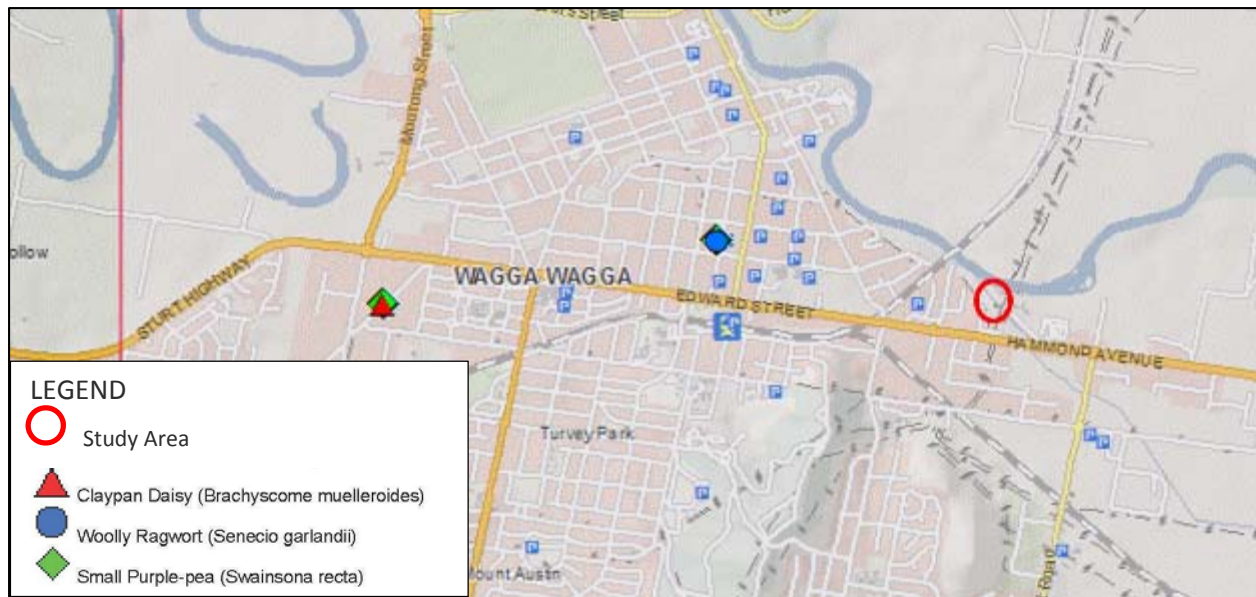


Figure 6-7: Threatened flora species recorded within 10 km of study area (zoomed in)

No threatened flora species were identified during the field survey. The Flora and Fauna Assessment Report (including as Appendix C to this EIS) presents a list of the threatened flora species identified from the database searches, along with a description of their habitat requirements and an assessment of the likelihood of occurrence in the study area. The assessments presented in Appendix C determined that the study area is unlikely to support potential habitat for threatened flora species. None of the flora species to be removed during the proposed works are listed as threatened species. 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.

6.5.1.2 Endangered Ecological Communities

Searches of the Atlas of NSW Wildlife database for Endangered Ecological Communities (EECs) revealed no State-listed EEC with the potential to occur in the study locality. The Protected Matters Search Tool Report revealed the following three nationally-listed EECs as having potential to occur within the study locality:

- 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.

Habitat assessments and field surveys found that the remnant vegetation within the study area, namely Inland Riverine Forest, is not consistent with any of the three EECs listed above or any other EEC listed on either the TSC Act and/or EPBC Act. Inland Riverine Forest is not listed as a threatened ecological community, however, any clearing or disturbance of the riparian vegetation along Marshalls Creek and the Murrumbidgee River may have indirect impacts on the '*Aquatic Ecological Community in Natural Drainage System of the Lower Murray River Catchment*' which is listed as an endangered ecological community under Part 3, Schedule 4 of the *Fisheries Management Act 1994*. An assessment of significance of impact ('Seven Part Test') of the proposed works on the EEC has been undertaken and is presented in the Flora and Fauna Assessment Report (Appendix C). The Seven Part Test concludes that the proposed works are unlikely to have a significant impact on the EEC.

6.5.1.3 Terrestrial Fauna

This section provides a summary of the terrestrial fauna habitats of the study area and an overview of fauna species recorded. A full list and general abundance of fauna species recorded during the survey is presented in the Flora and Fauna Assessment Report (Appendix C).

Fauna Survey Methodology

Opportunistic fauna surveys and habitat assessments 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 along the bank of the river adjoining the WTP site.

A targeted Grey-headed Flying-fox survey was undertaken at dusk on the southern bank of the Murrumbidgee River between the proposal site and the Grey-headed Flying-fox colony (see Figure 6-9) to:

- identify the location of roost sites near the proposal site;
- estimate the size of the population; and
- determine the direction of flight of bats leaving the roost site; and
- determine if the species utilises vegetation within the proposal site as foraging habitat.

Habitat types

Most of the study area is dominated by cleared land and existing infrastructure, providing minimal habitat for native fauna. Habitat for native terrestrial fauna is generally limited to riparian woodland dominated by a discontinuous canopy of River Red Gum and Grey Box along Marshalls Creek and the Murrumbidgee River.

Terrestrial habitats within the study area include:

- Fallen timber and dead wood (including snags) on the lower banks of the river that provide suitable habitat for ground-dwelling terrestrial species such as reptiles and mammals.
- The sandy/silty river bank which would provide burrowing opportunities for reptiles, mammals and birds (e.g. Rainbow Bee-eater) and may be used by terrestrial species to access the river and creek.
- Mature eucalypts with hollows, ranging from small to large, provide refuge, roosting and nesting habitat for a range of hollow-dependent birds and mammals.
- Canopy trees, particularly River Red Gum, within the riparian vegetation provide foraging habitat for nectar and pollen consumers such as flying-foxes, possums, gliders and honeyeaters and for insectivores such as microbats which would feed on insects above and/or below the tree canopy.
- River Red Gum, which is a primary food tree species for Koala in the Murrumbidgee Catchment Area.
- Remnant canopy trees along Marshalls Creek would provide a movement corridor for mobile species such as birds, bats and to a lesser extent, arboreal mammals.

The field survey identified two hollow-bearing trees (River Red Gums) in the riparian zone of the river within 10 m of the proposed works (Figure 6-8). The hollows are small (less than ten centimetres), providing potential shelter/ breeding habitat for small to medium-sized hollow-dependent birds (e.g. parrots), arboreal mammals (e.g. gliders) and microchiropteran bats. The proposed works would not require the removal of these hollow-bearing trees. A large number of hollow-bearing trees also occur

along Marshalls Creek (see Figure 6-8 and Photo 6), with hollows ranging from small to large, however these hollow-bearing trees have not been individually mapped.



Figure 6-8: Hollow bearing trees within the study area (outlined in red)

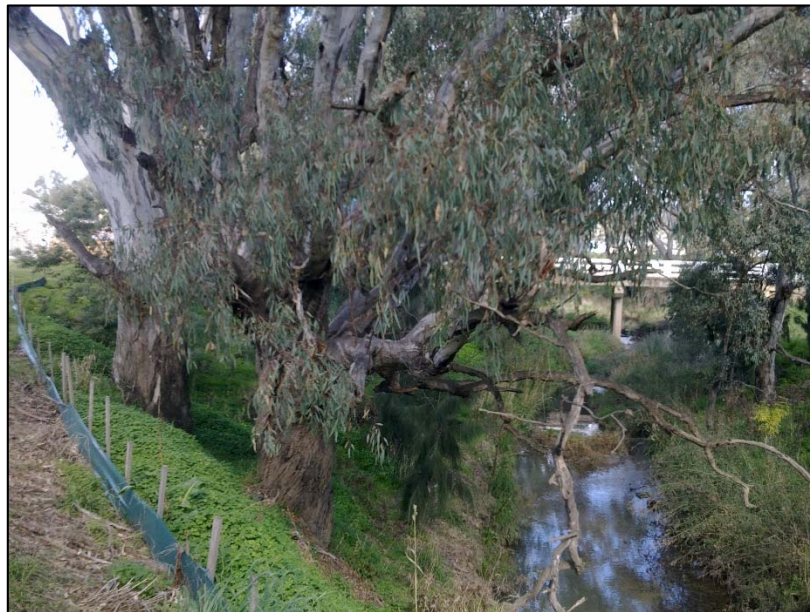


Photo 6: Large hollow-bearing River Red Gums along Marshalls Creek (view south towards bridge)

Fauna Species

Opportunistic observations made during the survey recorded a total of 20 species of birds, two species of mammals and two species of reptiles in the study area. This included a colony of Grey-headed Flying-foxes roosting in two locations within proximity to the proposal site, on Bat Island and the northern side of the river (see Figure 6-9). During targeted surveys, individual bats were observed to be flying over the proposal site and using vegetation within the proposal site for foraging. No introduced species were detected during the surveys.



Figure 6-9: Location of Grey-headed Flying-fox colony roost sites (outlined in yellow)

Threatened Terrestrial Fauna

A search of the Atlas of NSW Wildlife (accessed 20th May 2014) revealed 20 threatened fauna species listed on the TSC Act have been recorded within a 10 km radius of the study area. Of these species, five have been recorded within 2 km of the proposal site over the past 15 years (see Figure 6-10).

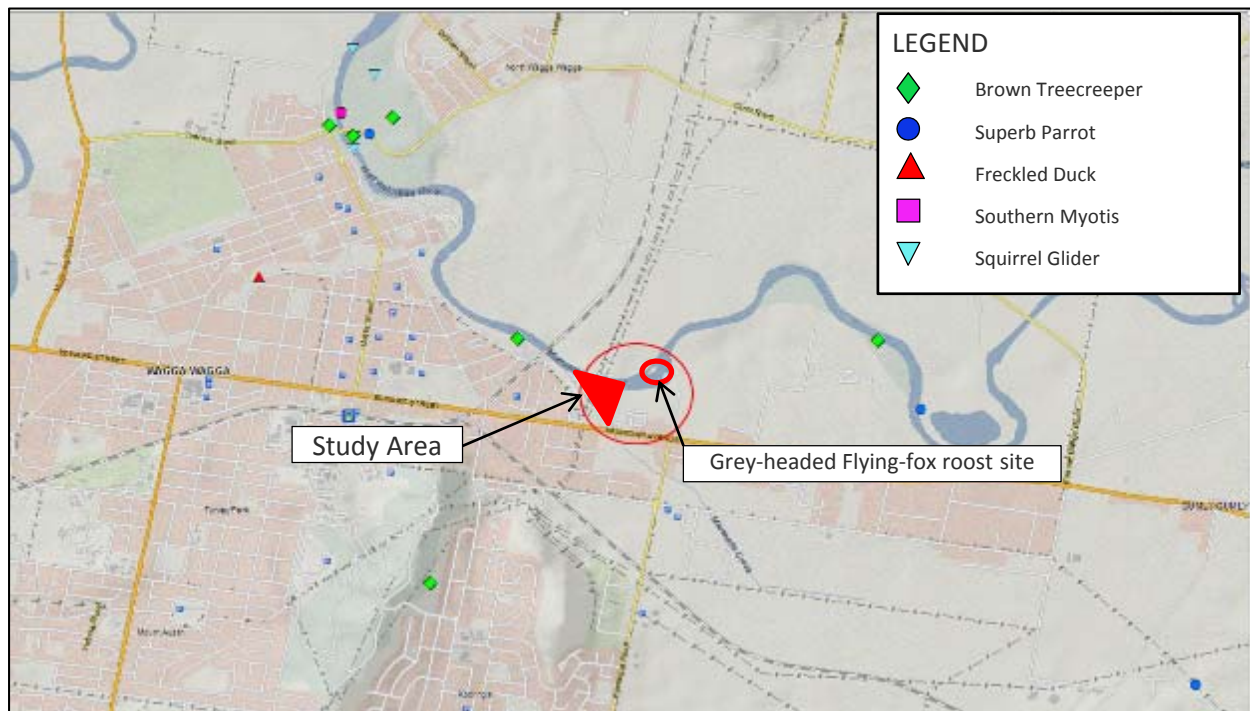


Figure 6-10: Recent records for threatened fauna species within 2 km of the study area (red triangle)

In addition, reference to the Protected Matters Search Tool Report produced for this assessment (see Appendix C) indicates that 13 threatened fauna species and nine migratory species listed on the EPBC Act may occur if suitable habitat is present.

During the field survey, an assessment of the suitability of habitat for threatened fauna identified from database searches was undertaken. The study area provides potential habitat for a number of threatened species including woodland and riparian birds, arboreal mammals and microbats. River Red Gum is recognised as a primary food tree species for Koala (*Phascolarctos cinereus*) in the Murrumbidgee Catchment Management Area. No Koalas, or evidence of their presence (such as scats) were recorded during the field survey. The lack of local records suggests that the study area is unlikely to provide important habitat for a local population of Koala.

Potential foraging habitat for the species is provided by flowering canopy trees in the study area. The Grey-headed Flying-fox was recorded in the study area during the field survey and individuals were heard vocalising and were observed on Bat Island.

The Grey-headed Flying-fox is listed as 'vulnerable' on both the TSC Act and EPBC Act. An Assessment of Significance of impact of the Proposal on the species is provided in the Flora and Fauna Assessment Report (see Appendix C of this EIS).

6.5.1.4 Aquatic Ecology

Aquatic habitats

Aquatic habitats within the study area are associated with the Murrumbidgee River and Marshalls Creek. The Murrumbidgee River is the only large, permanent waterway in the Wagga Wagga area, and is a major tributary of the Murray River within the Murray-Darling basin. Marshalls Creek is a small, free flowing creek that drains into the Murrumbidgee River. Tributaries of Marshalls Creek including Crooked Creek, Stringybark Creek and Gregadoo Creek.

The riparian vegetation along the creek provides shading and organic input for the aquatic food web. No instream vegetation, such as reeds or rushes, was observed in the main creek channel. Shelter / breeding habitat such as snags were generally absent and the channel appeared to be eroded down to bedrock.

As well as receiving supernatant discharge from the existing WTP, Marshalls Creek receives directed stormwater runoff from areas south of the Sturt Highway and west of the creek, as well as tertiary treated effluent discharged from sludge lagoons associated with the Koorinal Sewage Treatment Plant (STP) located upstream from the WTP. An ecological assessment report prepared for the Wagga Wagga and North Wagga Wagga Murrumbidgee River Levee Upgrades (GHD 2012) states that discharge from the STP is responsible for most of the permanent flow of the creek. The literature search undertaken for this EIS did not reveal any data on the water quality within Marshalls Creek, however field observations found the waterway to be quite turbid (Photo 7). A weir near RWCC's footbridge (which is located near the existing Clear Water Tank – see Figure 3-2) prevents fish moving between upstream habitat and the river, except during flood events when fish species may use the creek for spawning up-stream. Platypus may forage within the creek, more likely downstream near the confluence with the river than in reaches upstream of the Hammond Avenue Bridge.



Photo 7: View of Marshalls Creek from western boundary of WTP site

The Murrumbidgee River is a major tributary to the Murray River within the Murray-Darling basin. Where it flows along the northern boundary of the WTP site, the width of the main river channel is around 90 to 100 m, while between the upper banks it is up to 150 m wide. The banks are severely eroded and undercut, particularly in the vicinity of the existing river water intakes (Photo 8).

The WTP site is situated on the outer bend of the river, where hydraulic energy levels would be high, particularly during high flow / flood events. Reference to historic aerial photography indicates that large River Red Gums on the south bank have fallen in the last 10 years as a result of high energy flows destabilising the bank.

The profile of the south bank of the river varies along the northern boundary of the WTP. Towards the east, the profile generally comprises a moderately steep upper bank leading down to a gently sloping river terrace, followed by a moderately steep lower bank (Photo 9). Towards the west, the bank profile is more consistent and steeper (Photo 10).

Aquatic habitat features within the river which would provide foraging, breeding and shelter habitat for a range of aquatic fauna include open water, riffles, depositional bars and snags.



Photo 8: View of eroded south bank, looking west towards existing river intake



Photo 9: View of Murrumbidgee River towards roosting site of Grey-headed Flying-fox colony on northern bank.



Photo 10: View of steep bank adjacent to existing river intake

Habitat features associated with the river and the creek include:

- Fallen timber and dead wood (including two large snags around 10 m downstream of the proposed river intake) on the lower banks and bed of the river that provide suitable habitat for ground dwelling terrestrial species as well as shelter, breeding and foraging habitat for aquatic species such as macroinvertebrates and fish.
- The sandy/silty river bank which would provide burrowing opportunities for Platypus and crustaceans.
- Aquatic environments associated, such as open water, pools, riffles, submerged woody debris, sandy/silty substrate would provide foraging, breeding and shelter habitat for a range of aquatic fauna such as fish, tortoises, macroinvertebrates and waterbirds.

Threatened Aquatic Fauna

The aquatic environments of the Murrumbidgee River and Marshalls Creek contain potential habitat for a number of threatened fish occurring in the locality, namely Silver Perch (*Bidyanus bidyanus*), Trout Cod (*Maccullochella macquariensis*) and Murray Cod (*Maccullochella peelii*). These species are known to occur in the Murrumbidgee River where the Trout Cod and Murray Cod use snags for refuge and foraging and the Silver Perch may use the river bed for spawning. These habitats are generally widespread, however, and not confined to the study area.

Aquatic Ecological Community in Natural Drainage System of the Lower Murray River Catchment

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* (Lower Murray Aquatic EEC). The aquatic environments associated with Marshalls Creek and the Murrumbidgee River are considered to form part of this EEC. The Lower Murray Aquatic EEC includes all native fish and aquatic invertebrates in all natural creeks, rivers, and associated lagoons, billabongs and lakes of the regulated portions of the Murray River (also known as the River Murray) downstream of Hume Weir, the Murrumbidgee River downstream of Burrinjuck Dam, the Tumut River downstream of Blowering Dam and all their tributaries, anabranches and effluents (Fisheries Scientific Committee, undated). The Lower Murray Aquatic EEC occurs in a lowland riverine environment, characterised by meandering channels and wide floodplains in generally flat to gently sloping terrain. Lowland rivers provide a wide range of habitats

for fish and invertebrates, including pools, runs or riffles, backwaters and billabongs, large woody habitats and aquatic plants (DPI, 2007).

In its natural state, the area occupied by this community was characterised by a seasonal pattern of winter/spring high flows and floods and summer/autumn periods of low flow. Many species rely on this seasonal flow pattern for successful reproduction (Fisheries Scientific Committee, undated). The aquatic ecological community of the lower Murray River drainage system has been greatly modified since European settlement, through activities such as river regulation, agricultural practices and the introduction of non-native species. Many aquatic habitats are now degraded, and many native species have experienced declines in their numbers and distribution – some to the point where they are now listed as threatened (DPI, 2007).

Platypus

Although the Platypus is not listed as a threatened species on the TSC Act or FM Act, it is an iconic native species facing threats from various sources such as reductions in stream and river flows, habitat modification due to bank erosion and stream sedimentation. All native fauna species in NSW are 'protected' under the *National Parks and Wildlife Act 1974* (NPW Act), and care should be taken to avoid direct injury or mortality to the species.

A search of the Atlas of Wildlife database revealed the Platypus has been recorded within the locality of the WTP site (see Figure 6-11). Personal communication provided by RWCC personnel revealed Platypus are often observed in the vicinity of the existing river water intakes, near the confluence of the river and Marshalls Creek. Platypus was not recorded during the field surveys undertaken for this assessment, nor were any burrows. However, potential burrow habitat is provided in sections along the river and creek where sandy banks, combined with overhanging vegetation at creek level, provide suitable conditions for Platypus burrows. The proposed location for the new river water intake does not contain suitable burrowing habitat as these features are absent.

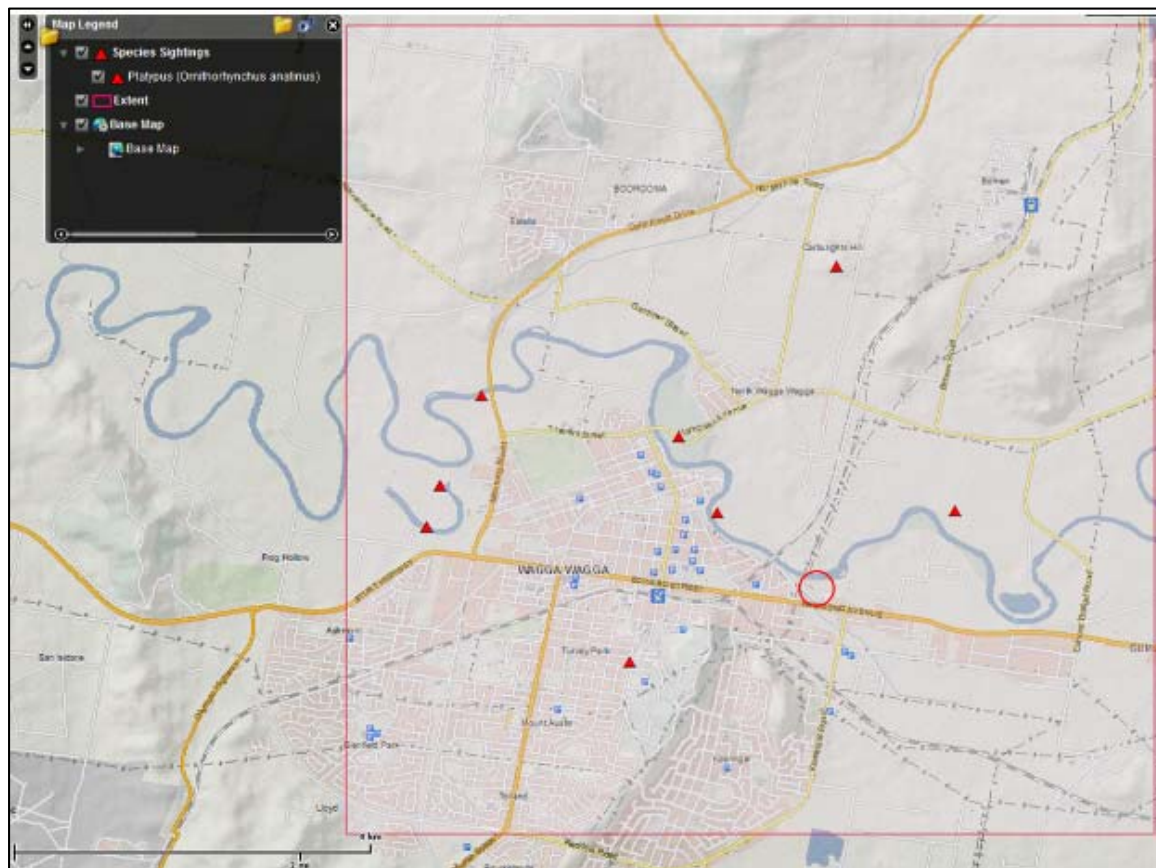


Figure 6-11: Platypus records (red triangles) within a 10 km radius of the study area (red circle).

6.5.1.5 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystems (GDEs) are ecosystems which are dependent in whole or in part on water reserves held in the ground and range from 'facultative' to 'obligate' based on their extent of dependency. The vegetation making up a GDE can have varying degrees of dependency on the groundwater. Obligate GDE's are made up of species that depend entirely on the groundwater, while facultative GDE's contain species that access the groundwater via the capillary fringe and also take up water from within the soil matrix above the capillary fringe.

GDE's include a range of ecosystems, such as:

- wetlands;
- terrestrial vegetation;
- stream base flows; and
- aquifer/cave ecosystems (DLWC, 2002).

Shallow groundwater can support terrestrial vegetation, such as forests and woodlands, either permanently or seasonally. Inland examples include River Red Gums along riverbanks and on floodplains of large rivers in the Murray Darling Basin (DLWC, 2002).

In a semi-arid climate such as Australia's, where groundwater is available an ecosystem will use it and is likely to become dependent upon it, at least partially if not entirely. This means that if the availability of groundwater is reduced, or the water quality is allowed to deteriorate, there will be impacts on these ecosystems (Hatton and Evans, 1998).

The *Water Management Act 2000* (WM Act) includes objects and principles aimed specifically at protecting and restoring water-dependent ecosystems. The *State Groundwater Dependent Ecosystems Policy* was developed to ensure these principles are implemented in NSW.

The principles of the *State Groundwater Dependent Ecosystems Policy* (DLWC, 2002) are as follows:

- The scientific, ecological, aesthetic and economic values of groundwater dependent ecosystems (GDEs), and how threats to them may be avoided, should be identified and action taken to ensure that the most vulnerable and the most valuable ecosystems are protected.
- Groundwater extractions should be managed within the sustainable yield of aquifer systems, so that the ecological processes and biodiversity of their dependent ecosystems are maintained and/or restored. Management may involve establishment of threshold levels that are critical for ecosystem health, and controls on extraction in the proximity of GDEs.
- Priority should be given to ensuring that sufficient groundwater of suitable quality is available at the times when it is needed:
 - For protecting ecosystems which are known to be, or are most likely to be, groundwater dependent; and
 - For GDEs which are under an immediate or high degree of threat from groundwater-related activities.
- Where scientific knowledge is lacking, the Precautionary Principle should be applied to protect GDEs. The development of adaptive management systems and research to improve understanding of these ecosystems is essential to their management.
- Planning, approval and management of developments and land use activities should aim to minimise adverse impacts on GDEs by:
 - Maintaining, where possible, natural patterns of groundwater flow and not disrupting groundwater levels that are critical for ecosystems;
 - Not polluting or causing adverse changes in groundwater quality; and
 - Rehabilitating degraded groundwater systems where practical.

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

GDE Atlas revealed a number of Groundwater Dependent Ecosystems (GDE) have been identified within the study locality (Figure 6-12). Remnant native vegetation within the riparian zones of the river and Marshalls Creek is likely to function as a facultative terrestrial GDE, with its dependency on groundwater increasing when surface water becomes less available e.g. during drought.

Construction and operation of the new WTP would be undertaken such that the principles of the State Groundwater Dependent Ecosystems Policy would not be compromised. Potential impacts on groundwater during construction of the river water intake would be temporary and localised, and operation of the new WTP would not require an increase in the current volume of groundwater extracted.

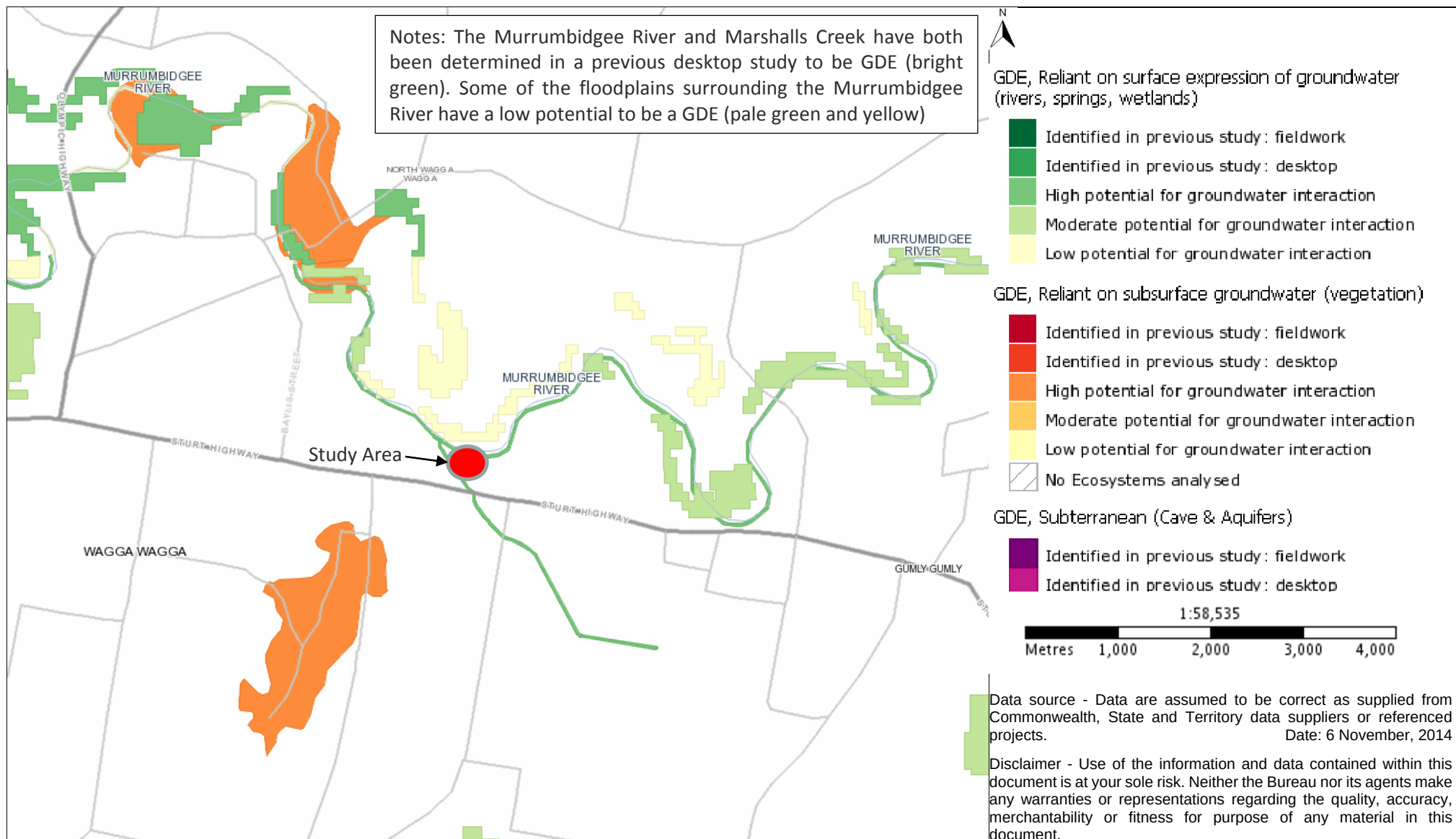


Figure 6-12: Groundwater dependent ecosystems in the locality of the study area (Bureau of Meteorology, National Water Commission and NSW Office of Water)

6.5.2 Construction Impacts

6.5.2.1 River Water Intake

The element of the proposed works posing the greatest risk of adverse ecological impact is construction of the river water intake. Construction activities would include excavation of the river bank from the top of the bank down to the river bed. The river bed itself would require excavation to a depth of around 1.7 m below existing bed level to achieve sufficient submergence. A temporary coffer dam would be required during construction of the river intake. Direct impacts resulting from construction of the river water intake include:

- Removal of three Black Wattle (*Acacia decurrens*), which provide potential habitat for pollen-consuming birds and arboreal mammals as well insectivores which consume insects attracted to flowering wattles), together with a ground layer dominated by introduced grasses and forbs.
- Removal of habitat for benthic (substrate-dwelling) aquatic macroinvertebrates.
- Removal of potential foraging habitat for Platypus and fish.
- Entrapment of aquatic fauna within the coffer dam and dewatering.
- Noise disturbance for fauna, including the Grey-headed Flying-fox.

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 'Bat Island' which is situated within the Murrumbidgee River, north-east of the proposal site). Approximately 350 individuals currently roost in this colony, although the flying-foxes 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 river intake (including sheet-piling the coffer dam), as this is the proposal element which is closest to the bat colony. In addition, construction activities would be undertaken at river level and sound travels better over water. 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).

The proposal is not likely to have a significant impact on the local Grey-headed Flying-fox population if it is undertaken during winter months when the species is not likely to be breeding in the area and the local population is largely absent. 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.

Construction activities associated with the river water intake also have the potential to result in:

- The release of a high sediment load into the river through potential collapse of the coffer dam, e.g. during storm / flood smothering aquatic substrates and causing high turbidity levels.
- Runoff from the river bank during trenching conveying sediment into the river and smothering benthic habitats and increasing turbidity levels.
- The invasion and spread of noxious weeds.
- Sedimentation impacts on potential habitat for threatened fish species such as Murray Cod, Macquarie Perch and Silver Perch.

The proposed river water intake would be constructed in an area that has not been identified as containing Platypus burrows. The potential for construction of the intake to remove suitable burrowing habitat for the Platypus is considered to be low, given that the site does not present characteristics usually associated with Platypus burrow habitat e.g. stable river bank and intact overhanging vegetation.

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 riparian environment and is likely to be disturbed during construction of the proposal.

Construction of the river water intake has the potential to impact upon habitat for three threatened fish species occurring in the Murrumbidgee River. These include the Murray Cod (*Maccullochella peelii*), Macquarie Perch (*Macquaria australasica*) and Silver Perch (*Bidyanus bidyanus*). The proposal could potentially impact these species through sedimentation caused by erosion, dredging and reclamation of the river bed and replacement of benthic habitat with a permanent instream structure. A Seven Part Test (TSC Act) and Assessment of Significance (EPBC Act) was undertaken for these threatened species and is included with the Flora and Fauna Assessment Report included as Appendix C to this EIS. The Seven Part Test concludes that the proposed works are unlikely to have a significant impact on any of these three species. No other species listed on the FM Act is expected to be impacted by the proposed works.

Any proposed works within either Marshalls Creek or the Murrumbidgee River, including construction and operation of the new river intake and removal of the existing intakes, would directly impact the Lower Murray Aquatic EEC. In addition, clearing or disturbance of riparian vegetation along the creek and/or the river has the potential to indirectly impact the EEC, such as through bank destabilisation, erosion, sedimentation and loss of carbon inputs to the aquatic food web.

An assessment undertaken to determine the significance of the proposed works on the EEC (i.e. Seven Part Test presented in Appendix C of this EIS) concluded that the proposed works are not likely to significantly impact the Lower Murray Aquatic EEC, based on the following:

- Natural river flows would not be permanently altered;
- The proposal would not cause changes in thermal temperatures of the Murrumbidgee River;
- The introduction of pest species would not occur as a result of the proposal;
- Sedimentation controls would be in place to prevent sedimentation on the river;
- Snags would not be removed during construction of the proposal;
- Agricultural practices do not form part of the Proposal; and
- Fishing would not be occurring as part of the Proposal apart from the possible removal of fish from one or more of the coffer dams and immediate release back into the river.

During construction of the river water intake, excavation works may encounter groundwater, necessitating dewatering. It is considered that this is unlikely to result in pressure on groundwater resources, nor is any GDE in the locality likely to be impacted, as the dewatering would be temporary and localised. The extracted groundwater would be pumped and passed through erosion and sediment controls (sediment filters and traps, barley bales) and across grassed areas to infiltrate the soil and/or evaporate.

6.5.2.2 Water Treatment Plant Site

With the exception of the river water intake site, construction of the new water treatment plant would be undertaken within previously cleared areas, with removal of native vegetation limited to six semi-mature trees on the proposal site. These trees are not a threatened species nor do they comprise species characteristic of an EEC listed on the TSC Act and/or EPBC Act.

Potential impacts to fauna would include:

- Disturbance and removal of trees which are foraging habitat for flying-foxes 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 provided by trees in riparian vegetation on adjacent lands.

The assessment of significance of impact undertaken for the Grey-headed Flying-fox (see Flora and Fauna Assessment Report in Appendix C of this EIS) concluded that impacts on the species are unlikely to be

significant as only a minimal amount of potential foraging habitat would be cleared and construction noise is unlikely to be of a level that would cause adults to desert the camp site, leaving dependent young to die especially considering major construction noise like piling operations will not be occurring.

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

6.5.3 Consideration of NSW Biodiversity Offsets Policy for Major Projects

The *NSW Biodiversity Offsets Policy for Major Projects* clarifies and standardises biodiversity impact assessment and offsetting for major project approvals in NSW. The policy applies to state significant development and state significant infrastructure under the NSW planning system, collectively referred to as 'major projects'.

Biodiversity offsets sit within a hierarchy of 'avoid, minimise, offset'. This means that the first priority is to avoid any unnecessary impacts of a proposed development on biodiversity. Where impacts cannot be avoided, a reasonable attempt must be made to minimise any impact. When all feasible measures have been taken to avoid and minimise the impacts, offsets should be used to compensate for any remaining impacts.

Biodiversity offsets provide benefits to biodiversity to compensate for adverse impacts of an action and comprise areas of land that are protected and managed to improve biodiversity values. Requirements for offsets are determined using an objective assessment of predicted loss of biodiversity at the development site and expected gain in biodiversity to be achieved at the offset site.

Based on the outcomes of the Flora and Fauna Assessment, acquirement of an offsets site for the Proposal is not considered warranted. The proposed works is unlikely to have an adverse impact on biodiversity, based on the following:

- The construction of the river water intake, including establishment of the coffer dam, would be timed to avoid the breeding season of the Grey-headed Flying-fox.
- Selection of the site for the new river water intake included avoiding removal of stags and mature River Red Gums on the bank of the river.
- Vegetation removal would be limited to negligible areas of potential foraging habitat for highly mobile birds, as well as the Grey-headed Flying-foxes.
- No important habitat features, such as hollow-bearing trees or flying-fox roost sites, would be removed or disturbed as part of the proposed works.
- Fauna species likely to utilise the habitat in the study area would be highly mobile and disturbance tolerant, as the existing environment is highly disturbed and modified.
- No area of vegetation consistent with an endangered ecological community listed under the TSC Act or EPBC Act would be removed as part of the proposed works.

The application of the measures presented in 6.5.4 are expected to minimise the impacts on biodiversity to the extent that residual impacts would be minimal. Therefore, no further consideration of the NSW Biodiversity Offsets Policy for Major Projects is warranted for the Proposal.

6.5.4 Construction Mitigation Measures

The following mitigation measures are to be incorporated into the Construction Environmental Management Plan (CEMP) for the proposed works:

- The CEMP is to include a site plan identifying the location of sensitive habitats in the vicinity of the proposed work site e.g. Marshalls Creek, hollow-bearing River Red Gums.
- No hollow-bearing trees are to be removed.
- Construction workers are to be inducted and updated on the environmental risks of construction activities, particularly at the river intake location, via toolbox meetings.
- Appropriate erosion and sediment control procedures are to be implemented for all construction works adjacent to, and within, riparian areas such as the banks of Marshalls Creek and the Murrumbidgee River to avoid erosion of the river banks and smothering of vegetation and habitats.
- 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.
- During de-watering of the coffer dam, entrapped native fauna such as fish and tortoises, are to be removed and immediately released to the river. Exotic fish species such as European Carp (*Cyprinus carpio*) would be euthanased and not returned to the river.
- Construction of the river intake site is to be undertaken during the winter months when dependent flying-fox young are unlikely to be present in the Grey-headed Flying-fox colony on Bat Island and dependent Platypus young are unlikely to be present in burrows.
- No large snags, including the two large fallen trees adjacent to the proposed river intake site, are to be removed during the construction works.
- Incorporate fish screens into the design of the river intake to minimise fish (including larval stages) entry and entrainment.

6.5.5 Operational Impacts

Impacts that may occur during operation of the new WTP include the following:

- An exacerbation of the existing soil erosion issues along the river bank resulting from the construction of the water intake.
- Spread of weeds on the upgraded WTP site.
- Changes in the discharge of supernatant to Marshalls Creek.
- Entry and entrainment of fish (including larval stages) in the river intake.
- Noise impacts on fauna, in particular the Grey-headed Flying-fox (see Section 6.5.2.1 for further details).
- Potential chemical contamination of local waterways.

Operation of river water intakes has the potential to impact on the aquatic faunal assemblage of rivers through the entry and entrainment of fish (including larval stages), directly removing fish and larvae from the river system or, as a minimum, causing injury. Factors influencing the impact of entry and entrainment on fish and larvae include:

- Timing of water intake. Water intake during spawning times, larval development/migration and high fish activity would result in greater loss of larvae and fish.
- Positioning of the intake pipe entrance near the bottom of the river and into the water flow of the river would cause more larvae and fish to be entrained.
- Placement of the water intake pipes in areas of fish activity including breeding and spawning zones.
- A lack of screening on the pipe entrance allowing fish entrainment.

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 result from insufficient vegetation cover or erosion control measure being established.

The aquatic environment of Marshalls Creek is unlikely to be affected by the anticipated change in supernatant discharge. It is expected that the proposed WTP upgrade would result in similar volume of discharge, or slightly higher, levels of suspended solids. In the event of a supernatant return line being commissioned in the next stage of the WTP upgrade, the cessation of discharge to the creek is not likely to adversely affect the flow of the creek as the discharge is a minor source of flow input to the creek.

Chemicals would be required in the treatment process train at the new plant, posing a potential risk of release of chemicals into the natural environment. This includes potential chemical contamination of the Murrumbidgee River and Marshalls Creek. The risk of such an incident occurring, however, is considered low, based on the range of safeguards that have been incorporated into the design of the new WTP (see Section 6.14.2.3 for further details).

Operation of the new WTP is unlikely to impact on GDEs in the locality, as the Proposal does not include increasing the current rate of extraction of groundwater for water supply.

Mitigation measures to address potential impacts on terrestrial and aquatic ecology during operation of the new plant are presented in the following section.

6.5.6 Operational Mitigation Measures

Measures to mitigate impacts on terrestrial and aquatic ecology during operation of the new WTP include:

- The Detail Design for the river water intake is to incorporate fish screens designed in accordance with *Development of fish screening criteria for water diversions in the Murray-Darling Basin* (Boys et. al. 2012) to prevent entrainment of fish (including larval stages) in the river intake.
- Ongoing monitoring of bank stabilisation works at the river water intake location to identify whether any remedial works, such as replacing native plantings which have died or been washed away by floodwaters, are required.
- Regular inspections of the river intake screens to identify if repairs are required.
- Design controls which contain any potential chemical spills or tank overflows from entering the river or Marshalls Creek.

Regular monthly monitoring of the WTP site, particularly the location of the river water intake 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.

6.6 Non-Indigenous Heritage

6.6.1 Existing Environment

The Wagga Wagga WTP is heritage listed at the local level. Previously, there has been no investigation or assessment of significance as part of this listing. A Heritage Impact Statement (HIS) for the site has been prepared as part of this investigation and is included as Appendix D to the EIS.

The site was set aside for a water treatment plant from the 1870s, with construction commencing in the early 1890s. In 1896 the plant was opened and commenced supplying water. There were initial problems with water cleanliness, as a filtration system was not installed. A series of settling tanks were used to try to attain a clean water supply. Throughout the twentieth century additional demands were placed on the plant as the growth of the service region and technological changes made altering the site and its buildings necessary. Some alterations were not successful, due to inferior construction methods and materials. As a result, construction and alterations have occurred in a haphazard way with no specific plan in place for the heritage values or aesthetics of the site.

The approach taken in the past and the actions of those managing projects has seen the main building preserved and adjoining structures are for the most part sympathetic to the heritage values of the site. Part of the core heritage value of the site is the adaptive reuse of older structures to maintain usability and promote longevity.

The existing environment is a complex of buildings that reflect architecture and aesthetics that were prevalent at the time of construction. To date a heritage assessment of individual components of the site has not been undertaken. A Conservation Management Plan is being prepared for the site. Although it is still in draft stage, its findings on the significance of individual buildings were available for the HIS (see Appendix D). No buildings were found to have exceptional significance. Buildings that have high heritage value include:

- The original pump-house, located near the western boundary of the site (Photo 11).
- A Victorian-era dwelling, known as 'Riverside Residence' located near the northern boundary of the site (Photo 12).

Buildings found to have moderate or contributory heritage value are:

- A 1930s workshop, located centrally on the complex (Photo 13);
- The 1920s boiler house (Photo 14);
- The brick water well (Photo 15);
- The concrete chimney (Photo 16);
- Two oak trees (Photo 17).

Structures which would be directly impacted by the proposed works include the river water intakes located on the riverbank (Photo 18) which would be decommissioned and removed following commissioning of the new river water intake. These structures were assessed in the HIS as having little heritage value, as were the remaining structures and buildings occurring on-site (see Appendix D).

The curtilage, or the surrounding area that contributes to the heritage values of the Riverside Residence, has not been previously designated. The proposed WTP layout includes a road between the residence and the new infrastructure. This would allow for the cottage to be a part of the functioning of the WTP, without being encroached on.



Photo 11: Original pump-house



Photo 12: Riverside Residence



Photo 13: 1930s Workshop, right side of the image at the rear



Photo 14: 1920s Boiler House (left)



Photo 15: Brick water well

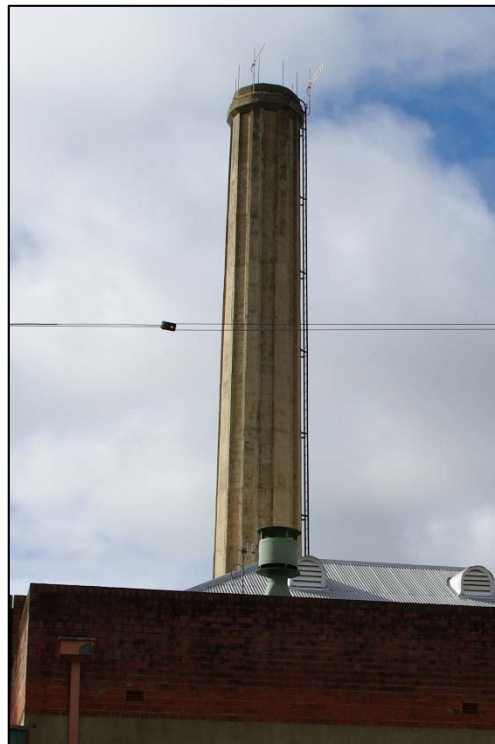


Photo 16: Concrete chimney



Photo 17: Oak trees



Photo 18: Existing river water intakes

6.6.2 Construction Impacts

No buildings or structures identified as having potential Heritage value would be removed during construction of the WTP replacement. Construction works, however, has the potential to impact on the aesthetic heritage values of one building on the site, namely Riverside Residence. These impacts are addressed in a Heritage Impact Statement included in Appendix D and discussed briefly below.

New infrastructure associated with replacement of the WTP would be located adjacent to the Riverside Residence. The proposed works would not physically impact on the cottage, however it is proposed to use the cottage as the site office during construction. This adaptive reuse is consistent with the heritage values of the structure, as it will allow the building to be used by RWCC employees and contractors, while at the

same time retaining the heritage features of the building. There are no plans at the present time to remove any items identified as having potential heritage value as part of the upgrade. The water intake pipes that would be decommissioned as a result of the upgrade were found to have no heritage value, as they are of a standard design, and have been replaced multiple times. Buildings would be maintained as per current maintenance schedules. The small gabled shed and the 1930s workshop will be impacted on as part of other works, and these impacts are addressed in a separate report.

The overall impact to the heritage significance of the site is considered to be minimal. This is because development, change and adaption are a key part of the heritage significance of the site. The new WTP would allow the continuation of the provision of water to Wagga Wagga and district, which has been a functional priority of the site since 1886. The development is located a significant distance from the building complex which contains the original pump house building and other structures with heritage value, and will not physically impact on these buildings.

6.6.3 Construction Mitigation Measures

- Care would be taken when using heavy machinery in the vicinity of Riverside Residence.
- The main structure of the cottage is not to be altered during the period of construction, through the removal of walls or replacement of doors and windows. Replacing furnishings, such as light fittings and carpet, are acceptable heritage impacts as the structure has been previously modified in this way and the current fittings are not original.
- An archival recording for the site should be carried out prior to works commencing. This should focus on the area around Riverside Residence. It can be carried out in conjunction with an archival recording that has been recommended for the construction of a levee bank, which is addressed in a separate report. It is not necessary to record Riverside Residence internally.

6.6.4 Operational Impacts and Mitigation Measures

During the operational phase of the WTP replacement, the long-term heritage values of the WTP site would be addressed through a Conservation Management Plan. The proposed works would not physically impact on any of the items identified as having heritage value.

6.7 Aboriginal Heritage

6.7.1 Existing Environment

Desktop Searches and Literature Review

A search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken on 4th June 2014. The AHIMS search results are included as Appendix G to this EIS. The search area included a 2 km radius of the proposal site. No Aboriginal heritage sites in the vicinity of the proposal site are recorded on AHIMS.

A letter was sent to the Wagga Wagga Local Aboriginal Lands Council (WWLALC) on 17th July 2014 for their input into the assessment process. A follow up email was sent on 14th August 2014. At the time of writing, a response from the WWLALC had not been received.

The Wiradjuri Heritage Study (Go Green, 2002) was reviewed for evidence of previous archaeological finds or information that would suggest that the site contains archaeological material. The study did not document any archaeological finds in this area. While the study discusses the important role of the Murrumbidgee River in the cultural and spiritual life of Wiradjuri, given the nature of disturbance on the site it is unlikely that evidence of previous occupation would be still in situ.

Generally within the study locality, which is addressed in the Wiradjuri Heritage Study (Go Green, 2002), Aboriginal heritage is described as follows:

- Artefact scatters are likely to be located in well drained areas near permanent water sources such as sand hills and creek levees;
- Hearth stones and artefacts are likely to be exposed by erosion at the base of sand dunes and drifts.
- Mussel shell deposits are often associated with ashy grey material and charcoal;
- Burials are usually only detected after disturbance (machine or natural i.e. erosion) but are usually in naturally elevated sand dunes; and
- Modified trees which can occur anywhere but are more common near water (Go Green, 2002).

The Wiradjuri did not always live in transient camps but often concentrated continued or repeated activity around certain camp sites and mounds (Go Green, 2002).

Site Inspection

The WTP proposal site is located adjacent to the Murrumbidgee River. The Murrumbidgee River is highly significant to Wiradjuri for cultural and spiritual reasons, and also for resource acquisition and as a meeting place.

A site visit was conducted on the 21st May 2014 by **ngh**environmental to determine the potential of the area to contain Aboriginal objects. The field visit focussed on providing a more informed assessment of the subject area than could be obtained from a desktop study alone.

No evidence of any Aboriginal cultural heritage was observed on site, such as trees that may have been scar trees or locations which could potentially contain artefact scatters. This is potentially explained by the large scale clearing that occurred in the nineteenth century under closer European settlement. The site is largely modified from its original condition due to the construction, operation and ongoing maintenance of the WTP. The site has been in continual use as a water treatment site since the 1880s.

6.7.2 Relevant Guidelines and Due Diligence Code of Practice

Clarification was sought from the NSW Department of Planning and Infrastructure (DP&I) with respect to the appropriate guidelines for the assessment of Aboriginal Heritage. DP&I confirmed that the following guidelines are the key guidelines with respect to the assessment of Aboriginal Heritage:

- *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005).
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011).

In addition, OEH have indicated that the *Aboriginal cultural heritage consultation requirements for proponents (2010)* also apply, and that a check for the Due Diligence Code of Practice should also be undertaken.

An assessment of the appropriate level of investigation, pursuant to Section 8 of the Due Diligence Code, has been conducted. The desktop assessment and site inspection found there is a low likelihood of Aboriginal objects being present due to existing ground disturbances.

Table 6-2: Determination of whether the Due Diligence Code applies

Item	Reasoning	Does Due Diligence code apply?
Is the activity a SSD (Division 4.1) and SSI (Division 5.1) <i>Is the activity a Part 3A project declared under s.75B of the EP&A Act?</i>	The project is assessed under Part 4, Division 4.1 of the EP&A Act. (It is noted that Part 3A has now been repealed)	No
Is the activity exempt from NPW Act or NPW Regulation?	The project is not exempt under these acts or regulations.	
Will the activity involve harm that is trivial or negligible?	The activity will not involve harm that is trivial or negligible.	
Do either or both of these apply: - Is the activity in an Aboriginal Place? - Have previous investigations that meet the requirements of this Code identified Aboriginal objects?	The activity will not occur in an Aboriginal Place. No previous investigations have been conducted.	
Is the activity a low impact one for which there is a defence in the NPW Regulation?	The proposal involves work on the existing Water Treatment Plant property. It does not fall within the definition of a low impact activity. The property, including riparian habitat, has been previously disturbed through the clearing of vegetation, construction of buildings and the erection of other structures and construction of buildings and the erection of other structures. In addition the riverbank has been cleared and also subject to heavy flooding.	
Do you want to use an industry specific code of practice, adopted by the NPW regulation or other due diligence process?	No industry code of practice exists.	No
	The Due Diligence Code of Practice does not apply. Refer to Part 3A Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation	

The process for investigating and assessing Aboriginal cultural heritage for SSD is outlined within the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011). The process detailed in these guidelines, and how it has applied to this project, is outlined in Table 6-3.

Table 6-3: Assessment of Aboriginal cultural heritage

Item	Response
Review the Background Information	A search of the Aboriginal Heritage Information Management System (AHIMS) was requested on the 4th June 2014. The search area included a 2km radius of the proposal site. No Aboriginal heritage sites in the vicinity of the proposal site are recorded on AHIMS. A description of the existing environment is included as part of Section 6.7.1.
Initiate ongoing consultation	A letter was sent to the Wagga Wagga Local Aboriginal Lands Council (WWLALC) on 17 th July 2014 for their input into the assessment process. A follow up email was sent on 14 th August 2014. At the time of writing a response had not been received.
Identify and assess the cultural heritage values	A site visit was conducted on the 21st May 2014 by nghenvironmental to determine the potential of the area to contain Aboriginal objects. No evidence of any Aboriginal cultural heritage was observed on site, including potential scar trees or artefact scatters.
Assess harm	No known items of Aboriginal cultural heritage are likely to be harmed or impacted by the activity.
Avoid harm	A description of the proposed mitigation measures is included as part of Section 6.7.4.

6.7.3 Construction Impacts

A desktop assessment and a field survey were undertaken in order to investigate the nature of the Aboriginal cultural heritage values of the activity area and to mitigate the risks to these Aboriginal places through appropriate management strategies. No Aboriginal cultural heritage places or objects were identified within the activity area.

The Wiradjuri heritage study review documents that the Murrumbidgee River was an important meeting, resource gathering and cultural place for Wiradjuri people. There is no evidence that the location of the WTP was a camp ground, as this is documented as being further downstream at what is now known as Wiradjuri reserve.

No potential archaeological deposits (PADs) or areas likely to contain Aboriginal cultural heritage were identified within the activity area. The desktop assessment and visual inspection confirms that there are unlikely to be any Aboriginal objects present at the site. This is based on a site assessment and also by referencing the Wiradjuri Heritage Study.

No known items of Aboriginal cultural heritage are likely to be harmed or impacted by the activity.

6.7.4 Construction Mitigation Measures

- No works are to occur outside the proposal area.
- If an item is discovered which is identified as Aboriginal Heritage during the construction phase, works would cease in the vicinity of the find and the Environmental Officer or Site Foreman contacted. No works would recommence until a detailed investigation by suitably qualified persons has been undertaken in accordance with OEH guidelines.
- All relevant RWCC staff and on-site personnel (including contractors) are to be made aware of the provisions for the protection of Aboriginal objects under the *National Parks and Wildlife Act 1974* and their statutory obligations under the Act.
- Stop work provisions (detailed below) would apply to the works in the event of discovery of suspected Aboriginal objects or discovery of suspected human skeletal material. All RWCC staff or contractors engaged by RWCC to complete the on-site works should be briefed on these stop work provisions and their reporting requirements prior to commencing any works on site.

Discovery of Suspected Aboriginal Objects

- If an Aboriginal object is identified while undertaking the proposed activity, the following steps must be implemented:
 - Do not further disturb or move the object.
 - Immediately cease all work at the particular location.
 - Notify OEH of the discovery and the location of the object, and determine an appropriate course of action (an AHIP application and further investigation may be required).
 - Contact an archaeologist for further specialist advice on reporting and consultation requirements.

6.7.5 Operational Impacts and Mitigation Measures

No impacts to Aboriginal Heritage are considered likely to occur during operation of the new WTP. No mitigation measures for the operational stage of the proposed works are considered warranted for Aboriginal Heritage.

6.8 Air Quality

6.8.1 Existing Background Air Quality

Wagga Wagga's climate typically has hot dry summers and cold wet winters; however more recently experiencing higher temperatures and lower rainfall than the long term average (WWCC 2013). There are no significant industrial sources of pollution in the area of the WTP. The main contributors to impacting air quality in the Wagga Wagga area are expected to be farming practices including from burning, vehicle emissions, dust storms, bushfires and wood-fired heaters in the winter months.

Odour has not been measured at the WTP. There are no sources of offensive odour that have been identified at the WTP. This is typical of the majority of WTPs which do not store sludge in sludge lagoons. There is a limited potential for localised odours from chemicals and sludge, which are enclosed within the WTP. The odours are not experienced off site.

6.8.2 Construction Impacts

Potential air quality impacts during construction would result from the following emissions:

- Dust generation from exposed areas of soil, soil excavation and soil stockpiles, rock crushing, vehicles travelling on unsealed roads, concrete cutting, on-site concrete batching (which may be used by construction contractor in combination with pre-mixed concrete delivered to site) or other similar construction activities;
- Exhaust emissions from construction traffic and machinery; and
- Use and handling of chemicals.

An accurate calculation or quantification of the contribution of construction vehicles/plant to exhaust emissions in the Wagga Wagga area is not possible at concept design stage. Despite this, it is considered that emissions during construction are unlikely to cause significant impacts on the local and regional air quality given that the works are confined to the WTP (with the exception of deliveries) and temporary.

Due to the size and nature of construction, the Proposal is not expected to cause significant impacts on the local and regional air quality.

6.8.3 Construction Mitigation Measures

The following mitigation measures would be implemented to manage air quality during construction of the Proposal:

- Vehicle exhaust systems would be properly maintained so that exhaust emissions comply with the Clean Air Regulation under the *Protection of the Environment Operations Act 1997*.
- Potential dust sources (soil stockpiles, access tracks) would be covered or regularly watered (if water restrictions are not in place) when required, particularly on hot, dry and windy days.
- Any construction activities likely to create dust would utilise containment methods to minimise any impact to nearby sensitive receivers.
- If soil stockpiles are to remain for longer than a 10 day period, they would be covered or stabilised with quick growing, sterile grasses.
- The location and number of dust sources (i.e. bare surfaces, including stockpiles) would be considered prior to construction and restricted during works.

6.8.4 Operational Impacts and Mitigation Measures

Operation of the Proposal has potential to produce a negligible amount of emissions from the use and handling of chemicals required during the treatment process. Chemicals would be used and managed in accordance with the relevant Safety Data Sheets and controls identified during the Hazard and Operability (HAZOP) study to be undertaken during the detailed design of the WTP. All chemicals would be stored in an enclosed storage tank or room.

Sludge is unlikely to produce significant odours, and would be stored and dewatered within enclosed treatment infrastructure (rather than open-air onsite drying lagoons) before being transported off-site to landfill.

The operation of the WTP would involve the consumption of electricity and therefore the generation of greenhouse gas (GHG) emissions. GHG emissions are discussed in Section 6.14. Opportunities such as upgrades, technological upgrades or innovations to reduce electricity consumption and GHG emissions would be considered throughout operation.

6.9 Noise and Vibration

SLR Consulting Australia Pty Ltd (SLR) was engaged to carry out a noise assessment of the proposed works. The Noise Assessment Report is included as Appendix F to this EIS.

The noise assessment includes consideration of construction and operational noise impacts.

Construction noise assessment was undertaken in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECC 2009).

The operational impacts of the proposed works were considered in accordance with the *Industrial Noise Policy 2000* (INP). The INP provides a framework for and process for deriving noise criteria for the operation of the WTP.

6.9.1 Existing Environment

The nearest and potentially most affected noise sensitive receptor locations have been identified as Easts Riverview Holiday Park located along the eastern boundary of the site, and the dwellings along Lonergan Place approximately 170 m to the west of the site.

Ambient noise monitoring surveys were undertaken at two locations near to residential receivers to assist in the determination of construction noise management levels and operational noise criteria in accordance with the INP and potential project impacts. The monitoring locations are shown in Figure 6-13 and a summary of the results is provided in Table 6-4.

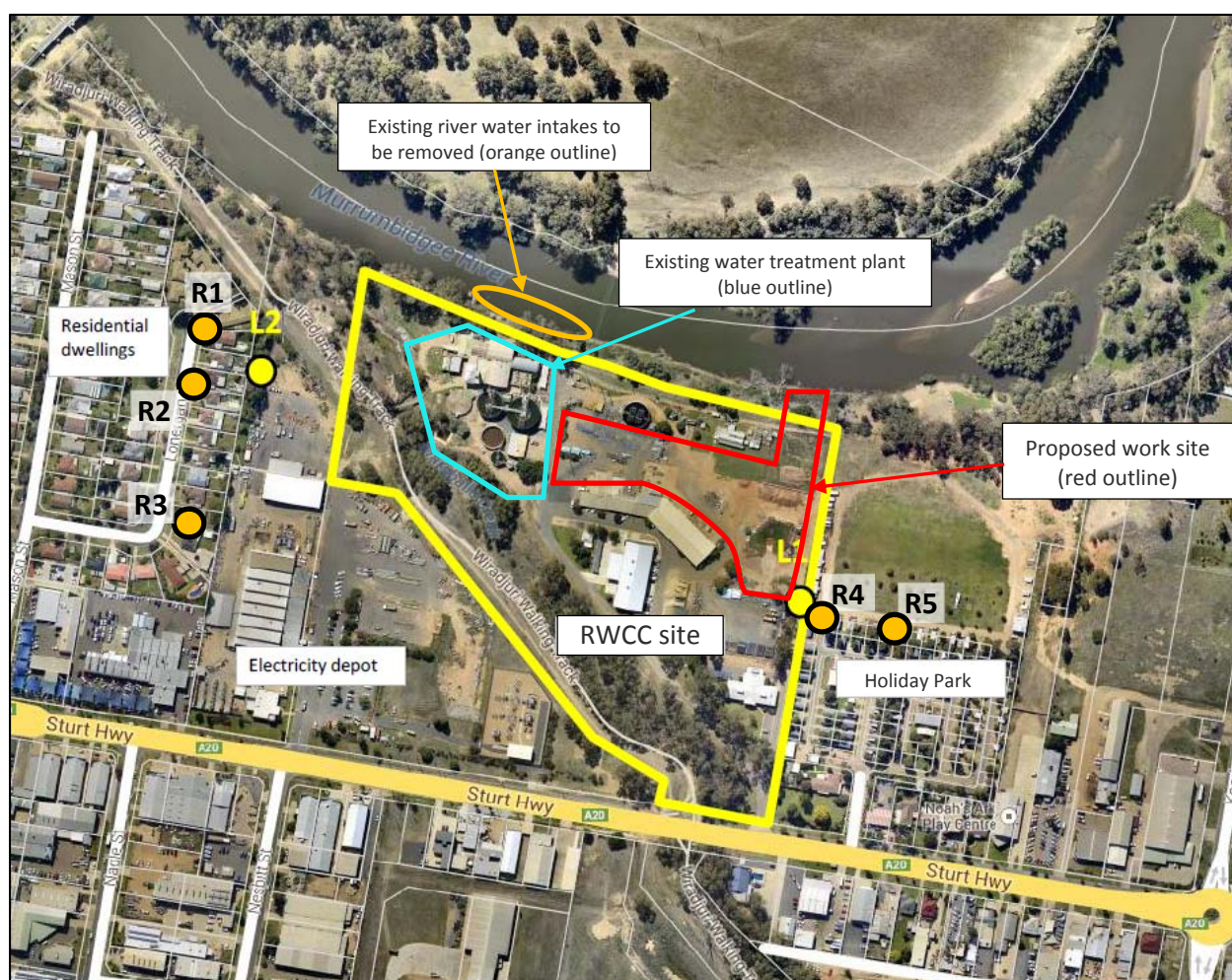


Figure 6-13: Location of background noise monitoring (SLR, 2014) in relation to proposed work site (red outline)

Table 6-4: Summary of Ambient Rating Background Levels (RBL's) and LAeq Noise Levels.

Monitoring Location	RBL, dBA			LAeq(period), dBA		
	Daytime 0700-1800 Hours	Evening 1800-2200 Hours	Night 2200-0700 Hours	Daytime 0700-1800 Hours	Evening 1800-2200 Hours	Night 2200-0700 Hours
L1	44	43	42	54	49	48
L2	36	37	33	57	44	43

Review of the data presented in Table 6-4 indicates that the RBL's at the various monitoring locations ranged from 36 dBA to 44 dBA during the daytime, 37 dBA to 43 dBA during the evening and 33 dBA to 42 dBA during the night-time. The measured ambient noise levels are typical for rural environments.

The existing ambient noise environment at the east boundary position was dominated by traffic on Hammond Avenue. There was just audible noise from the existing WTP at the east boundary measurement location.

The ambient noise at the west location was also dominated by noise from traffic on the Hammond Avenue. Occasional noise from the electricity depot would have been present during the day.

For the purposes of assessing noise from the upgraded WTP unattended noise monitoring results measured at L1 (east boundary of WTP) would be considered representative of all residential dwellings located in the adjacent caravan park.

Similarly, the noise monitoring results for L2 (at the NW boundary of the electricity depot) would be representative of the closest houses to the west of the WTP along Lonergan Place.

6.9.2 Interim Construction Noise Guidelines

The *Interim Construction Noise Guideline* (ICNG) (EPA 2000) sets out noise management levels for residential receivers and how they are to be applied. Under the ICNG the recommended construction noise level is Rating Background Level (RBL) + 10dB (see Table 6-5). The policy suggests restriction to the hours of construction that applies to activities that generate noise at residences above the 'highly affected' noise management level. This level is 75 dBA for residential receivers. The construction of the initial stage of the proposed works is anticipated to take up to 12 to 16 months in optimal conditions. The remainder of the works are likely to be phased in over the next 5 to 10 years.

Table 6-5: Noise at residences using quantitative assessment

Time of Day	Noise level LA _{eq} (15 min)	Application
Recommended Standard hours Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected (RBL + 10 dB(A))	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LA _{eq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected (>75dB(A))	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, scheduled sporting or community events, mid-morning or mid-afternoon for works near residences). 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Source: DECC (2009)

The ICNG also explains that commercial and industrial land can experience a broad range of sensitivity to noise from construction. Hence, noise management levels are separated into three categories:

- Industrial premises: external LA_{eq}(15minute) 75 dBA
- Offices, retail outlets: external LA_{eq}(15minute) 70 dBA
- Other businesses that may be very sensitive to noise (i.e. theatres, childcare centres etc.).

6.9.3 Construction Noise Impacts

Land adjacent to the facility to the south-west would be primarily classified as industrial type usage and would be subject to an external construction noise criterion of 75 dBA.

To assess the potential noise and vibration impacts during construction, a number of scenarios comprising typical plant and equipment have been developed. These are summarised in Table 6-6.

It is understood that all construction works are proposed to be undertaken during standard daytime periods (7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm on Saturdays). The construction of the initial stage of the proposed works is anticipated to take up to 12 to 16 months in optimal conditions. The remainder of the works are likely to be phased in over the next 5 to 10 years.

Table 6-6: Construction scenarios and noise levels

Equipment	No. of Items in 15 min period	Sound Power Level dBA Leq ²
Electric powered saw	2	91
Plate Compactor	1	108
Small Road Roller	1	102
Crane Mounted Trucks	1	99
Hand tools	2	91
Bobcat	1	105
Hydraulic Crane	1	104
Excavator	2	100
Small Truck	1	105
Sheet Piling rig	1	96 ¹
Concrete mixer truck	2	108

The results presented in Table 6-7 show the predicted noise level at the closest residential noise receivers with a worst case scenario of all machinery operating at the same time. The predicted noise levels have been compared with the relevant design (construction noise management level) goals.

Table 6-7: Construction Noise Predictions

Receiver	Site Clearing and Construction - Daytime hours			
	Noise Level – LAeq(15minute) (dBA)			
	Predicted	RBL	Construction Noise Management Level	Predicted Exceedance
R1 - 30 Lonergan Place	56	36	46	10
R2 - 26 Lonergan Place	57	36	46	11
R3 - 12 Lonergan Place	53	36	46	7
R4 - Holiday Park NW corner ¹	69	44	54	15
R5 - Holiday Park North ²	66	44	54	12

¹: shown on Figure 6-13 as R4

²: shown on Figure 6-13 as R5

It is also noted that RWCC has administration offices and a maintenance depot within the same lot as the WTP. Appendix C of the specialist noise report prepared by SLR and included as Appendix F to the EIS outlined predicted noise construction contours for the study area. The predicted noise level surrounding the RWCC Administration offices is 66 dBA Leq.

The dominant source of construction noise to the caravan park is predicted to be from the concrete mix trucks. It is common on construction sites that the concrete trucks would operate a concrete pour during the morning period, and then not operate during the afternoon. This allows affected residents a period of relief during the afternoon which is a better outcome than spreading the noise over the whole day.

The dominant source of noise to residents in Lonergan Place is predicted to be from the soil compactor and powered saws. Similar methods of mitigation treatment should be considered, in particular avoiding early morning operation and also providing some shielding of the activities with the use of site sheds and construction material storage areas.

Assessment of the proposed construction activities for the facility shows that there will be noise levels at receptor locations above the “Noise Affected” management level according to the DECC’s *Interim Construction Noise Guideline* (July 2009). However the predicted noise levels do not exceed the “Highly Noise Affected Level” of 75 dBA. The highly noise affected level represents the point above which there may be strong community reaction to noise.

Increased noise disturbance from construction vehicle movements (predicted 20 vehicles per day during construction) is likely to be negligible given the existing high volumes of traffic along Hammond Avenue (Sturt Highway).

6.9.4 Construction Vibration Impacts

As a guide, safe working distances for typical items of vibration intensive plant are listed in Table 6-8. The safe working distances are quoted for both “Cosmetic Damage” (*British Standard BS 7385 Evaluation and Measurement of Vibration in Buildings*) and “Human Comfort” (*British Standard BS 6472-1 BS 6472-1:2008 Guide to Evaluation of Human Exposure to Vibration in Buildings*). Construction plant that are likely to be a source of vibration are listed in Table 6-8.

Table 6-8: Recommended Safe Working Distances for Vibration Intensive Plant

Plant Item	Rating/Description	Safe Working Distance	
		Cosmetic Damage (BS 7385)	Human Response (BS 6472)
Piling rig (impact) ¹	(assumed similar to 900 kg hydraulic hammer)	7 m	23 m
Vibratory Pile Driver		2 m to 20 m	20 m
Piling rig (screw)	≤ 800 mm	2 m (nominal)	N/A
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

Note: 1. Vibration levels generated from piling rigs are very much site dependant and are influenced by variables such as pile diameter, hammer weight, and rock type. The vibration levels used here are assumed to be similar to a medium sized hydraulic hammer (900kg). Vibration levels from the piling rigs MUST be verified on site at the commencement of piling activities, the ground vibration attenuation at the site confirmed and the safe working distances verified.

2. More stringent safe working distances may apply to heritage or other sensitive structures than are nominated above.

The safe working distances presented in Table 6-8 are indicative and would vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions. The safe working distances should be verified at the commencement of the works by confirming the ground vibration attenuation levels of the site.

In relation to human comfort (response), the safe working distances in Table 6-8 relate to continuous vibration and apply to residential receivers. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods are allowed, as discussed in BS 6472-1.

At the distance between the construction activities and the nearest sensitive receivers the safe working distances (20 m) for human response would not be exceeded.

Construction of the new plant infrastructure is unlikely to physically impact on Riverside Residence or the Heritage items associated with the existing WTP. Excavation works in the vicinity of the heritage items occurring on-site are unlikely to result in structural impacts to the buildings as the sub-surface material comprises alluvial material, avoiding the need for high vibration generating works such as rock-breaking.

Construction works are also unlikely to physically impact on accommodation buildings within the adjacent holiday park, as most of the buildings are relocatable structures installed on piers (e.g. besser bricks). In addition, the separation distance between the construction footprint of the new WTP infrastructure and the holiday park, together with the underlying alluvial subsurface material, provides attenuation of vibration impacts resulting from activities which may generate vibrations e.g. excavation works.

6.9.5 Construction Mitigation Measures

A Construction Noise and Vibration Management Plan (CNVMP) would be prepared for inclusion in the CEMP. Construction of the project and the CNVMP is to consider Strategies 1-7 of Section 6 of the ICNGs outlined as follows:

- Strategy 1 Universal work practices (*Table 4 ICNG*)
- Strategy 2 Consultation and notification (*Table 5 ICNG*)
- Strategy 3 Plant and Equipment (*Table 6 ICNG*)
- Strategy 4 Onsite (*Table 7 ICNG*)
- Strategy 5 Work scheduling (*Table 8 ICNG*)
- Strategy 6 Transmission path (*Table 9 ICNG*)
- Strategy 7 At residences or other sensitive land uses (*Table 10 ICNG*)

The CNVMP is to include as a minimum, but not be limited to, the following mitigation measures to manage noise and vibration during construction of the Proposal:

- The proponent would inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
- RWCC staff who work on site would be informed regarding the proposed works.
- Given the potential for the predicted noise exceedances, noise mitigation strategies should be implemented wherever feasible during the construction works. Where feasible and reasonable, the quietest plant and equipment should be utilised in combination with management measures to minimise the noise impact on the local community.
- Noise impacts are to be minimised in accordance with the *Interim Construction Noise Guideline* (DECC 2009).
- Where possible, the use of concrete mixing trucks would be avoided during early morning hours, and would be programmed to operate the within a single shorter period rather than spread out over the whole day where possible. This allows affected residents a period of relief during the afternoon which is a better outcome than spreading the noise over the whole day.
- Where possible avoid early morning operation of soil compacter and powered saws and also providing some shielding of the activities with the use of site sheds and construction material storage areas.
- Communicate to workers the potential adverse impact of reversing alarms and the need to avoid reversing where possible, to minimise impacts from reversing alarms.

- Use spotters, “smart” reversing alarms, or “squawker” type reversing alarms in place of traditional reversing alarms.
- Construction works would be generally within the working hours of Monday-Friday 7am to 6pm and Saturday 8am to 1pm. No audible construction work to take place outside these hours or on Sundays or public holidays. Should the need for activities to be undertaken outside of the standard working hours, such as to ensure continuity of potable water supply during construction, these would only be carried out only when no other method of construction is considered reasonable and feasible.
- Scheduling the noisiest work tasks during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays).
- All reasonable attempts would be made to complete significant noisy activities within a short period.
- Well maintained and low noise generating machinery would be used and machinery operated at the minimum necessary power setting.
- Noise monitoring would be undertaken if community complaints are received to ensure that noise mitigation measures have been effectively implemented.
- Machines used for construction would be fitted with residential grade exhaust silencers and maintained in good condition for the duration of the work. Machines found to produce excessive noise compared to industry best practice would be removed from the site or stood down until repairs or modifications can be made.
- Regular inspection and maintenance of equipment and machinery to ensure that it is in good condition.
- Machinery and equipment would be operated in an effective manner to minimise noise, e.g. turning off plant machinery or equipment when it is not being used.
- Avoiding the use of noisy machinery and equipment working simultaneously/ close together as much as possible.
- Workers would be inducted about noise from the works at the identified land uses and reduction options/strategies e.g. appropriate use of equipment and machinery, avoidance of shouting/ talking loudly and restricting the slamming of vehicle doors and dropping materials from heights.
- Construction methodologies would be adopted that would minimise noise and vibration.
- Review and implement actions (where possible) additional to those described above if circumstances change or complaints are received.
- The safe working distances should be verified at the commencement of the works by confirming the ground vibration attenuation levels of the site.

6.9.6 Operational Noise Impacts

A project criteria of 38 dBA was established for operational noise for closest sensitive receivers in accordance with the INP (Table 6-9). This was based on the night period when there is the lowest background noise levels.

Table 6-9: Operational Noise Levels

Receiver	Night – (dBA) Leq		
	Project Criteria	Predicted Noise Level	
		Neutral	Worst Case
R1 - 30 Lonergan Place	38	34	36
R2 - 26 Lonergan Place	38	34	36
R3 - 12 Lonergan Place	38	31	34
R4 - Holiday Park NW corner	38	41	41
R5 - Holiday Park North	38	40	41

The potential dominant source of operational noise to the holiday park noise receptors is predicted to be the clarifier mixers and scraper motors, the rapid mix tank, raw water compressor and filter blower room. The existing aerator basin and main office air-conditioning condensers are also a dominant contributor.

The potential dominant sources of noise to the receptors on Lonergan Place would be the centrifuge building, aeration basin, Clearwater pump building and air-conditioning condensers on the filter switchroom.

A computer model incorporating all significant noise sources; the closest potentially affected residential properties, and the intervening terrain was been prepared by SLR. Weather conditions influence noise propagation. Therefore modelling of the equipment operation was undertaken for a neutral case and worst case (highest noise level when considering wind, cloud cover etc). It was assumed that buildings constructed of sheet metal included glass wool insulation.

The results of noise modelling under neutral and worst case propagation conditions shows that the predicted noise levels comply with the project noise level criteria at all of the closest noise sensitive receivers except for the north-west corner of the adjacent holiday park where there is an excess of 3 dBA at night during neutral propagation conditions and 3 dBA under worst case propagation conditions.

Consideration has been given to the potential for sleep disturbance due to the noise generated from the operation of the WTP. The EPA's current approach to assessing potential sleep disturbance is to apply an initial screening criterion of background noise plus 15 dBA. A review of research on sleep disturbance in the EPA's Road Noise Policy concludes that:

Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to cause awakening reactions.

One or two noise events per night, with maximum internal noise levels of 65 dBA to 70 dBA, are not likely to affect health and wellbeing significantly.

The sleep disturbance design goals, where noise should not exceed that level, are outlined in Table 6-10.

Table 6-10: Sleep Disturbance Design Goals

Receiver	Night time RBL, dBA	Sleep Disturbance Noise Emission Design Goal (LA1(1 min)) dBA
R1, R2 and R3 - Lonergan Place	42	57
R4 and R5 -Holiday Park	33	48

NOTE 1: Sleep disturbance design goal, LA1(1 min) = RBL + 15 dB.

With regard to the assessment of sleep disturbance during the operational phase of the project, the variation in peak Lmax (the maximum A-weighted noise level that occurs over a given measurement period) and LA1 (the noise level exceeded for 1% of a measurement period) noise events from the (as modelled) Leq noise levels would be minimal. Given the higher applicable noise goals of 57 dBA, LA1 at the closest receivers, noise from the facility during normal night-time scheduled operations is unlikely to result in sufficient levels to cause sleep disturbance events. Table 6-10 shows that predicted noise is below the 57 dBA level.

6.9.1 Operational Mitigation Measures

Measures for consideration for the design of the WTP to mitigate operational noise include:

- Clearwater pumps to be housed in a sheet metal insulated building with a roof with internal glasswool insulation lining and sheet metal external cladding. Ventilation should be via insulated ducts.
- If there are an ongoing noise issues with clarifier drive motors then options for treatment could include installation of acoustic panels around the platform surrounding the motors approximately 1m away and 1m higher than the top of the motor.
- Air-conditioning condensers are a potential source of noise to receptors and should be located at low level where possible and on building facades not directly facing the closest residential receivers.
- The building housing the filter blowers be internally insulated or be of masonry construction.

6.10 Traffic and Transport

6.10.1 Existing Environment

Site Access and Existing Traffic Conditions

The main access to the WTP is off Hammond Ave (Sturt Highway, HW4). At this location, Hammond Ave is a two-way, single carriageway road. A taper for an additional lane commences at the entrance to the WTP, whilst a taper from a second lane on the opposite side of the road ceases at the WTP entrance. A two lane bridge over Marshalls Creek is located immediately west of the WTP entrance. Photo 18 below shows the entrance to the Wagga Wagga WTP.

No on-street parking is permissible at the intersection with the WTP, although parking is permissible on both sides of the road nearby.

No pedestrian infrastructure is present at the entrance to the WTP. Pedestrian access across Marshalls Creek is provided on the southern side of the bridge, on the opposite side to the WTP.

No bus stops are located nearby, and no other public transport facilities are located in the vicinity.

Sight distances to the east and west from the WTP entrance are generally good (refer to Photo 18 and Photo 19), although fog which is prevalent in winter can severely limit sight distances at times, and the bridge over Marshalls Creek does impede slightly on line of sight to the west (Photo 19). RWCC currently has a 'Left Turn Only' out of the WTP. Left turns into the WTP site from Hammond Avenue are unrestricted by any signage.

Hammond Avenue (Sturt Highway) is a major thoroughfare in the region (Figure 6-14). It forms a major east-west arterial road for local traffic, as well as forming the major highway route between the Hume Highway to the east and the Olympic and Newell Highways, the Riverina region and ultimately Adelaide to the west.

Traffic Flows

Existing traffic on the Sturt Highway (Edward Street in the western area of Wagga Wagga and Hammond Avenue in the eastern area of Wagga Wagga) consists of a mixture of heavy and light vehicles. Average speed is estimated to be around 50km/h. The Sturt Highway at the Best Street intersection (west of the proposal site) has an Annual Average Daily Traffic (AADT) of 17,416 (RMS, 2014), and traffic volumes in the vicinity of the WTP would be similar. Traffic consists of both local and through traffic. There is no sealed footpath along Hammond Avenue near the WTP entrance.

Traffic into and out of the WTP site consists of:

- Light vehicles, either staff driving to/from work, or staff using light work vehicles to access the water network in the region.
- Heavy vehicles delivering equipment and supplies, including materials to be stockpiled at a depot which is located at the WTP and re-distributed at a later date to parts of the network.
- Heavy vehicles delivering water treatment chemicals.
- Heavy vehicles carrying plant.
- Waste transporters and contractors, including the transport of sludge to landfill.

The existing raw water pumping station is accessed from a locked gate from the WTP site.

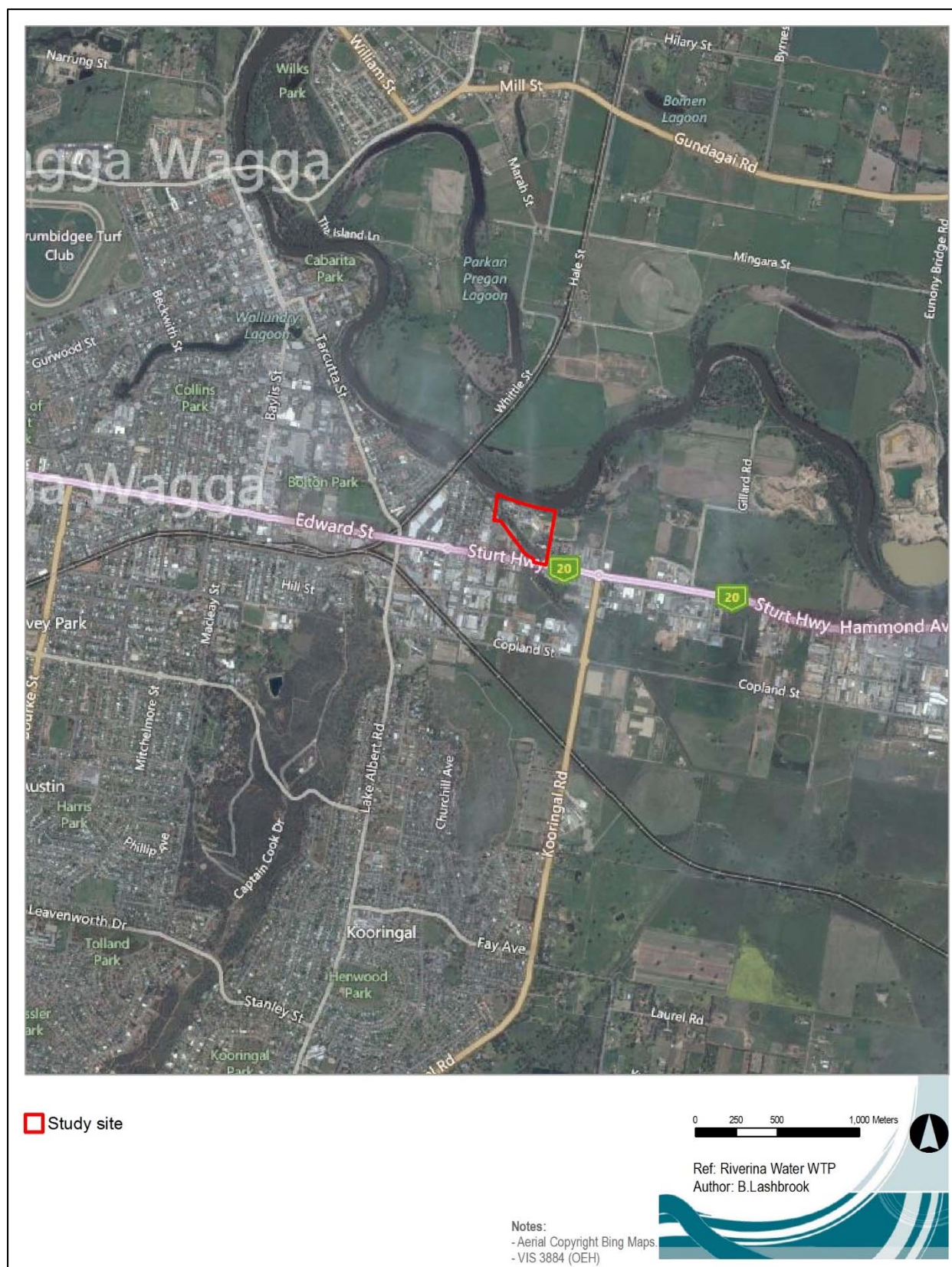


Figure 6-14: Local and regional road network in the study area



Photo 18: WTP site access from Hammond Avenue looking east (Google Maps 2014).

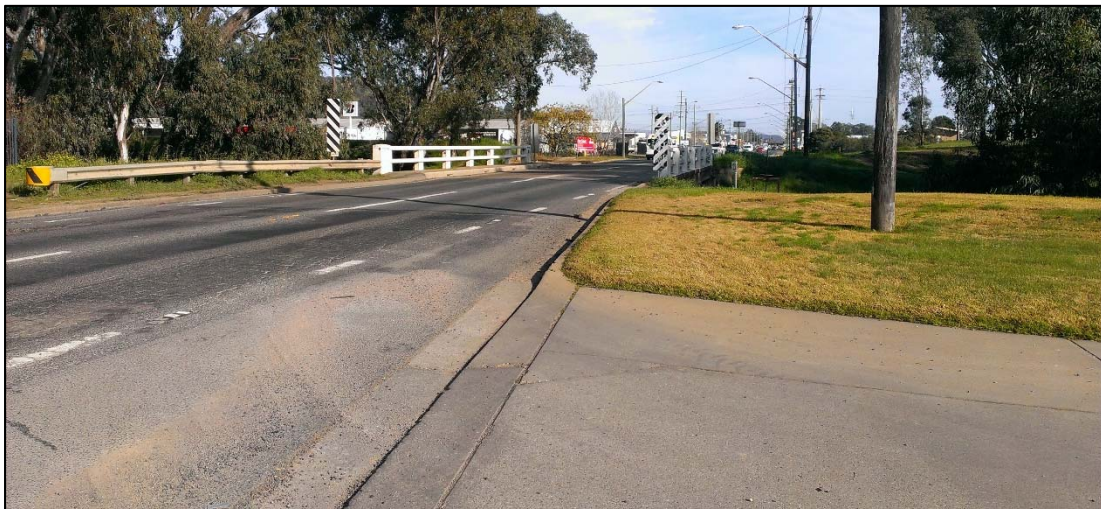


Photo 19: Sight distances to the west from the WTP entrance (nghenvironmental).



Photo 20: Sight distances to the east from the WTP entrance (nghenvironmental 2014)

6.10.2 Construction Impacts

An assessment of impacts resulting from the generation of traffic during construction of the new WTP was undertaken with reference to the *Guide to Traffic Generating Developments* (RTA, 2002) and Austroads publications, in particular the *Guide to Traffic Management Part 12: Traffic Impacts of Development* (Austroads, 2009).

The traffic impact assessment presented below addresses:

- Estimated traffic volumes (vehicle numbers) and nature/ mode of traffic generated (types of vehicles).
- Proposed transport routes
- Direct impacts to the local and regional road network from vehicles accessing the development site.

Access to work site

The proposal site would be accessed by the existing driveway off Hammond Ave. No road works are proposed as part of the proposal. The proposed works are unlikely to require partial or full road closures along Hammond Ave, although turning restrictions for construction traffic into and out of the WTP may need to be imposed to ensure safe traffic conditions for users of Hammond Ave. There may be some minor disturbances when large plant and equipment are accessing and leaving the site.

With a workforce of around 30 people, it would be anticipated that there may be approximately 100 additional light vehicle movements per day to and from the site. It is considered that the additional traffic movements (e.g. increase in number of truck movements for delivery of materials and removal of construction waste) would have minimal impact on traffic activity along local roads, including Hammond Ave. Traffic egress would be limited to left turns. This will reduce the time taken to enter and exit the site and reduce the impact to traffic flow.

Access would be required to the Murrumbidgee River for the construction of the river intake. It is proposed that access would be gained from the northern side of the WTP, through a gate that would be able to be locked. There is no formal pedestrian access adjacent to the river in this area. Measures would be implemented to control truck access to the area and to restrict access to the construction site.

There are ten (10) driveways on Hammond Avenue surrounding the entrance to the WTP facility (Figure 6-15). All of these are commercial premises. No on-street parking would be required during construction, hence access to these premises is not expected to be impacted by the proposed works.

Nature of Construction Traffic

Delivery of materials to the site would be required during the 12 to 16 month construction period including:

- Equipment to undertake earthworks
- Pipes
- Electrical instrumentation including transformers
- Chemical dosing infrastructure and associated buildings
- Concrete for slabs, bunds, site access paths and building works
- Equipment and tanks for the clarifiers, filters, sludge and wash water management and associated buildings
- Materials for internal access roads

It is anticipated that the majority of excavated material generated during construction would be able to be reused on the site. Some waste material would be required to be transported off-site.

Typical construction workforce for a WTP construction of this size is in the order of 30 people. The workforce would vary over the construction program according to the activities occurring on site and the construction contractor's methodology and program.

For construction of the WTP it is anticipated that there would be on average 5 to 10 truck deliveries per day (10 to 20 truck movements in and out of the WTP site). The likely vehicle types include large delivery vehicles (design prime mover and semi-trailer, 19.0 m overall length) courier vehicles, cement mixer trucks and smaller delivery trucks. The frequency would vary over the construction period depending on the construction activity and construction contractor's program and methodology. The highest frequency of truck movements is expected during concrete pours. This volume and frequency is unlikely to cause queuing issues, with traffic able to pass right turning vehicles into the WTP via the second lane.

Deliveries would be generally restricted to Monday to Friday 7.00 a.m. to 6.00 p.m. and Saturday 8.00 a.m. to 1.00 p.m. If any oversized equipment is required to be delivered alternative delivery times may be considered to minimise impact on traffic.



Figure 6-15: Proposed construction traffic movements.

6.10.3 Construction Mitigation Measures

The CEMP is to include a Traffic Management Plan (TMP) which would be prepared and implemented in accordance with the RMS *Traffic Control at Worksites Manual, Version 4* (RTA, 2010). The TMP is to include, as a minimum:

- A requirement to adhere to traffic speed limits both on and off-site.
- A requirement to obey all traffic signs, including 'Left Turn Only' on to Sturt Highway from WTP site.
- A site plan designating access points and parking areas for construction contractors.
- Signage on Hammond Ave advising of heavy vehicles entering / leaving the WTP site.

6.10.4 Operational Impacts and Mitigation Measures

Correspondence provided by Roads and Maritime Service (RMS) in relation to consultation undertaken by HWA (see Appendix E) acknowledges that the development represents the replacement of existing facilities on the subject site therefore changes to the current traffic generation due to operation of the site are likely to be minimal. During operation, traffic movements are unlikely to increase.

During operation, there is not likely to be a significant increase in vehicle movements into and out of the WTP. Currently worker vehicle movements are approximately 100 per day, this is unlikely to change as a result of the new WTP. Deliveries and maintenance vehicle movements are likely to remain similar.

Chemical Deliveries

The number of chemical deliveries to the existing WTP average approximately eight per month. This is likely to be similar to the operation of the proposed new WTP as shown in Table 6-11.

Table 6-11: Chemical Delivery Frequency

Chemical	Current Operation Delivery	Estimated Delivery Frequency for Initial Operation of the New WTP	Estimated Delivery Frequency when Future chemical systems are implemented (possibly 5 to 10 years)
Alum	Fortnightly	21 days	21 days
Activated silica	2-3 times per year	Not proposed	Not proposed
Lime	Monthly	Not proposed	21 days
Fluoride (sodium silicofluoride)	Monthly	21 days	21 days
Chlorine Gas	Every 2-3 weeks	Not proposed	Not proposed
Polyacrylamide	Every ~3 months	21 days	21 days
Sodium hydroxide	Not used	28 days	28 days
Sodium hypochlorite	Not used	21 days	21 days
Carbon dioxide (CO ₂)	Not used	Not proposed	21 days
Potassium Permanganate	Not used	Not proposed	21 days
Powdered Activated Carbon	Not used	Not proposed	21 days

Dewatered Sludge Transfer to Landfill

Dewatered sludge is currently removed from site by truck approximately two to four times per week (Table 6-12). The rate of removal of dewatered sludge from the site that currently occurs has been based on a sludge truck size of around 14 m³. During operation of the new WTP, it is proposed to use as large a truck as possible to transport dewatered sludge to landfill. The number of future truck movements has therefore been based on a truck capacity of 30 m³. The rate of removal is anticipated to be similar to current rates, potentially increasing to six truck movements per day when treating highly turbid water (300 NTU). Reference to turbidity data for the Murrumbidgee River indicates that high turbidity levels generally occur as spikes, dropping off quickly once turbidity peaks and then gradually evening out. Hence, although there is potential for six truck movements per day to occur when turbidity levels are high, this number is unlikely to be sustained for more than one or two days.

Table 6-12: Truck movements related to sludge removal

Plant production	Truck Movements per day			
	Current ¹	New plant ²		
	up to 100 NTU	40 NTU	100 NTU	300 NTU
20 ML/day	1.7	0.3	0.8	2.2
40 ML/day	3.4	0.6	1.6	4.4
55 ML/day	N/A	0.8	2.2	6.1

1: based on truck capacity of around 14m³

2: based on truck capacity of around 30m³

RWPS Access

Access would be required to the new RWPS. This would be a similar arrangement as current where access would be gained from a gate on the northern side of the WTP.

Personnel Access

The number of staff accessing the site is not likely to change during operation of the replacement WTP, as staff numbers at the site are expected to remain the same, or similar. Around five people would be required to operate the plant.

Maintenance

Traffic movements to undertake maintenance is not anticipated to differ significantly from the current operation of the WTP.

6.11 Visual Amenity

6.11.1 Existing Environment

The study area is dominated by the WTP, and to the east and north by other business activities and similar urban landscapes. The Murrumbidgee River and Marshalls Creek dominate to the south and west.

Public views of the study area are predominantly from the Easts Riverview Holiday Park (holiday park) to the east (Photo 21), and the Murrumbidgee River to the south. Existing well-established screening vegetation in the form of closely planted conifers limits views of the WTP site from the holiday park. The rear of the holiday park, from which the new WTP would be visible, is used for caravan storage (Photo 21). There are also restricted views of the south western edge of the levee from the Wiradjuri Walking Track (Photo 22). Views from the Sturt Highway are minimal, the shape of the proposal site boundary

restricts views from the road given the narrow entrance (Photo 23). The location of these viewpoints is illustrated in Figure 6-16.



Photo 21: View south along the eastern edge of the proposal site. The holiday park is on the left.

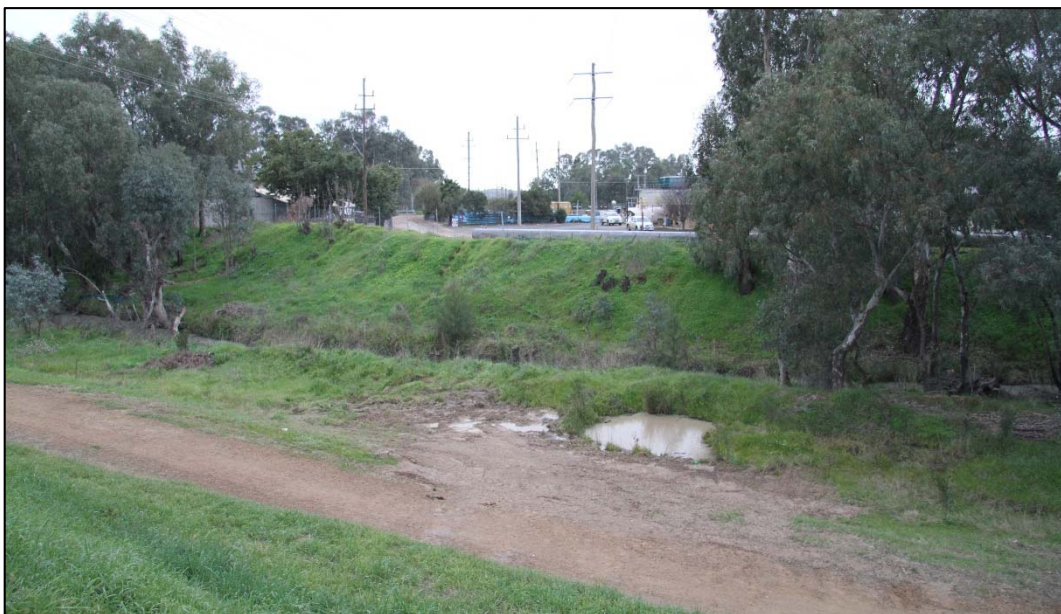


Photo 22: View north east from the Wiradjuri walking track along western edge of the proposal site.



Photo 23: View east along Sturt Highway – entrance to WTP is on left (Google Earth 2014)



Figure 6-16: Location of viewpoints

6.11.2 Assessment Method

For the purposes of this visual assessment, three viewpoints of the proposal were identified (refer to Table 6-13 and Figure 6-16).

Table 6-13: Viewpoints of the Proposal

Viewpoint	Description and visibility of the Proposal at the viewpoint
Easts Riverview Holiday Park	Visitors have partial views of the existing WTP infrastructure. Views are obscured in some sections by existing vegetation.
Wiradjuri Walking Track	This view is screened by existing riparian vegetation alongside Marshalls Creek. There are direct views of the WTP from along the power line easement (Photo 22).
Motorists on Sturt Highway	Motorists, travelling in either direction have very limited and brief views of the existing Riverina Water County Council corporate office. The proposal site is not visible from the road.

In addition, consideration has been given to views of the new raw water intake and pump station from the Murrumbidgee River which is used for boating and canoeing activities.

The impact on each viewpoint is assessed in terms of the sensitivity of the view and the magnitude of the proposal. Visual sensitivity refers to the quality of the view and how sensitive it is to the proposed change. Visual sensitivity is related to the direction of view, the composition of the view and may include more than one character zone. Magnitude refers to the nature of the proposal and its proximity to the viewer. Refer to Table 6-14 for the visual impact grading matrix.

Table 6-14: Impact grading matrix

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.11.3 Construction Impacts

Visual amenity is subjective to the extent that landscape features can be perceived differently by different people. What some people may deem to be visually attractive, others may perceive as visually intrusive. This is particularly the case with water supply infrastructure such as water treatment plants, dams, weirs and regulators.

The dominant visual characteristic of the locality is that of a light industrial landscape, interspersed with residential areas along a riparian corridor.

Table 6-15 provides the assessment of the impact of the proposal on each viewpoint during construction. Overall the visual impact on local receivers would be minimal during construction. Construction works would have a minor short-term visual impact on users of the holiday park.

Table 6-15: Visual impact assessment during construction of the new WTP

Viewpoint	Impact of Proposal	Visual sensitivity	Magnitude	Overall impact	Comment
East's Riverview Holiday Park	Tourists would have partial, temporary views of construction works. The main area of the Holiday Park which has been developed is located in the southern section of the park, which is not immediately adjacent to the proposed new WTP. The part of boundary between the RWCC site and the Holiday Park where the caravans are located is screened with vegetation (as show in Figure 6-7). There are views from some of the caravans to the northern section of the WTP site where there is no vegetation screening.	Moderate	Moderate	Moderate	Construction works would have a minor short-term visual impact. The levee that is proposed to be built prior to construction of the WTP would provide partial screening as it is proposed to be sheet piling. There is potential to use shade cloth material on the area of the fenceline where vegetation is not yet established or where the levee sheet piling does not provide screening to minimise visual impacts during the construction phase.
Wiradjuri Walking Track	This view is screened by existing riparian vegetation alongside Marshalls Creek. Limited views of the construction works would be possible.	Moderate	Low	Moderate to Low	The majority of the proposed work is located in the center and eastern sides of the proposal site. Views are currently partially blocked by existing riparian vegetation along marshals Creek.

Viewpoint	Impact of Proposal	Visual sensitivity	Magnitude	Overall impact	Comment
Motorists on Sturt Highway	Motorists, travelling in either direction have very limited and brief views of the existing Riverina Water County Council corporate office.	Negligible	Negligible	Negligible	Motorists, travelling in either direction would continue to have very limited and brief views of the existing Riverina Water corporate office.
Murrumbidgee River	Views to the WTP can be experienced by boat and canoe users of the Murrumbidgee River	Moderate	Low	Moderate to Low	The dominant feature would be the construction of the raw water pumping station.

6.11.4 Construction Mitigation Measures

- Revegetate disturbed areas on the boundary with the caravan park with native grasses and shrubs and vegetation to be used for longer term screening.
- Revegetate the river bank around the raw water intake with shrubby vegetation, such as wattles, to reduce visual impacts of the structure on river users.

6.11.5 Operational Impacts and Mitigation Measures

The proposed works have the potential to alter the surrounding visual amenity, as the works involve the upgrade of existing infrastructure and construction of new buildings and associated treatment infrastructure. The proposed changes are shown on a 3D concept drawing shown in Figure 6-17. Note that during development of the detail design, the raw water pump station shown in Figure 6-17 has been replaced with a structure similar in appearance to that shown in Photo 24. Note that, unlike the draft tubes shown in Photo 24 the three draft tubes to be installed at the Wagga Wagga WTP would be installed below ground, emerging at a height of approximately 1 m where they would be joined in a manifold with valving and instrumentation. The manifold will then continue below ground. This design substantially reduces the visual impact of the pumping station as the above-ground structure would be much smaller.



Photo 24: Indicative raw water intake structure to be constructed at Wagga Wagga WTP site

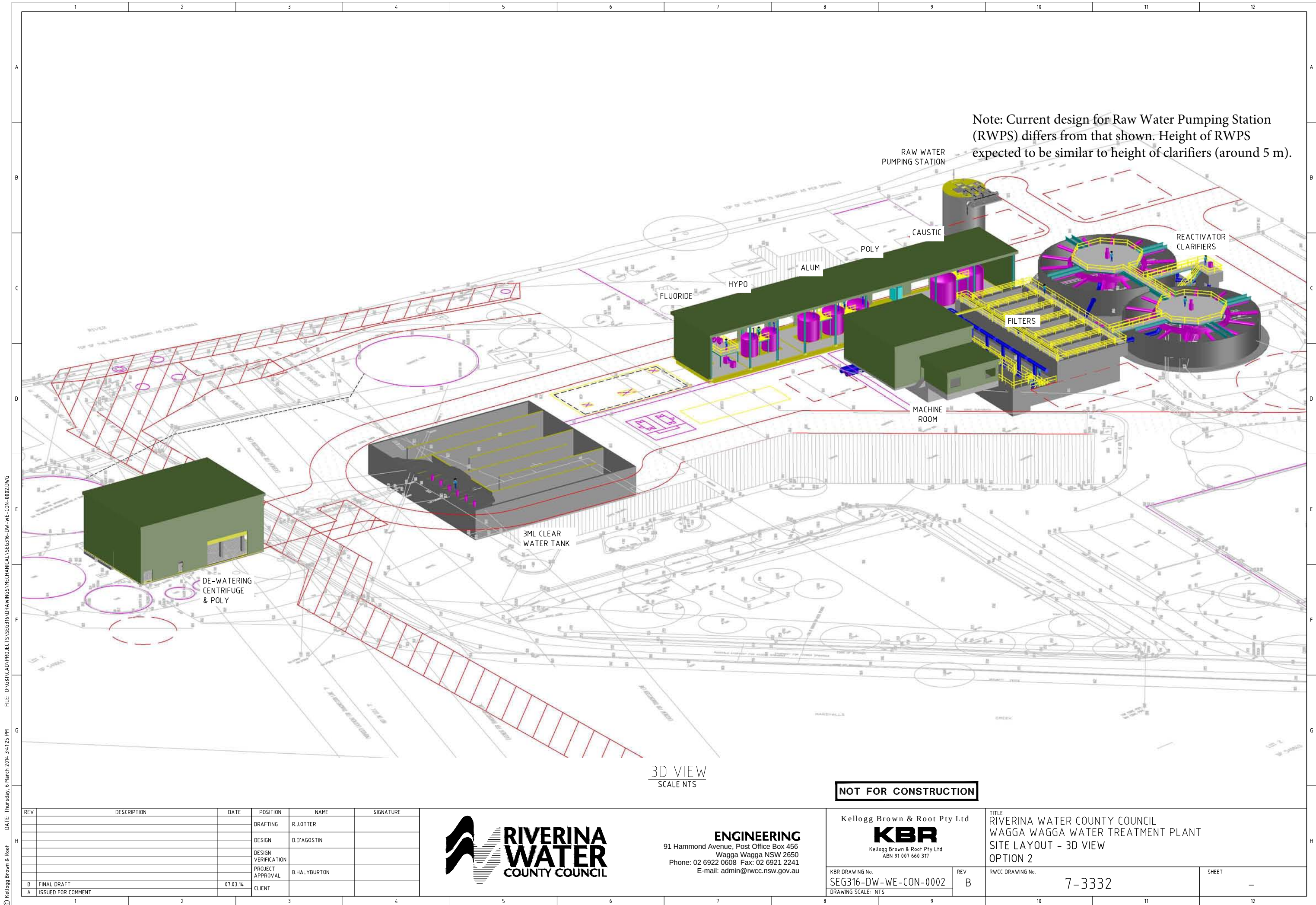


Figure 6-17: 3D Concept drawing of WTP Replacement

The approximate height of the new WTP infrastructure is shown in Table 6-16. The heights would be confirmed during the detailed design development. Materials for buildings would be selected in detail design.

Table 6-16: Height of Main Infrastructure Components

Structure	Approximate Height of the Structure Above Ground	Distance from Holiday Park Boundary
Raw Water Pumping Station	1 m	35 m
Chemical Storage Building	8 m	80 m
Lamella Clarifier (rectangular tank) or Reactivator Clarifier (two circular tanks)	5 m	30 m
Filter machine room (including filter air scour blowers)	7.3 m	75 m
Plant control room and laboratory (adjoining the machine room)	4 m	75 m
Filters	4 m	60 m
Building for centrifuge and dewatering	10 m	200 m
Switchroom / transformers	4 m	40 m
Substation	1 m	40 m
Clear Water Tank for Treated Water Storage	1 m. The tank would be mainly buried below ground (excavation depth 5 m)	170 m

Table 6-17 provides an assessment of the impact of the proposal on each viewpoint. Overall, the operation of the WTP would have a minor visual impact on most of the surrounding receivers, with the exception of the Easts Riverview Holiday Park. Views of the completed WTP at both the Wiradjuri walking track and Hammond Avenue would be not dissimilar to the current views. Views from the holiday park would be moderately impacted as there are direct views of the proposed clarifier and the raw water pumping station. The changes in visual landscape from this viewpoint are consistent with the current use of the WTP. Any impacts can be mitigated by way of establishment of screening vegetation.

Table 6-17: Visual impact assessment during operation of the new WTP

Viewpoint	Impact of Proposal	Visual sensitivity	Magnitude	Overall impact	Comment
Easts Riverview Holiday Park	Tourists would have partial views of the WTP clarifiers and the raw water pumping station. In the future, buildings to house chemicals may also be constructed on the eastern side of the WTP buildings and would be closer to the property boundary than is currently the case. Some of the infrastructure would be visible above proposed screening along the boundary until vegetation becomes well established. There would be minimal vegetation clearance required for the construction.	Moderate	Moderate	Moderate	Impacts may be largely, if not entirely, mitigated by way of well-placed landscaping and screening vegetation. This will take a few years to establish. Planting early in the construction program will minimise the time when there are views to the WTP. Tall growing trees or shrubs would be required for screening the site, as the raw water pump station and clarifiers would be up to 5 m in height.
Wiradjuri Walking Track	This view is screened by existing riparian vegetation alongside Marshalls Creek. This vegetation would not be cleared as part of the proposal.	Moderate	Low	Moderate to Low	The majority of the proposed work is located in the center and eastern sides of the proposal site. Views would continue to be obscured by the existing vegetation.
Motorists on Sturt Highway	Motorists, travelling in either direction would continue to have very limited and brief views of the existing Riverina Water corporate office.	Negligible	Negligible	Negligible	Motorists, travelling in either direction would continue to have very limited and brief views of the existing Riverina Water corporate office.
Murrumbidgee River	Views to the WTP can be experienced by boat and canoe users of the Murrumbidgee River	Moderate	Low	Moderate to Low	The dominant feature would be the raw water pumping station on the bank of the river. It would be approximately 5 m above the ground surface. Impacts can be mitigated with landscaping.

6.11.6 Operational Mitigation Measures

- Vegetation is to be established and maintained along the eastern boundary to screen views from Easts Riverview Holiday Park and around the raw water intake to reduce visual impacts on river users.

6.12 Waste Management

6.12.1 Existing waste environment

Operation of the existing WTP produces backwash wastewater and sludge as by-products of the treatment process. Under EPL 614, RWCC is currently licensed to discharge to Marshalls Creek up to 1 ML per day of supernatant wastewater up to a Total Suspended Solids (TSS) limit of 30 mg/L. RWCC is required to undertake sampling of the discharge for TSS on a weekly basis and provide an annual report to the EPA on monitoring results. RWCC are also required to report any discharges above 30mg/L immediately to the EPA.

The existing WTP treats turbidity levels up to 100 NTU and is able to produce approximately 44 ML/day of drinking water under typical river conditions. Currently, the WTP produces an average of 0.4 tonnes of dewatered sludge per day under normal operating conditions, increasing to 3.05 tonnes/day when the plant is operating at maximum loading rates.

6.12.2 Construction Impacts

Waste would be generated during excavation and construction/installation activities. It is expected that the following waste would be generated:

- Approximately 255 m³ of alluvial material would be excavated from the river bed and the lower bank as part of the river water intake works.
- Material from excavations for site levelling, the Clear Water Storage, and pipelines from the WTP site, which is proposed to be reused onsite for other construction works and restoration.
- Vegetation cleared from the river intake site. This may include noxious weeds, the management of which must be undertaken in accordance with local control plans and/or the weed's classification as per the *Noxious Weeds Act 1993*.
- General recyclable and non-recyclable waste, including construction building waste.
- Demolition waste generated by removal of existing river intakes.
- Redundant mechanical and electrical equipment including pumps, electrical cabinets, and pipes
- General personnel waste from construction staff.

6.12.3 Construction Mitigation Measures

A Waste Management Plan would be prepared by the contractor as part of the CEMP and would include but not be limited to addressing the following general measures:

- The principles of waste reduction, reuse, and recycle would be understood and implemented by the Contractor.
- Excavated soils would be reused for backfilling where possible, with all topsoil re-used on site.
- Materials would be recycled wherever practical.
- Different waste streams would be separated for disposal and materials disposed to recycling facilities where available.
- Any hazardous waste would be managed and disposed of in accordance with WorkCover and EPA requirements.
- Waste would be disposed of in accordance with the Waste Classification Guide (DECC 2008).

- No waste from the site, including excess spoil, would be conveyed to or deposited at any location that cannot be lawfully used as a waste facility for that waste.
- A register of all waste disposed of would be maintained.
- Cleared vegetation, excluding weeds, would be re-used on site as mulch.
- Weeds would be removed and disposed of in accordance with their classification.

6.12.4 Operational Impacts and Mitigation Measures

The main waste streams from operation of the new WTP are supernatant (backwash waste water) and dewatered sludge. Until a supernatant return line is installed in the future, supernatant would continue to be disposed to Marshalls Creek as per current practice. There are two parameters that influence the amount of supernatant generated during the water treatment process. The flow rate that the plant is operating at and the turbidity of the raw water. The high normal scenario is for raw water turbidity of 50 NTU (which is the high value that is normally expected to be encountered). The maximum design value is for a raw water turbidity of 300 NTU (which is the highest raw water turbidity the plant is designed to treat, resulting in more frequent filter backwashing). Based on a flow rate of 55 ML/day, the estimated supernatant discharge rate to Marshalls Creek would normally go as high as 0.45 ML/day but could theoretically increase discharge to 2.22 ML/day when treating raw water with 300 NTU turbidity. Based on a flow rate of 40 ML/day, the discharge rates are estimated to be approximately 0.4 ML/d and 2.05 ML/d for normal high and maximum design value scenarios. A variation to RWCC's EPL would be required as the anticipated discharge volumes during periods when the river water has high turbidity levels would exceed the 1 ML/day limit set by the EPA in EPL 614.

The current level of TSS in wastewater discharged to Marshalls Creek is approximately 15 mg/L. This is not expected to alter under the Proposal, with the new WTP designed to control TSS levels under the 30 mg/L limit set by EPL 614.

The quantity of dewatered sludge resulting from operation of the new WTP would vary according to raw water quality and plant production levels. For turbidity levels up to 100 NTU, dewatered sludge production would remain the same, with around 8 tonnes per day produced when processing turbidity levels of 80 to 100 NTU. However, as much as 21 tonnes/day are likely to be produced when treating high turbidity levels (i.e. 300 NTU) at a plant production level of 40 ML/day and 29 tonnes/day at a production level of 55 ML/day (see Table 6-18). Reference to turbidity data for the Murrumbidgee River, however, indicates that high turbidity levels generally occur as spikes, dropping off quickly once turbidity peaks and then gradually evening out. Hence, although there is potential for up to 21 tonnes per day of dewatered sludge to be produced when turbidity levels are high, this number is unlikely to be sustained for more than one or two days.

Table 6-18: Dry solids production rates for current and new WTP (adapted from HWA 2012)

Plant production	Dry Solids Production (kg/day)			
	Current	Upgraded plant		
	up to 100 NTU	40 NTU	100 NTU	300 NTU
20 ML/day	3,800	1,450	3,800	10,500
40 ML/day	7,600	2,900	7,600	21,000
55 ML/day	N/A	4,000	10,500	28,900

Dried solids would be transported to landfill. In the event of infrastructure or process upgrades, or newly identified material reuse options in the future (in particular water residuals reuse options), the principles of waste reduction / minimisation would be considered and applied to reduce waste disposal to landfill.

6.13 Greenhouse Gas Emissions and Energy Use

6.13.1 Existing Environment

The total energy consumption for Wagga Wagga WTP for 2013/14 was 2,494,085 kWh which equates to 2,245 tonnes CO₂, based on Schedule 1 of the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* made under subsection 10 (3) of the *National Greenhouse and Energy Reporting Act 2007*.

6.13.2 Construction Impacts

Construction activities for the Proposal would generate greenhouse gas (GHG) emissions. The major sources of expected emissions include the operation of plant, machinery, and the transportation of materials to and from site resulting from diesel and petrol combustion.

6.13.3 Construction Mitigation Measures

The following mitigation measures to minimise GHG emissions during construction would be undertaken to reduce the production of GHG emissions. With these safeguards in place there would be no significant level of GHG as a result of the construction of the Proposal.

- Use of well-maintained plant and equipment to minimise fuel consumption.
- Incorporate energy efficiency considerations into site inductions and the use and selection of vehicle and plant.
- Proper fitting and maintenance of vehicle exhausts systems to ensure emissions comply with the POEO Act.
- Only start up vehicles when required and limit idling time when not in use.
- Minimise haulage vehicle movements by filling to maximum allowable limits.

6.13.4 Operational Impacts

Operation of the new WTP infrastructure would create GHG emissions through the operation of the sludge management system and the consumption of electricity.

The overall operation of the Proposal is 900t CO₂-e/year, equating to a reduction of approximately 60 per cent in existing plant emissions.

6.14 Hazards and Risks

6.14.1 Public Health

Raw Water Quality Risk Identification

A Raw Water Quality Risk Assessment Workshop was conducted in 2012 with representatives from RWCC, NSW Public Works, Hunter Water Australia (HWA) and HydroScience Consulting in attendance. The objective of the workshop was to identify and rate the raw water quality risks posed to the Wagga Wagga community and which must be addressed by the WTP upgrade.

The key risks identified in the workshop, documented in *Wagga Wagga WTP Upgrade Feasibility Raw Water Quality Risk Assessment* (HWA 2012) are summarised below.

Hazards rated as 'Very High' risk include:

- Microbiological pathogens – *E. coli*, *Cryptosporidium* and *Giardia* from grazing livestock, livestock in river upstream of plant, storms, Forrest Hill WWTP discharge.
- Turbidity from farming operations, land clearing, storms.

Hazards rated as 'High Risk' include:

- Microbiological pathogens – *E. coli*, *Cryptosporidium* and *Giardia* from floods, camping, swimming, fishing, boating, sabotage/ deliberate contamination.
- Turbidity from flood.
- Chemical contamination caused by floods, tanker spill.
- Heavy metals from chemical tanker spills, industrial site flooding.
- High organics and chlorine demand caused by floods.

Hazards rated as 'Moderate Risk' include:

- Microbiological pathogens – *E. coli*, *Cryptosporidium* and *Giardia* from native and feral animals, residential development (on-site sewage management systems).
- Chemical contamination from farming, intentional dumping of septic wastes, sabotage/ deliberate contamination, mining practices, industrial spills, industrial site stormwater.
- Heavy metals from farming, mining practices, industrial spills and industrial site stormwater.
- High organics and chlorine demand from farming, drought.
- Pesticides and herbicides from farming.
- Iron and manganese from geology, storms and floods (low due to dilution).
- Algal tastes, odours and toxins caused by drought.

Hazards rated as 'Low Risk' include:

- Microbiological pathogens – *E. coli*, *Cryptosporidium* and *Giardia* from bushfire, timber harvesting, intentional dumping of septic wastes.
- Turbidity from bushfire, timber harvesting, stratification of dams.
- Chemical contamination from farming fuel storage, bushfire, timber harvesting, Airforce base/ airport.
- Heavy metals from geology, storms and floods (low due to dilution).
- High organics and chlorine demand from wastewater facilities discharge, stratification of dams.
- Iron and manganese from stratification.
- Algal tastes, odours and toxins from stratification.
- Emerging contaminants (Endocrine Disrupting Compounds (EDC), Pharmaceuticals and Personal Care Products (PPCP)) from wastewater discharge.
- Salinity from stratification of dams.

Treated Water Quality Targets

Following on from the Raw Water Quality Risk Assessment, a review of treated water quality targets was undertaken. The targets include a RWCC minimum requirement and also an enhanced target (HWA 2012). As can be seen from Table 6-19, RWCC's treated water quality targets meet or exceed the Australian Drinking Water Guidelines (ADWG) for treated water. The ADWG undergo rolling revision to ensure they represent the latest scientific evidence on good quality drinking water. .

Table 6-19: Treated Water Quality Targets (HWA 2012)

Treated Water Parameter	ADWG Treated Water Value	RWCC Requirement	RWCC Long Term Desirable
Turbidity	< 1 NTU 95%ile	95%ile of samples <0.2 NTU and always less than 0.5 NTU.	95%ile of samples <0.15 NTU and always less than 0.3 NTU
Cryptosporidium	0.2 NTU from each filter	0.2 NTU from each filter	5-log removal
E. coli	No detects	No detects	No detects
Enteric viruses	Conventional treatment + C(t) = 30 mg.min/L = 5 log	Conventional treatment + C(t) = 30 mg/L. min = 5 log	Conventional treatment + C(t) = 30 mg/L. min = 5 log
Colour	15 Hazen units	True colour, 5 Hazen units	True colour, < 5 Hazen units
Biological Stability		60 - 80% DOC removal	DOC < 2 mg/L
Disinfection By-Products	TTHM < 250 µg/L plus other DBP's as outlined in the ADWG.	TTHM < 250 µg/L plus other DBP's as outlined in the ADWG.	Desirable to have (or build in the flexibility) to meet tighter DBP levels in the future. < 80 µg/L
Stability/Corrosion pH	pH 6.5 – 8.5	pH 7.0 to 7.8 CHPP: -5 to -1 mg/L LI: -1 to -0.5	pH 7.2 to 7.8 CHPP: -5 to -1 LI: -1 to -0.5
Aluminium	0.2 mg/L	Total <0.20 mg/L Soluble < 0.10 mg/L	Total <0.10 mg/L
Iron	< 0.3 mg/L	< 0.1 mg/L	< 0.1 mg/L
Manganese	<0.1 mg/L	<0.02 mg/L	<0.015 mg/L
Fluoride	Meet targets consistent with regulations.		
Algal Taste & Odours		No target unless identified in future.	No target unless identified in future.
Other Taste & Odours - metallic etc		No tastes and odours detected by staff and/or customers. Optimising process for metals targets, pH, stability to minimise taste and odour formation potential.	Proactively seek taste and odours reduction and use panel set up to ADWG guidelines.
Algal Toxins	Microcystin should not exceed 1.3 ug/L expressed as microcystin LR equiv.	Effective removal of microcystins (< 1.3 ug/L expressed as microcystin LR equivalents). Minimum chlorine C(t) of 30 mg.min/L	No enhanced target unless identified in future.

Risk to public health posed by chemical use

The design of the WTP includes additional chemical treatment to treat highly turbid water and target the key water quality issues in the raw water extracted from the Murrumbidgee River to produce high quality drinking water. The proposed chemicals to be used in the upgraded treatment process are discussed in Section 6.14.2.3. There is a risk to public health if there is chemical overdosing of the treated water supply. Mitigation measures for the storage and use of chemicals, including operational design features to prevent overdosing, are included in Section 6.14.2.4 of this EIS.

6.14.2 Work Health and Safety

6.14.2.1 Construction Risks / Hazards

General

Construction activities, including operation of plant and equipment, pose a risk of injury or death to site construction site workers, as well as the general public.

Fire

Construction techniques that involve hot work, such as the welding of pipes (which can generate sparks), are considered to have some, albeit low, potential to generate a fire or increase the existing frequency of fires in the area (particularly during the fire danger period).

Hazardous Materials

Construction activities are likely to encounter hazardous materials, such as asbestos and lead which may present within buildings or structures to be demolished, as well as chemicals currently in use on-site. The WTP layout has taken into account the potential risk posed by storage of chemicals on-site including standards for siting chlorine tank, such as maintaining a minimum distance from the nearest residence. A Preliminary Hazard Analysis for the Proposal has been undertaken and is presented in Appendix B and discussed in Section 6.14.2.3.

6.14.2.2 Construction Mitigation Measures

- All requirements of the *Work Health and Safety Act 2011* and *Work Health and Safety Regulation 2011* must be fulfilled during the works.
- Public access to construction sites would be prohibited.
- Any potential fire risk on-site would be reduced by:
 - Removing flammable material from the work site.
 - Training Staff in the proper use of equipment and fire-fighting techniques.
 - Continually monitoring operations, especially during high risk activities.
 - Wearing appropriate Personal Protective Equipment (PPE).
 - Appropriate equipment to quickly extinguish any sparks generated on site.
 - The CEMP would incorporate contractor requirements to restrict the use of combustible fuels, and cigarette smoking on the construction site, as well as being aware of potential ignition risk when conducting hot work (such as welding) in or near vegetated areas or other potential ignition sources.
- All works related to hazardous and corrosive chemicals and all associated facilities including the delivery area would be designed in accordance with *AS 3780 – The Storage and Handling of Corrosive Substances*.
- The Safety Management Plan for construction of the Proposal is to include measures for minimising the risk of direct human contact with hazardous materials.
- An Incident Response Plan is to be prepared by the construction contractor and endorsed by RWCC prior to commencement of construction works to address the risk of site staff having direct contact with such hazardous materials.
- Risks would be minimised by applying safe handling and transport procedures and appropriate PPE relevant to the activity such as:
 - Appropriate gloves
 - Steel-capped leather boots
 - Long sleeved shirt and long trousers
 - Disposable face mask
 - Eye protection
 - Prior to working, all PPE should be inspected to ensure they are of good quality with no tears or holes.

6.14.2.3 Operational Chemical Storage and Management

Analysis of hazards posed by water treatment chemicals

A Preliminary Hazard Analysis (PHA) was prepared to consider the hazardous nature of the dangerous goods proposed to be store on site at the WTP. The PHA was prepared in consideration of SEPP No.33 - Hazardous and Offensive Industries and associated guidelines. The PHA is contained in Appendix B.

An overview of existing chemicals used on site is provided in Table 6-20. A preliminary risk screening was undertaken to determine whether the storage of chemicals on site is considered to be potentially hazardous under SEPP 33. It was found that the storage volume of Sodium hydroxide (caustic soda) and Sodium hypochlorite (chlorine), which are corrosive substances classified as Class 8 under the Dangerous Good Class Classification, exceeded the SEPP 33 trigger levels. Consideration was also given to the transport of Sodium silicofluoride (fluoride) as it is classified as a toxic Class 6.1 dangerous good.

Table 6-20: 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

It was determined that public safety hazards are unlikely beyond the boundary of the WTP site. Chemicals stored and used at the WTP are required to be stored in accordance with Australian Standards, adequately sealed within infrastructure and appropriately bundled. Chemicals may also be required to be disposed of during operation of the WTP. Requirements for the storage, handling and disposal of chemicals during operation would be undertaken in accordance with the relevant Safety Data Sheets and included in the WTPs Operational Management Plan.

Environmental risk were considered in regards to release of chlorinated water and loss of containment of filtered or clarified water from filters or clarifiers due to structural damage or overflow of structures. It was determined that there is potential for off-site impact under these scenarios but that it would not result in any adverse safety or major environmental issues.

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 of the PHA when further details are known and it is proposed to use the chemicals.

6.14.2.4 Mitigation measures relating to chemical storage and use

To mitigate the risk posed by chemicals to WTP staff and chemical delivery staff, the following measures are to be adopted during the operational phase of the Proposal:

- All WTP operators would have appropriate training and qualifications to handle the chemicals used at the plant.
- Chemicals would be transported, stored, handled and dosed in accordance with all relevant legislation, Australian Standards and guidelines.
- 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*.
- The following safety equipment would be available during operation of the new WTP:
 - Deluge-type safety shower/ plunge bath and eye wash facilities complying with AS 4775.
 - A hose (25mm diameter minimum) of length suitable to reach all parts of the unloading area and permanently connected to a water tap.
 - Safety Data Sheets (SDSs) for each chemical.
 - Adequate ventilation for all enclosed chemical areas.
 - Fire extinguishers complying with AS 2444.
 - Appropriate safety signage.

Controls/ safeguards incorporated into the upgraded water treatment process at the WTP to mitigate the risk of accidental release of chemicals into the environment or chemical overdosing of drinking water include:

- Liquid storage tanks would be fitted with level indicators connected to local alarms and the WTP Supervisory Control And Data Acquisition (SCADA) system.
- Each liquid chemical storage area would have a local filling panel that controls the chemical storage filling process and includes local and remote alarms and hard-wired interlocks to prevent overfilling storage tanks.

- Relevant chemical systems and unloading areas would have sunken bunds to contain the chemical in the event of a spillage with bunds designed in accordance with AS3780. 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 as specified in the Australian Standard.
- Bund drain valves would be normally closed and when opened, contents would be drained to an on-site chemical waste tank for later removal. Roofing over chemical storage bunds would substantially exclude rainwater.
- Dedicated road tanker unloading bay would be provided with a bund.
- All chemical dosing lines would be laid in chemical trenches or trays where appropriate. The trenches would be covered with removable covers and have drains that divert to the wastewater system.
- All equipment (including injection equipment and dosing lines) would allow for easy and safe isolation, to facilitate quick repairs without total closure of the plant.
- Measures that are in place to ensure water quality is of suitable quality for human health and systems in place to test prior to distribution and shutdown if any issues, for example:
 - dosing systems would be metered;
 - process equipment and instrumentation would have fault alarms and abnormal operation condition alarms specific to the equipment; and
 - final water would be sampled at the outlet of the Clear Water Storage and tested for on-line Chlorine, pH and turbidity.
- 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
- Acid and alkali bulk storages would be located away from each other and in a well-ventilated area.
- Cross contamination would be eliminated by signage, and different nozzle fittings for each chemical.
- Traffic speed limits on WTP site would be adhered to for chemical deliveries.

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).

7 Environmental Management and Summary of Safeguards

7.1 Construction Environmental Management Plan Requirements

An Environmental Management Plan (EMP) is a site-specific plan developed to ensure that all operators, contractors and sub-contractors comply with the environmental conditions of approval for the Proposal and that the environmental risks are properly managed.

All primary contractors responsible for elements of the proposed works are required to prepare a Construction Environmental Management Plan (CEMP) for those construction elements and are responsible for ensuring sub-contractors operate as per the CEMP. CEMP(s) are to be prepared to the satisfaction of RWCC prior to commencing any works (including site establishment). CEMPs are to be prepared in accordance with the NSW Government's Environmental Management System Guidelines – Edition 2 (NSW Government Construction Consultative Committee 2009) and the DIPNR EMP Guideline 2004.

The CEMP would include but not be limited to:

3. Erosion and Sediment Control Plan
4. Water Quality and Groundwater Management Plan
5. Traffic Management Plan
6. Construction Noise and Vibration Management Plan
7. Waste Management Plan (including measures for handling hazardous materials such as asbestos)
8. Work Health and Safety measures and staff induction
9. Monitoring and auditing
10. Complaints Management

As a minimum the CEMPs would address all issues identified in this EIS and contain all construction mitigation measures as per Section 6 and 7 of this EIS. The CEMP would also address the following 14 elements, as a minimum, of the *Environmental Management System Guidelines – Edition 2* (NSW Government Construction Consultative Committee 2009) including (but not be limited to):

1. Environmental policy
2. Review and identification of environmental aspects and impacts
3. Identification of legal and other requirements
4. Setting objectives and targets
5. Resources
6. Roles, responsibility and authority
7. Competence, training and awareness
8. Documentation
9. Operational control
10. Emergency preparedness and response
11. Monitoring and measuring performance
12. Corrective and preventive action
13. Control of records
14. Internal and management review

7.2 Mitigation Measures

7.2.1 Issues to be Managed by the Construction Contractor

The construction contractor is to manage environmental issues and objectives identified in this EIS during construction of the Proposal. Recommended mitigation measures to minimise any adverse impacts on the environment during construction of the proposed works are provided in Table 7-1, accompanied by suggested frequency/timing and responsibilities for their implementation. Operational mitigation measures identified in this assessment would be incorporated into the operational management plan of the Wagga Wagga WTP.

Table 7-1: Mitigation Measures to be managed by Construction Contractor

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Land Use Minimise disruption to existing land uses	- A lease agreement with Crown Lands is to be sought prior to commencement of construction. - All stakeholders would be informed of the planned works and kept informed of progress against the plan. - All employees at the existing WTP, maintenance depot and administrative office, would be notified of construction works and briefed on the impact to their daily operations. - Adjoining landholders would be informed of the construction scheduling, prior to construction commencing.	Prior to construction	RWCC
	Each work activity would be planned with contingency and risk mitigation measures considered and ready for implementation.	Prior to construction	Construction Contractor
	There would be sufficient potable water stored within the system downstream of the WTP to ensure continuity of potable water supply can be achieved within the timeframe of the planned works whilst also allowing for contingencies and risk.	During Construction	Construction Contractor
	Work would be scheduled to occur considering the likely potable water demand and volume of stored potable water in the system (i.e. working overnight when there is lower demand or during time periods when the WTP is off-line may be required).		
	The construction contractor would abandon or reschedule works at the direction of RWCC if changes in conditions necessitate e.g. change in demand profile of potable water customers.		

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Water Quality, Hydrology and Soils • Prevent erosion and soil loss • Prevent polluting of the soil profile • Prevent sediments or pollutants from entering waterways • Prevent pollution of groundwater	GENERAL CONSTRUCTION WORKS • An Erosion and Sediment Control Plan (ESCP) is to be prepared in accordance with <i>Managing urban stormwater: soils and construction</i> (Landcom 2004). The ESCP would be consistent with Section 6.4 of this EIS and any recommendations provided in the Geotechnical Investigation Report (Coffey 2013), and is to be developed as part of a Construction Environmental Management Plan (CEMP), and would detail the measures to minimise pollution, soil erosion and sedimentation impacts. • All onsite employees and contractors (including sub-contractors) would be trained in accordance with the Erosion and Sediment Control Plan. • A spill management plan would be developed before construction begins and implemented throughout construction. • Sediment and erosion control measures would be installed prior to excavation and construction works and would be maintained in an effective condition until earthworks have been completed and the sites are rehabilitated. • If a temporary concrete batch plant is to be used on-site, measures for effectively managing wastewater from the concrete batch plant in the CEMP would be included so that discharge of pollution into Marshalls Creek and the Murrumbidgee River does not occur. • The CEMP is to include notification procedures to be followed under the POEO Act in the event that there is potential material risk of harm if a spill occurs.	Prior to Construction	Construction Contractor
	• Wastewater from the concrete batch is to be diverted, captured, treated and reused to prevent release to waterways and soils. • Sediment and erosion controls are to ensure runoff is diverted around the WTP construction site. • Sediment and erosion control devices would be inspected regularly and after rainfall events, maintained to ensure effectiveness over the entire duration of the Proposal, and cleaned out before 30% capacity is reached. • Sediment control devices would be placed at the entry points to any culverts and stormwater channels to prevent sediment entering the stormwater system. • Sediment control devices (e.g. silt fences, straw bales wrapped in geotextile etc.) would be installed parallel with the contours of the site and immediately downslope of any areas where the natural ground surface has been disturbed.	During Construction	Construction Contractor

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
	No waste or materials would be stored or placed on or adjacent to sediment fences.		
Water Quality, Hydrology and Soils <i>Prevent erosion and soil loss</i> <i>Prevent pollution of the soil profile</i> <i>Prevent sediments or pollutants from entering waterways</i> <i>Prevent pollution of groundwater</i>	- Rainfall and any encountered groundwater seepage would be permitted to evaporate or if required, pumped and passed through erosion and sediment controls (sediment filters and traps, barley bales) and across grassed areas prior to discharge. No discharge would occur directly to waterways. - Any spoil storage areas or stockpiles would have appropriate erosion control devices installed to control runoff and prevent sedimentation. Silt barriers/sediment filters/traps around any stockpiles of soil would be provided to prevent the loss of material. - Dust suppression techniques would be employed where required. - Removed topsoil and vegetation would be stockpiled separately. They would be stockpiled so that material will not enter drainage lines or water courses and will maintain existing drainage flow. Appropriate erosion and sedimentation control should include silt fencing installed around the entire perimeter of any stockpiles, and on the downside of any exposed stripping and excavations. - Measures would be in place to ensure mud is not tracked onto public roads.	During Construction	Construction Contractor

	CONSTRUCTION OF RIVER WATER INTAKE • Construction of the river water intake would take into consideration NSW Office of Water's <i>Controlled Activities Guidelines</i>, including but not limited to: ○ Preparing a rehabilitation plan for areas of river bed and banks disturbed by the works, including the removal of the existing raw water intakes. ○ Incorporating permanent bed and bank stabilisation works for scour protection. • Preparation of a Vegetation Management Plan (VMP) by a suitably qualified person detailing how restoration of the river bank would be undertaken. The VMP is to be prepared in accordance with Office of Water's <i>Guidelines for Vegetation Management Plans on Waterfront Lands</i>, addressing the following criteria: ○ The VMP should consider the full width of the riparian corridor – in this case, from the river intake structure to the pump station. ○ The VMP is to include maps or diagrams which clearly identify the riparian corridor; the existing vegetation; the vegetation to be retained; the vegetation to be cleared; the footprint of construction activities; and areas of proposed revegetation. ○ Photographs of the site should be supplied and photo points should be identified. To assist with future monitoring and reporting requirements, the photo points should be identified by GPS coordinates or by survey. This is particularly important for large scale earthworks or extractive industries. ○ Measures for controlling long term access and encroachments (bollards, fences, etc.) into the riparian corridor should be identified. ○ Vegetation species composition, planting layout and densities should be identified. Species should comprise a mix trees, shrubs and groundcovers species representative of River Red Gum woodland. Planting densities should achieve quick vegetative cover and root mass to maximise bed and bank stability along the subject watercourse. Note that costs associated with high density planting would be recovered through reduced maintenance costs for weeding or replacement planting in the maintenance period ○ Seed or plant sources should be identified. Where possible, native plants and seed sources of local provenance should be used. ○ Exotic vegetation should be avoided. The use of exotic species for temporary soil stabilisation is permitted provided they are sterile, non-invasive and easily eradicated when permanent vegetation is established.	Prior to construction	Construction Contractor
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Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
	○ Details of the planting program, rehabilitation methods and staging should be provided. Techniques such as hydro-seeding, direct seeding, brush matting or assisted natural regeneration may be considered. ○ Maintenance requirements should extend for a minimum of two years after the completion of works or until such time as a minimum 80 per cent survival rate of each species planted and a maximum 5 per cent weed cover for the treated riparian corridor controlled activity is achieved. ○ Project tasks should be defined and described, including a schedule detailing the sequence and duration of works necessary for the implementation of the VMP. ○ Costings for the implementation of all components and stages of the work including materials, labour, watering, maintenance which includes plant replacement, monitoring and reporting should be prepared. ● Processes for monitoring and review, including a method of performance evaluation should be identified. This should include replacing plant losses, addressing deficiencies, problems, climatic conditions and successful completion of works.		
	● Construction of the river water intake would be undertaken in accordance with the rehabilitation plan for areas of river bed and banks disturbed by the works, including the removal of the existing raw water intakes. ● Pipe trenches are to remain open for a minimal length of time. ● The height of each coffer dam should provide protection for a 1 in 10 year flood event, if possible. ● Instream silt curtains are to be installed around each coffer dam to contain sediment which may be displaced from the coffer dam area. ● Water removed from the coffer dams is not to be discharged directly into the river if considered to be a pollutant under the POEO Act. This water is to be discharged to a vegetated area at least 100 m from the river and filtered through sandbags, or the like. If any waters extracted from the proposed coffer dams are proposed to be discharged to the river it must be certified that is of appropriate quality and treated as required prior to release. ● Coffers dams are to be inspected regularly and immediately repaired, as required. A thorough inspection is to be undertaken following flood events.	During Construction	Construction Contractor

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Water Quality, Hydrology and Soils - Prevent erosion and soil loss - Prevent polluting of the soil profile - Prevent sediments or pollutants from entering waterways - Prevent pollution of groundwater	- Weather forecasts are to be monitored to anticipate the occurrence of high flow events, and work operations adjusted to accommodate possible overtopping of the coffer dams. - Silt curtains are to remain in place until the coffer dams have been removed. - Encroachment of the coffer dam into the river is to be minimised as far as possible. - All debris, construction waste and accumulated sediment is to be cleared away from the site before the removal of the coffer dam. - Stabilisation of the river bank is to be undertaken in accordance with NSW Office of Water's <i>Controlled Activities Guidelines</i> to provide long-term stabilisation and mitigation of erosion and sedimentation impacts.	During Construction	Construction Contractor
Flora and Fauna Minimise impacts of works on flora and fauna and minimise disturbance to habitat	Incorporate fish screens into the design of the river intake to minimise fish (including larval stages) entry and entrainment in accordance with <i>Development of fish screening criteria for water diversions in the Murray-Darling Basin</i> (Boys et. al. 2012).	Detailed Design	RWCC / NSW Public Works
	- The CEMP is to include a site plan identifying the location of sensitive habitats in the vicinity of the proposed work site e.g. Marshalls Creek, hollow-bearing River Red Gums. - No hollow-bearing trees are to be removed. - Construction workers are to be inducted and updated on the environmental risks of construction activities, particularly at the river intake location, via toolbox meetings. - Appropriate erosion and sediment control procedures are to be implemented for all construction works adjacent to, and within, riparian areas such as the banks of Marshalls Creek and the Murrumbidgee River to avoid erosion of the river banks and smothering of vegetation and habitats.	Prior to Construction	Construction Contractor

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Flora and Fauna <i>Minimise impacts of works on flora and fauna and minimise disturbance to habitat</i>	- 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. - During de-watering of the coffer dam, entrapped native fauna such as fish and tortoises, are to be removed and immediately released to the river. Exotic fish species such as European Carp (<i>Cyprinus carpio</i>) would be euthanased and not returned to the river. - Construction of the river intake site is to be undertaken during the winter months when dependent flying-fox young are unlikely to be present in the Grey-headed Flying-fox colony on Bat Island and dependent Platypus young are unlikely to be present in burrows. - No large snags, including the two large fallen trees adjacent to the proposed river intake site, are to be removed during the construction works.	During Construction	Construction Contractor
Non-indigenous Heritage <i>No disturbance to any items of non-indigenous heritage</i>	- Care is to be taken when using heavy machinery in the vicinity of Riverside Residence. - The main structure of the cottage is not to be altered during the period of construction, through the removal of walls or replacement of doors and windows. Replacing furnishings, such as light fittings and carpet, are acceptable heritage impacts as the structure has been previously modified in this way and the current fittings are not original. - An archival recording for the site should be carried out prior to works commencing. This should focus on the area around Riverside Residence. It can be carried out in conjunction with an archival recording that has been recommended for the construction of a levee bank, which is addressed in a separate report. It is not necessary to record Riverside Residence internally.	During Construction	Construction Contractor
Aboriginal Heritage <i>No disturbance to any items of Aboriginal heritage</i>	All relevant RWCC staff and on-site personnel (including contractors) are to be made aware of the provisions for the protection of Aboriginal objects under the <i>National Parks and Wildlife Act 1974</i> and their statutory obligations under the Act.	Prior to Construction	RWCC & Construction Contractor
	- No works are to occur outside the proposal area. - If an item is discovered which is identified as Aboriginal Heritage during the construction phase, works would cease in the vicinity of the find and the Environmental Officer or Site Foreman contacted. No works would recommence	During Construction	Construction Contractor

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
	until a detailed investigation by suitably qualified persons has been undertaken in accordance with OEH guidelines. - Stop work provisions (detailed below) would apply to the works in the event of discovery of suspected Aboriginal objects or discovery of suspected human skeletal material. All RWCC staff or contractors engaged by RWCC to complete the on-site works should be briefed on these stop work provisions and their reporting requirements prior to commencing any works on site. <i>Discovery of Suspected Aboriginal Objects</i> If an Aboriginal object is identified while undertaking the proposed works, the following steps must be implemented: - Do not further disturb or move the object. - Immediately cease all work at the particular location. - Notify OEH of the discovery and the location of the object, and determine an appropriate course of action (an AHIP application and further investigation may be required). - Contact an archaeologist for further specialist advice on reporting and consultation requirements.		

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Air Quality / Odour - No dust or vehicle emissions complaints during construction - No odour complaints during operation	- Vehicle exhaust systems would be properly maintained so that exhaust emissions comply with the Clean Air Regulation under the <i>Protection of the Environment Operations Act 1997</i>. - Potential dust sources (soil stockpiles, access tracks) would be covered or regularly watered (if water restrictions are not in place) when required, particularly on hot, dry and windy days. - Any construction activities likely to create dust would utilise containment methods to minimise any impact to nearby sensitive receivers. - If soil stockpiles are to remain for longer than a 10 day period, they would be covered or stabilised with quick growing, sterile grasses. - The location and number of dust sources (i.e. bare surfaces, including stockpiles) would be considered prior to construction and restricted during works.	During Construction	Construction Contractor
Noise and Vibration - No noise complaints during construction and operation. - Minimise disturbance to surrounding properties and residences and native fauna.	- A Construction Noise and Vibration Management Plan (CNVMP) would be prepared for inclusion in the CEMP. Construction of the project and the CNVMP is to consider Strategies 1-7 of Section 6 of the ICNGs outlined as follows: - Strategy 1 Universal work practices (Table 4 ICNG) - Strategy 2 Consultation and notification (Table 5 ICNG) - Strategy 3 Plant and Equipment (Table 6 ICNG) - Strategy 4 Onsite (Table 7 ICNG) - Strategy 5 Work scheduling (Table 8 ICNG) - Strategy 6 Transmission path (Table 9 ICNG) - Strategy 7 At residences or other sensitive land uses (Table 10 ICNG) - Workers would be inducted about noise from the works at the identified land uses and reduction options/strategies e.g. appropriate use of equipment and machinery, avoidance of shouting/ talking loudly and restricting the slamming of vehicle doors and dropping materials from heights. - The proponent would inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. - RWCC staff who work on site would be informed regarding the proposed works. - The safe working distances should be verified at the commencement of the works by confirming the ground vibration attenuation levels of the site.	Prior to Construction	Construction Contractor

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Noise and Vibration <i>No noise complaints during construction and operation.</i> <i>Minimise disturbance to surrounding properties and residences and native fauna.</i>	The CNVMP is to include as a minimum, but not be limited to, the following mitigation measures to manage noise and vibration during construction of the Proposal: - Given the potential for the predicted noise exceedances, noise mitigation strategies should be implemented wherever feasible during the construction works. Where feasible and reasonable, the quietest plant and equipment should be utilised in combination with management measures to minimise the noise impact on the local community. - Noise impacts are to be minimised in accordance with the Interim Construction Noise Guideline (DECC 2009). - Where possible, the use of concrete mixing trucks would be avoided during early morning hours, and would be programmed to operate the within a single shorter period rather than spread out over the whole day where possible. This allows affected residents a period of relief during the afternoon which is a better outcome than spreading the noise over the whole day. - Where possible avoid early morning operation of soil compacter and powered saws and also providing some shielding of the activities with the use of site sheds and construction material storage areas. - Communicate to workers the potential adverse impact of reversing alarms and the need to avoid reversing where possible, to minimise impacts from reversing alarms. - Use spotters, “smart” reversing alarms, or “squawker” type reversing alarms in place of traditional reversing alarms. - Construction works would be generally within the working hours of Monday-Friday 7am to 6pm and Saturday 8am to 1pm. No audible construction work to take place outside these hours or on Sundays or public holidays. Should the need for activities to be undertaken outside of the standard working hours, such as to ensure continuity of potable water supply during construction, these would only be carried out only when no other method of construction is considered reasonable and feasible. - Scheduling the noisiest work tasks during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). - All reasonable attempts would be made to complete significant noisy activities within a short period.	During Construction	Construction Contractor

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Noise and Vibration - No noise complaints during construction and operation. - Minimise disturbance to surrounding properties and residences and native fauna.	- Well maintained and low noise generating machinery would be used and machinery operated at the minimum necessary power setting. - Noise monitoring would be undertaken if community complaints are received to ensure that noise mitigation measures have been effectively implemented. - Machines used for construction would be fitted with residential grade exhaust silencers and maintained in good condition for the duration of the work. Machines found to produce excessive noise compared to industry best practice would be removed from the site or stood down until repairs or modifications can be made. - Regular inspection and maintenance of equipment and machinery to ensure that it is in good condition. - Machinery and equipment would be operated in an effective manner to minimise noise, e.g. turning off plant machinery or equipment when it is not being used. - Avoiding the use of noisy machinery and equipment working simultaneously/ close together as much as possible. - Construction methodologies would be adopted that would minimise noise and vibration. - Review and implement actions (where possible) additional to those described above if circumstances change or complaints are received.	During Construction	Construction Contractor
Traffic and Transport - Maintain safe traffic conditions - Minimise traffic and access disruptions	The CEMP is to include a Traffic Management Plan (TMP) which would be prepared and implement in accordance with the RMS Traffic Control at Worksites Manual, Version 4. The TMP is to include, as a minimum: - A requirement to adhere to traffic speed limits both on and off-site. - A requirement to obey all traffic signs, including 'Left Turn Only' on to Sturt Highway from WTP site. - A site plan designating access points and parking areas for construction contractors. - Signage on Hammond Ave (Sturt Highway) advising of heavy vehicles entering / leaving the WTP site.	Prior to construction	Construction Contractor
	Adherence to all requirements in the TMP by all project personnel, including RWCC employees, contractors and subcontractors.	During construction	RWCC & Construction Contractor

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Visual Amenity Minimise impact on visual amenity	- Revegetate disturbed areas on the boundary with the holiday park with native grasses and shrubs and vegetation to be used for longer term screening. - Revegetate the river bank around the raw water intake with shrubby vegetation, such as wattles, to reduce visual impacts of the structure on river users.	During construction	Construction Contractor
Waste Management - Minimise amount of waste going to landfill. - Manage waste in accordance with relevant legislation, guidelines and policies.	A Waste Management Plan would be prepared by the contractor as part of the CEMP and endorsed by RWCC prior to works commencing. The Plan would include but not be limited to addressing the following general measures to be implemented during construction of the Proposal: - The principles of waste reduction, reuse, and recycle would be understood and implemented by the Contractor. - Excavated soils would be reused for backfilling where possible, with all topsoil re-used on site. - Materials would be recycled wherever practical. - Different waste streams would be separated for disposal and materials disposed to recycling facilities where available. - Any hazardous waste would be managed and disposed of in accordance with WorkCover and EPA requirements.	Prior to Construction During construction	Construction Contractor Construction Contractor
Waste Management - Minimise amount of waste going to landfill. - Manage waste in accordance with relevant legislation, guidelines and policies.	- Waste would be disposed of in accordance with the Waste Classification Guide (DECC 2008). - No waste from the site, including excess spoil, would be conveyed to or deposited at any location that cannot be lawfully used as a waste facility for that waste. - A register of all waste disposed of would be maintained. - Cleared vegetation, excluding weeds, would be re-used on site as mulch. - Weeds would be removed and disposed of in accordance with their classification.	During Construction	Construction Contractor

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Greenhouse Gas Emissions and Energy Use Minimise GHG emissions and energy consumption	- Use of well-maintained plant and equipment to minimise fuel consumption. - Incorporate energy efficiency considerations into site inductions and the use and selection of vehicle and plant. - Proper fitting and maintenance of vehicle exhausts systems to ensure emissions comply with the POEO Act. - Only start up vehicles when required and limit idling time when not in use. - Minimise haulage vehicle movements by filling to maximum allowable limits.	During Construction	Construction Contractor
Risks and Hazards Minimise risk of harm to people and property	- All requirements of the <i>Work Health and Safety Act 2011</i> and <i>Work Health and Safety Regulation 2011</i> must be fulfilled during the works. Public access to construction sites would be prohibited. - Public access to construction sites would be prohibited. - Construction techniques that involve hot work, such as the welding of pipes (which can generate sparks), are considered to have some, albeit low, potential to generate a fire or increase the existing frequency of fires in the area (particularly during the fire danger period). Any potential risk would be reduced by: - Removing flammable material from the work site. - Training Staff in the proper use of equipment and fire-fighting techniques. - Continually monitoring operations, especially during high risk activities. - Wearing appropriate Personal Protective Equipment (PPE). - Ensuring appropriate equipment to quickly extinguish any sparks generated on site is available.	During Construction	Construction Contractor
	- The CEMP would incorporate contractor requirements to restrict the use of combustible fuels, and cigarette smoking on the construction site, as well as being aware of potential ignition risk when conducting hot work (such as welding) in or near vegetated areas or other potential ignition sources. - All works related to hazardous and corrosive chemicals and all associated facilities including the delivery area would be designed in accordance with <i>AS 3780 – The Storage and Handling of Corrosive Substances</i>. - The Safety Management Plan for construction of the Proposal is to include measures for minimising the risk of direct human contact with hazardous materials.		

Environmental Issue and Objectives	Construction Mitigation Measures	Suggested Frequency/Timing	Reporting and Responsibility
Risks and Hazards <i>Minimise risk of harm to people and property</i>	- An Incident Response Plan is to be prepared by the construction contractor and endorsed by RWCC prior to commencement of construction works to address the risk of site staff having direct contact with such hazardous materials. Risks would be minimised by applying safe handling and transport procedures and appropriate PPE relevant to the activity such as: - Appropriate gloves - Steel-capped leather boots - Long sleeved shirt and long trousers - Disposable face mask - Eye protection - Prior to working, all PPE should be inspected to ensure they are of good quality with no tears or holes.	During Construction	Construction Contractor

7.3 Operational Mitigation Measures

The new infrastructure to be established through construction of the Proposal would be operated in accordance with RWCC's systems and programs and regulatory requirements.

Land Use

- Maintenance and emergency repairs would be required for the lifetime of the Proposal when necessary and would be undertaken in accordance with operational procedures for the WTP.
- RWCC would be required to arrange a lease agreement with Crown Lands to maintain access to the river bank and bed during operation of the new river intake structure.

Water Quality, Hydrology and Soils

Measures to mitigate impacts on adjacent waterways include:

- Maintaining sealed and vegetated areas to reduce sediment being conveyed off-site.
- On-site containment of chemical spills e.g. bunds with 110% capacity around delivery points.
- Maintaining native plantings on the bank at river water intake site to facilitate long-term bank stabilisation.

Controls/ safeguards that would be incorporated into the upgraded water treatment process at the WTP to mitigate the risk of accidental release of chemicals into the environment or chemical overdosing of drinking water include:

- Liquid storage tanks would be fitted with level indicators connected to local alarms and the WTP Supervisory Control And Data Acquisition (SCADA) system.
- Each liquid chemical storage area would have a local filling panel that controls the chemical storage filling process and includes local and remote alarms and hard-wired interlocks to prevent overfilling storage tanks.
- Relevant chemical systems and unloading areas would have sunken bunds to contain the chemical in the event of a spillage with bunds designed in accordance with AS3780 *The Storage and Handling of Corrosive Substances*. Bund drain valves would be normally closed and when opened, contents would be drained to an on-site chemical waste tank for later removal. Roofing over chemical storage bunds would substantially exclude rainwater.
- All chemical dosing lines would be laid in chemical trenches or trays where appropriate. The trenches would be covered with removable covers and have drains that divert to the wastewater system.
- All equipment (including injection equipment and dosing lines) would allow for easy and safe isolation, to facilitate quick repairs without total closure of the plant.
- Adequate access and roadway would be provided to allow for the delivery of chemicals into relevant vessels/storage spaces. This would include concrete or bitumen roadway and hardstand delivery areas adjacent to chemical storage units.
- Chemical delivery and storage areas would be bunded to contain accidental chemical spills.
- Turbidity analysers on the clarified water line from each clarifier would monitor individual clarifier performance monitoring. In addition, a clarified water sample would be sent to the laboratory for remote water quality analysis.
- Water quality sampling points would be located on various lines/ inlets/ outlets, such as raw water, pre-dosed water, flocculated water, clarified water and filtered water. Final water would be sampled at the outlet of the Clear Water Storage and tested for on-line Chlorine, pH and turbidity.

Flora and Fauna

Measures to mitigate impacts on terrestrial and aquatic ecology during operation of the new WTP include:

- The Detail Design for the river water intake is to incorporate fish screens designed in accordance with *Development of fish screening criteria for water diversions in the Murray-Darling Basin* (Boys et. al. 2012) to prevent entrainment of fish (including larval stages) in the river intake.
- Ongoing monitoring of bank stabilisation works at the river water intake location to identify whether any remedial works, such as replacing native plantings which have died or been washed away by floodwaters, are required.
- Regular inspections of the river intake screens to identify if repairs are required.
- Design controls which contain any potential chemical spills or tank overflows from entering the river or Marshalls Creek.
- Regular monthly monitoring of the WTP site, particularly the location of the river water intake 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.

Non-Indigenous Heritage

- A Conservation Management Plan would be prepared for the management of the heritage values of the WTP site.

Noise and Vibration

Measures for consideration for the design of the WTP to mitigate operational noise include:

- Clearwater pumps to be housed in a sheet metal insulated building with a roof with internal glasswool insulation lining and sheet metal external cladding. Ventilation should be via insulated ducts.
- If there are an ongoing noise issues with clarifier pumps then options for treatment could include installation of acoustic panels around the platform surrounding the motors approximately 1m away and 1m higher than the top of the motor.
- Air-conditioning condensers are a potential source of noise to receptors and should be located at low level where possible and on building facades not directly facing the closest residential receivers.
- The building housing the filter blowers be internally insulated or be of masonry construction.

Traffic and Transport

- 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*.

Visual Amenity

- Vegetation is to be maintained along the eastern boundary to screen views from Easts Riverview Holiday Park and around the raw water intake to reduce visual impacts on river users.

Waste

- Discharge to Marshalls Creek is to be in accordance with the Environment Protection Licence.
- Dried solids would be transported to landfill. In the event of infrastructure or process upgrades, or newly identified material reuse options in the future (in particular water residuals reuse options), the principles of waste reduction / minimisation would be considered and applied to reduce waste disposal to landfill.

Chemical Management

To mitigate the risk posed by chemicals to WTP staff and chemical delivery staff, the following measures are to be adopted during the operational phase of the Proposal:

- All WTP operators would have appropriate training and qualifications to handle the chemicals used at the plant.
- Chemicals would be transported, stored, handled and dosed in accordance with all relevant legislation, Australian Standards and guidelines.
- 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*.
- The following safety equipment would be available during operation of the new WTP:
 - Deluge-type safety shower/ plunge bath and eye wash facilities complying with AS 4775.
 - A hose (25mm diameter minimum) of length suitable to reach all parts of the unloading area and permanently connected to a water tap.
 - Safety Data Sheets (SDSs) for each chemical.
 - Adequate ventilation for all enclosed chemical areas.
 - Fire extinguishers complying with AS 2444.
 - Appropriate safety signage.

Controls/ safeguards incorporated into the upgraded water treatment process at the WTP to mitigate the risk of accidental release of chemicals into the environment or chemical overdosing of drinking water include:

- Liquid storage tanks would be fitted with level indicators connected to local alarms and the WTP Supervisory Control And Data Acquisition (SCADA) system.
- Each liquid chemical storage area would have a local filling panel that controls the chemical storage filling process and includes local and remote alarms and hard-wired interlocks to prevent overfilling storage tanks.
- Relevant chemical systems and unloading areas would have sunken bunds to contain the chemical in the event of a spillage with bunds designed in accordance with AS3780. 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 as specified in the Australian Standard.
- Bund drain valves would be normally closed and when opened, contents would be drained to an on-site chemical waste tank for later removal. Roofing over chemical storage bunds would substantially exclude rainwater.
- Dedicated road tanker unloading bay would be provided with a bund.
- All chemical dosing lines would be laid in chemical trenches or trays where appropriate. The trenches would be covered with removable covers and have drains that divert to the wastewater system.
- All equipment (including injection equipment and dosing lines) would allow for easy and safe isolation, to facilitate quick repairs without total closure of the plant.
- Measures that are in place to ensure water quality is of suitable quality for human health and systems in place to test prior to distribution and shutdown if any issues, for example:
 - dosing systems would be metered;
 - process equipment and instrumentation would have fault alarms and abnormal operation condition alarms specific to the equipment; and
 - final water would be sampled at the outlet of the Clear Water Storage and tested for on-line Chlorine, pH and turbidity.
- 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
- Acid and alkali bulk storages would be located away from each other and in a well-ventilated area.
- Cross contamination would be eliminated by signage, and different nozzle fittings for each chemical.
- Traffic speed limits on WTP site would be adhered to for chemical deliveries.

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).

8 Conclusion

The Proposal assessed in this EIS is the upgrade of the Wagga Wagga Water Treatment Plant. As detailed in Section 6 of this EIS, a number of potential impacts have been identified as a result of the construction activities of the Proposal particularly with regard to the proposed works on the bank of the Murrumbidgee River, and the generation of noise impacts for sensitive receivers in the adjoining Easts Riverview Holiday Park. It has been assessed that these impacts can be managed through the implementation of appropriate safeguards in accordance with industry best practice as prescribed by relevant statutes, policies and guidelines. The majority of the impacts would be temporary in nature occurring for the duration of the construction period.

The construction contractor would prepare a CEMP in accordance with the requirements of this EIS and other relevant guidelines, to document all management measures to be implemented during the construction of all elements of the Proposal.

The Proposal would have positive social impacts by providing a more reliable water supply source without the need to increase extraction levels from the river, beyond the existing licensing arrangement.

Pursuant to the provisions of the EP&A Act and EP&A Regulation 2000, an environmental assessment of the proposed construction and operation of the Wagga Wagga WTP Upgrade has been undertaken. The Proposal has been assessed to be consistent with the principles of Ecologically Sustainable Development.

Consideration has been given to the likely impact of the activity on the environment, having regard to all relevant factors. On the basis of the information presented in this EIS it is concluded that by adopting the safeguards identified in this assessment it is unlikely that there would be significant adverse environmental impacts associated with the Proposal.

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