Riverina Water County Council

Wagga Wagga Water Treatment Plant Replacement

Environmental Impact Statement

Final

December 2014

Presented by Hunter Water Australia Pty Limited

ABN 19080869905

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Submission of environmental impact statement (EIS)

Prepared under the *Environmental Planning and Assessment Act* 1979

Part 4, Section 78A

EIS prepared by	
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Part 4.1 State Significant Development	
proponent name	Riverina Water County Council
proponent address	91 Hammond Avenue, Wagga Wagga
land on which activity to be carried out: address	91 Hammond Avenue Wagga Wagga
lot no. DP / MPS	Lot 2, DP 540063 and adjacent Crown Land
proposed development	Construction and operation of a new water treatment plant with a plant capacity of 55ML/d
environmental impact statement	An environmental impact statement (EIS) is attached

certificate

I certify that I have prepared the contents of this Statement and to the best of my knowledge

- in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, and
- contains all available information that is relevant to the environmental assessment of the infrastructure to which the statement relates, and
- that the information contained in the statement is neither false nor misleading.

signature	Anne Finegan
name	Anne Finegan
date	19/12/2014

Executive Summary

Introduction

The Wagga Wagga Water Treatment Plant (WTP) is operated by Riverina Water County Council (RWCC). The WTP supplies reticulated water to the City of Wagga Wagga and the Shires of Lockhart and Greater Hume in combination with the West Wagga Wagga WTP, North Wagga WTP and smaller bore systems. The plant treats raw water sourced from the Murrumbidgee River and groundwater sourced from the East Wagga Borefield. The existing filtration WTP has the capacity to treat approximately 44 ML/d of water.

It is proposed to replace the WTP to address both water quality issues and to provide increased capacity in the plant for predicted increases in demand. RWCC is seeking development consent, as the owner and operator of the Wagga Wagga Water Treatment Plant (WTP), to construct a replacement WTP on the site of the existing plant.

This Environmental Impact Statement (EIS) has been prepared by Hunter Water Australia (HWA) and nghenvironmental on behalf of RWCC to assess the potential environmental impacts associated with the proposed new Wagga Wagga WTP. The EIS has been prepared in accordance with Division 4.1 (State Significant Development) of the *Environmental Planning and Assessment Act,* 1979 (EP&A Act).

Location and Surrounding Land Use

The proposed WTP would be constructed within the boundary of the existing Wagga Wagga WTP which is located off the Sturt Highway (Hammond Avenue) (Lot 2, DP 540063) in Wagga Wagga in the Riverina region of NSW. Wagga Wagga is located approximately 380 km south west of Sydney. The WTP site covers an area of 8.43 ha.

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 land uses within or immediately adjacent to the Proposal include:

- Utility operation/water treatment: infrastructure and buildings associated with the existing WTP. RWCC also has its administration buildings on site and a depot for servicing its water supply reticulation.
- Easts Riverview Holiday Park / Big 4 Wagga Wagga Holiday Park on the eastern boundary.
- 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 on the western side of Marshalls Creek.
- Crown Land: bank and bed of the Murrumbidgee River.
- Residential areas approximately 170 m to the west of the site.

Need for the Proposal

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

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). 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.

The current raw pumping arrangement from the Murrumbidgee River uses a combination of seven pumps, it 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. It has therefore been identified that a new river intake is required.

The Murrumbidgee River is subject to high turbidity particularly during storm or flood events. RWCC monitoring data 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). 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.

Proposal Scope

The Proposal involves the construction of a new WTP with an ultimate capacity of 55 ML/d. A conventional water treatment process has been proposed. The proposed water treatment process includes clarification to settle out solids from the raw water and dual media filtration to remove particles in the water with pre- and post-filter chemical dosing. The water would be treated to a standard to meet the Australian Drinking Water Quality guidelines.

The elements of the WTP proposed to be constructed include:

- Raw water intake and pumping station. The intake would be constructed within the river. The pumping station would be built on Crown Land adjacent to the WTP on the bank of the Murrumbidgee River to supply raw water to the plant.
- Dosing tanks and static mixers for alum and polymer dosing systems.
- Fluoride dosing
- pH correction dosing systems
- Dewatering building with two new centrifuges to dewater sludge material produced from clarification and filtration during the water treatment process. The existing centrifuge would be decommissioned once the new plant is in operation.
- Backwash wastewater collection tank and pumping station for the wastewater produced from the clarification and filtration process.
- Inclined plate clarifiers (Lamella clarifiers) or Activator clarifiers.
- Six dual media filters including backwash pumps and air scour blowers.
- Chlorine storage and dosing system and channel-type static mixer for clear water storage.
- Clear water system upgrade including a new 3 ML clear water storage tank and low level and high level pumping stations each fitted with three pumps.
- Electrical works including switchrooms, automation and control infrastructure, electrical substations and two new 1500kVA transformers.
- Filter wastewater collection sump and transfer pumps.
- Pipework and valves.
- Control room, water testing and analyzing facilities
- Internal access roads.

In the initial stage of the Proposal, supernatant from the filter backwash wastewater treatment would continue to be discharged to Marshalls Creek, which is located on the western boundary of the WTP, as per the current practice. The design for the new WTP includes provision for a return line to be installed in the future to allow for supernatant to be returned to the head of plant, eliminating discharges to the creek. Dried sludge material resulting from the water treatment process would be transport to landfill as per the current practice.

Construction works are anticipated to take 12 to 16 months.

Environmental Assessment

An assessment of potential environmental impacts associated with the construction and operation of the proposed upgrade was undertaken by the Project Team.

Key environmental considerations for the Proposal include:

- Water Quality, Hydrology and Soils
- Ecological Impacts
- Non-indigenous Heritage
- Aboriginal Heritage
- Human Health
- Odour
- Noise and Vibration
- Traffic and Transport
- Visual Amenity
- Hazards and Risks

A summary of the outcomes of the environmental assessment for each of these key issues is provided below.

Water Quality, Hydrology and Soils – Construction Phase

Construction of the new river water intake would require excavation of the bed and lower bank of the Murrumbidgee River. This would require the installation of a coffer dam to keep the works area dry. This presents a potential risk to water quality. The excavation would also have the potential to encounter groundwater which would be required to be managed during the construction phase.

Due to the generally flat ground surface across the WTP site, cut and fill requirements would be minimal for the construction of the WTP, 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.

Excavation activities have the potential to pollute soil and water resources through sedimentation, encourage localised erosion, create a dust nuisance and compact soil. Mitigation measures have been identified so that these impacts would be adequately managed.

Water Quality, Hydrology and Soils – Operational Phase

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 would be put in place to minimise any risk.
- Overflow from structures storing water. Controls would be put in place to minimise any risk.
- Ongoing release of supernatant to Marshalls Creek.
- Cessation of water input to Marshalls Creek (future).

RWCC currently holds a water access licence issued under the *Water Management Act* 2000 to extract 7805 ML/year from the Murrumbidgee River. RWCC also has a 1000 ML high security licence. 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. Downstream users of the river water would not be impacted due to the operation of the WTP.

Ecological Impacts

An ecological assessment was undertaken to consider the impacts of the:

- Construction and operation of river water intake and raw water pumping station.
- Clearing of vegetation within the boundary of the WTP.
- Aquatic ecology impacts associated with the operation of the WTP and the discharge of supernatant to Marshalls Creek and potential risk of spills.
- Construction and operational impacts of the WTP on the local population of Grey-headed Flying-foxes, listed as a threatened species under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*.

No threatened flora species or ecological endangered community listed under the *Threatened Species Conservation Act* 1995 were recorded in the study area. The proposed works would result in minimal clearing.

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.

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. The greatest impact that the proposal would have on this species is noise produced by construction of the new river intake, as this is the proposal element which is closest to the bat colony. The proposal is not likely to have a significant impact on the local Grey-headed Flying-fox population if the construction of the river intake is undertaken during winter months when the species is not likely to be breeding in the area and the local population is largely absent.

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. The creek receives tertiary treated effluent discharged from sludge lagoons associated with the Kooringal Sewage Treatment Plant (STP) located upstream from the WTP. The ecological assessment undertaken 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. A weir near RWCC's footbridge (which is located near the existing Clear Water Tank) 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 Ave bridge.

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. One Endangered Ecological Community (EEC) was identified within the proposal 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. A Seven Part Test (TSC Act) and Assessment of Significance (EPBC Act) was undertaken for these threatened species and the EEC. It was assessed that the proposed works would not significantly impact these species and the EEC.

Non-indigenous Heritage

The Wagga Wagga WTP is heritage listed at the local level. Buildings of high heritage value occurring on the WTP site include:

- An original pump-house, located near the western boundary of the site.
- A Victorian-era dwelling, known as 'Riverside Residence' located near the northern boundary of the site.

Buildings found to have moderate or contributory heritage value include:

- A 1930s workshop, located centrally on the complex.
- A 1920s boiler house.
- A brick water well.
- A concrete chimney.
- Two oak trees.

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 would not physically impact on these buildings.

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 for RWCC purposes, while at the same time retaining the heritage features of the building.

Aboriginal Heritage

There have been no Aboriginal sites previously recorded at the site. A site inspection was undertaken which indicated that there was no evidence of any Aboriginal cultural heritage on site, such as trees that may have been scar trees or locations which could potentially contain artefact scatters. No known items of Aboriginal cultural heritage are likely to be harmed or impacted by the activity.

Air quality

No odour issues are anticipated for the operation of the proposed WTP.

Noise and Vibration

A noise impact assessment was undertaken for both the construction and operational phases of the proposed works. The noise assessment identified existing noise levels at nearby receivers, and calculated predicted noise levels during construction and operation.

The nearest and potentially most affected noise sensitive receptor locations have been identified as the 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.

Assessment of the proposed construction activities for the facility indicates 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.

Operational noise modelling indicates that under neutral and worst case propagation conditions 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 above the noise level objective.

The noise from the facility during normal night-time scheduled operations has been assessed as being unlikely to result in sufficient noise levels to cause sleep disturbance events.

Traffic and Transport

The proposed construction works would increase traffic movements to and from the site. It is anticipated that it would be in the order of 10 to 20 truck movements per day. However this would vary over the 12 to 16 month construction period. It is not required to carry out any road works at the WTP's proposed access point.

There would be minimal change to current operational traffic movements.

Visual Amenity

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 north and west.

Public views of the study area are predominantly from the Easts Riverview Holiday Park to the east, and the Murrumbidgee River to the north. There are also restricted views of the south western edge of the WTP from the Wiradjuri Walking Track. Views from the Sturt Highway are minimal, the shape of the proposal site boundary restricts views from the road given the narrow entrance and the levee bank along Marshalls Creek.

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. Operation of the WTP would have a minor visual impact to 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 would be direct views of the proposed clarifier. Existing well-established screening vegetation in the form of closely planted conifers limits views of the WTP site from the holiday park. The changes in visual landscape from this viewpoint are consistent with the current use of the WTP. Views of the new WTP would be further mitigated by extending the screening vegetation along the boundary between the holiday park and the WTP.

Human Health

A Raw Water Quality Risk Assessment and review of treated water quality targets set in RWCC's Drinking Water Quality Management Plan were undertaken. The targets include a RWCC minimum requirement and also an enhanced target for treated water quality. These treated water quality targets meet or exceed the Australian Drinking Water Guidelines for treated water. As part of RWCC's Drinking Water Quality Management Plan, the treated water quality targets would be reviewed regularly, considering both WTP capability and changing standards in Australia and internationally.

Hazards and Risks

A Preliminary Hazard Analysis (PHA) was prepared to consider the hazardous nature of the dangerous goods proposed to be stored on site at the WTP. A preliminary risk screening was undertaken to determine whether the storage of chemicals on site is considered to be potentially hazardous. It was found that the storage volume of Sodium hydroxide and Sodium hypochlorite, which are corrosive substances classified as Class 8 under the Dangerous Good Class Classification, could potentially be considered to be hazardous. Consideration was also given to the transport of Sodium silicofluoride as it is classified as it is a toxic Class 6.1 dangerous good.

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 bunded. 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 Operational Management Plan for the WTP.

Conclusion

The EIS has considered the potential environmental impacts associated with the Proposal to replace the WTP. On the basis of the information presented in this EIS and the adoption of identified safeguards it is concluded that the Proposal is unlikely to cause significant adverse environmental impacts. The Proposal is considered to result in a positive socio-economic impact for the community through increased water security and meeting treated water quality requirements.

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List of Abbreviations and Acronyms

ACH	aluminium chlorohydrate
ADWG	Australian Drinking Water Guidelines
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ASRIS	Australian Soil Resource Information System
CCPP	Calcium Carbonate Precipitation Potential
CEMP	Construction Environmental Management Plan
centrate	Wastewater removed from sludge by centrifugal process
CLM Act	*Contaminated Land Management Act 1997*
CO_2	carbon dioxide
CWPS	Clear Water Pumping Station
CWS	Clear Water Storage
DBP	Disinfection By-product
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DGRs	Director-General's Requirements
DOC	Dissolved Organic Carbon
DPE	Department of Planning and Environment
DPI	Department of Planning and Infrastructure
EEC	endangered ecological community
EIS	Environmental Impact Statement
EDCs	Endocrine Disrupting Compounds
EMP	Environmental Management Plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPI	environmental planning instrument
EPL	environment protection licence
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development
FM Act	*Fisheries Management Act 1994*
GHG	greenhouse gas
ha	hectare(s)

HAZOP	Hazard and Operability
HWA	Hunter Water Australia
ICNG	Interim Construction Noise Guidelines
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
IWCM	Integrated Water Cycle Management
kL	Kilolitre
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
LG Act	Local Government Act
LWU	Local water utility
(MF/UF	Microfiltration/Ultrafiltration
ML	megalitre
NES	National Environmental Significance
NHMRC	National Health and Medical Research Council
NOW	NSW Office of Water
NPW Act	*National Parks and Wildlife Act 1974*
NRMMC	Natural Resource Management Ministerial Council
NSESD	National Strategy for Ecologically Sustainable Development
NSW	New South Wales
NTU	Nephelometric Turbidity Unit
NV Act	*Native Vegetation Act 2003*
NW Act	*Noxious Weeds Act 1993*
OEH	Office of Environment and Heritage
PAC	Powder activated carbon
PEA	Preliminary Environmental Assessment
PHA	Preliminary Hazard Analysis
PIRMP	Pollution incident response management plan
POEO Act	*Protection of the Environment Operations Act 1997*
PolyDADMAC	polydiallyldimethyl ammonium chloride
PPCP	Pharmaceuticals and Personal Care Products
PPE	Personal Protective Equipment
RWPS	Raw Water Pumping Station
RWCC	Riverina Water County Council
SCADA	Supervisory Control And Data Acquisition
SDS	Safety Data Sheet

SEPP	State Environmental Planning Policy
SEPP 33	*State Environmental Planning Policy 33 — Hazardous and Offensive Development*
SG	Specific Gravity
SOHI	Statement of Heritage Impact
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SSD	State Significant Development
TIA	Traffic Impact Assessment
TSC Act	*Threatened Species Conservation Act 1995*
TSS	Total Suspended Solids
TTHM	Trihalomethanes
UV	Ultraviolet
WSP	Water Sharing Plan
WTP	Water Treatment Plant
WWLALC	Wagga Wagga Local Aboriginal Lands Council

Glossary

Calcium Carbonate Precipitation Potential (CCPP)	Calcium Carbonate Precipitation Potential water stability index based on a quantitative measure of the calcium carbonate deficit or excess of the water
Hazen unit	Standard unit of measurement of water colour
C(t)	Measure of disinfection effectiveness for the time that the water and disinfectant are in contact. C is the disinfectant residual concentration (mg/L) at the peak flow and T is the time that disinfectant is in contact with the water at that peak flow. The units are min.mg/L.
Log removal	A measure of change in pathogen population; used to quantify the effectiveness of a treatment step in reducing pathogen concentrations e.g. 1-log removal = 90% decrease in population, 2-log removal = 99% decrease in population; 3-log removal = 99.9% decrease in population, etc.
Nephelometric Turbidity Unit (NTU)	A unit of measure of turbidity based on a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension.
% w/w	Percentage weight to weight (% w/w) is an abbreviation for percentage weight of a substance of the total weight at a specified temperature, e.g. 10 % w/w H_2O_2 = 10 g hydrogen peroxide in 90 gm (90 ml) water.
Specific Gravity	Specific Gravity (SG) of a liquid is a dimensionless unit defined as the ratio of density of the liquid to the density of water at a specified temperature.
supernatant	Upper layer of clear water which separates from the sludge once the wastewater has settled in a sludge settling lagoon or a sludge thickening tank
sludge	Water residuals generated during the water treatment process
turbidity	Cloudiness caused by fine suspended matter in water.

1 Introduction

1.1 Background

Riverina Water County Council (RWCC) is seeking development consent, as the owner and operator of the Wagga Wagga Water Treatment Plant (WTP), to construct a replacement WTP on the site of the existing plant. This Environmental Impact Statement (EIS) has been prepared by Hunter Water Australia (HWA) and **ngh**environmental on behalf of RWCC to assess the potential environmental impacts associated with the proposed new Wagga Wagga WTP.

The WTP supplies reticulated water to the City of Wagga Wagga and the Shires of Lockhart and Greater Hume in combination with the West Wagga Wagga WTP, North Wagga WTP, East Wagga Wagga WTP and smaller bore systems. The Wagga Wagga Filtration WTP was built in stages, commencing in the 1930's with the construction of Clarifier 1, Filters 1 and 2, and Clear Water Storage 1. The final filter (Filter 6) was constructed in the early 1960's. A new wash-water and sludge handling plant was commissioned in 2006. Raw water for the WTP is sourced from the Murrumbidgee River and from groundwater sources (i.e. East Wagga Borefield). The existing filtration plant has the capacity to treat approximately 44 ML/d of water.

A Raw Water Quality Risk Assessment Workshop held in February 2012 identified microbial pathogens (*Escherichia coli*, *Cryptosporidium* and *Giardia*) and turbidity (cloudiness caused by fine suspended matter in the water) as the key risks associated with the water quality of the Wagga Wagga WTP. The water quality in the Murrumbidgee River at Wagga Wagga can deteriorate significantly with very high turbidity levels (in excess of 1000 Nephelometric Turbidity Units (NTU) on occasions) following heavy rain in the region. When turbidity exceeds 100 NTU, river water is no longer pumped to the WTP. Instead the water is sourced from the East Wagga Borefield. However, as regional demand increases, the system will be unable to rely solely on the East Wagga Borefield and the Murrumbidgee River source will need to be utilised during high turbidity events.

RWCC is therefore proposing to replace the existing Wagga Wagga WTP in order to treat water turbidity levels up to 300 NTU and to be capable of maintaining a secure production of 55ML/d from the Murrumbidgee River to cater for future growth.

1.2 Proposal location

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

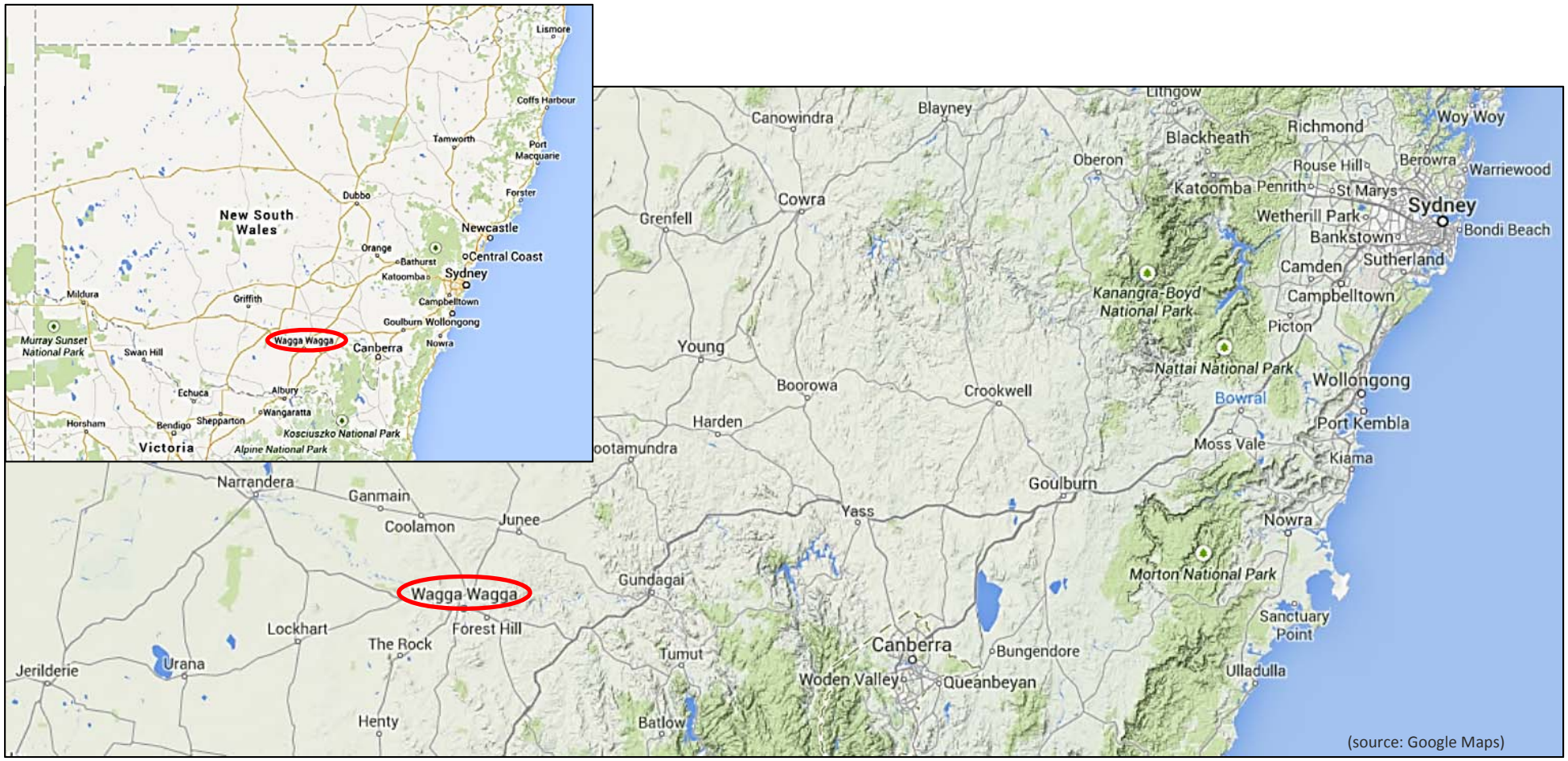


Figure 1-1: Location of Wagga Wagga

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

Source of aerial imagery: SIX Maps, NSW Government web-site

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

Source of aerial imagery: SIX Maps, NSW Government web-site

1.3 Scope of the Environmental Impact Statement

The proposed development is State Significant Development (SSD) to which Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) applies in accordance with the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP).

Consideration has been given to the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and other relevant legislation and planning requirements as detailed in Section 2 of this EIS. The EIS considers the potential environmental impacts of the proposed activity in accordance with clauses 6 and 7 in Schedule 2 of the EP&A Regulation and the Director-General's Requirements (DGRs) issued by the NSW Department of Planning and Environment (DPE). Section 2.7 of this EIS provides a summary of the DGRs and cross references where each requirement is addressed within the EIS. The DGRs are contained in Appendix A of this EIS.

1.4 Structure of the Environmental Impact Statement

The EIS is structured as follows:

1. Introduction
2. Planning context
3. Proposal Description
4. Strategic Justification for Proposal
5. Agency and Stakeholder Consultation
6. Existing environment, assessment of impacts and mitigation measures
7. Environmental management and summary of safeguards
8. Conclusion
9. References

2 Planning Context

2.1 Introduction

The EP&A Act and EP&A Regulation provide the framework for the assessment of the environmental impact of activities in NSW.

In NSW environmental planning instruments (EPIs), formed under Part 3 of the EP&A Act, govern the framework for development assessment and land use planning. EPIs comprise of:

- State Environmental Planning Policies (SEPPs); and
- Local Environment Plans (LEPs).

The application and consideration of EPIs determines whether a proposed development is permissible without consent, permissible with consent, is exempt from assessment or is prohibited.

State and Commonwealth environmental and planning legislation, must also be considered. These are addressed in the following sub-sections.

2.2 Environmental Planning and Assessment Act 1979

Division 4.1 of the EP&A Act relates to the assessment of development that is deemed to be State Significant Development (SSD). Section 89C(2) of the EP&A Act states that: "*A State environmental planning policy may declare any development, or any class or description of development, to be State significant development*."

Clause 8 of *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) declares a development to be SSD where a development is not permissible without development consent under Part 4 of the EP&A Act and is listed in Schedule 1 or 2 of the SRD SEPP. Schedule 1 lists development for the purpose of water storage or water treatment facilities (not including desalination plants) that has a capital investment value of more than $30 million.

The proposed works will require a capital investment greater than $30 million for water treatment facilities and therefore is deemed as SSD under SRD SEPP. Accordingly, RWCC is seeking development approval for the new WTP under Division 4.1 of the EP&A Act.

An Environmental Impact Statement is required to be prepared in accordance with Part 4, Division 4.1 of the EP&A Act and lodged with the development application to be assessed by the Minister for Planning and Environment (or delegated authority). Under Section 89D, the Minster for Planning and Environment is the consent authority. The Minster can delegate this authority such as to the Director-General of Planning and Environment, if certain circumstances are met.

In determining a SSD development application, the consent authority is to take into consideration the matters listed in Section 79C (1) of the EP&A Act 1979, as listed in Table 2-1.

Table 2-1: Matters under Section 79C of the EP&A Act 1979

Matters under Section 79C	How Addressed in the EIS
(a) the provisions of: *(i) any environmental planning instrument, and* *(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Director-General has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and*	Environmental Planning instruments relevant to the proposal have been consider in Section 2.3 of the EIS.
(iii) any development control plan, and	Development control Plans do not apply to Sate Significant Development under Clause 11 of the SRD SEPP.
(iiia) any planning agreement that has been entered into under Section 93F, or any draft planning agreement that a developer has offered to enter into under Section 93F, and	RWCC has not entered into any planning agreement under Section 93F.
(iv) the regulations (to the extent that they prescribed matters for the purpose of this paragraph), and	The EIS has been undertaken in accordance with the regulations.
(v) any coastal zone management plan (within the meaning of the Coastal Protection Act 1979*),that apply to the land to which the development application relates,*	The site is not located within the coastal zone.
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,	The likely impacts have been considered in Section 6.0 of the EIS.
(c) the suitability of the site for the development,	The site is zoned IN2 Light Industrial and is permissible with consent. The existing WTP is located on the site. Site suitability is considered in Section 3.8.2 and Section 6 of the EIS through addressing the impacts.
(d) any submissions made in accordance with this Act or the regulations,	Any submissions received would be considered after the exhibition of the EIS.
(e) the public interest.	The proposal is considered to be in the public interest as it will result in maintaining a secure water supply for the areas supplied by the WTP. A range of mitigation measures have been proposed to manage environmental impacts of the proposed development.

Section 89J of the EP&A Act states that the following approvals do not apply to SSD:

- The concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of that Act.
- A permit under section 201, 205 or 219 of the *Fisheries Management Act 1994*.
- An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*.
- An Aboriginal Heritage Impact Permit under section 90 of the *National Parks and Wildlife Act 1974.*
- An authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act repealed by that Act) to clear native vegetation or State protected land.
- A bush fire safety authority under section 100B of the *Rural Fires Act 1997*.
- A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000.*

Clause 89K of the EP&A Act states that an Environment Protection Licence (EPL) under Chapter 3 of the *Protection of the Environment Operations Act 1997* cannot be refused if it is necessary for carrying out SSD that is authorised by a development consent under Division 4.1 and is to be substantially consistent with the consent.

2.3 Environmental Planning Instruments

2.3.1 Wagga Wagga Local Environmental Plan 2010

Zoning

The Proposal is located within the Wagga Wagga Local Government Area (LGA). The applicable Local Environmental Plan (LEP) is the Wagga Wagga LEP 2010. The LEP defines land use zones and permissible land uses within each zone. Under the Wagga Wagga LEP, the WTP site is zoned IN2 Light Industrial.

The objectives of the zone are to:

- Provide a wide range of light industrial, warehouse and related land uses.
- Encourage employment opportunities and to support the viability of centres.
- Minimise any adverse effect of industry on other land uses.
- Enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.
- Support and protect industrial land for industrial uses.

Water treatment facilities are permitted with consent in the zone. Environmental management measures have been proposed so that adverse impacts from the proposal are minimised.

Heritage

The WTP is listed as a local heritage item under Schedule 5 of the LEP.

Clause 5.10 of the LEP outlines the objectives for heritage conservation which are to:

(a) conserve the environmental heritage of Wagga Wagga;

(b) conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views;

(c) conserve archaeological sites; and

(d) conserve Aboriginal objects and Aboriginal places of heritage significance.

The above objectives and requirements in Clause 5.10 have been considered by preparing a Statement of Heritage Impact (Appendix D) and assessing the likelihood of the proposed works impacting on Aboriginal objects and Aboriginal places (refer to Section 6.7).

Clause 5.10 (2d) requires development consent when erecting a building on land on which a heritage item is located.

Riparian Land and Waterways

Clause 7.5 of the Wagga Wagga LEP includes provision for development within riparian lands and waterways and requires the consent authority to consider:

(a) any potential adverse impact on any of the following:

(i) water quality within the waterway;

(ii) aquatic and riparian habitats and ecosystems;

(iii) stability of the bed, shore and banks of the waterway;

(iv) the free passage of fish and other aquatic organisms within or along the waterway; and

(v) habitat of any threatened species, population or ecological community.

(b) whether or not it is likely that the development will increase water extraction from the waterway for domestic or stock use and the potential impact of any extraction on the waterway.

(c) proposed measures to ameliorate any potential adverse impact.

Development consent must not be granted to development unless the consent authority is satisfied that:

(a) the development is designed, sited and managed to avoid any potential adverse environmental impact, or

(b) if a potential adverse impact cannot be avoided, the development:

(i) is designed and sited so as to have minimum adverse impact; and

(ii) incorporates effective measures so as to have minimal adverse impact; and

(iii) mitigates any adverse impact through the restoration of any existing disturbed area on the land.

Consideration of impacts and mitigation for riparian land and waterways have been included in Sections 6.4 (Water Quality, Hydrology and Soils), 6.5 (Flora and Fauna) and Appendix C (specialist flora and fauna assessment report) of the EIS.

Biodiversity

Areas of the WTP are mapped on the LEP Biodiversity Map. Clause 7.3 of the Wagga Wagga LEP includes provision for development within areas mapped as land identified as "biodiversity" and requires the consent authority to consider:

(a) any potential adverse impact of the proposed development on any of the following:
(i) a native vegetation community;
(ii) the habitat of any threatened species, population or ecological community;

(iii) a regionally significant species of plant, animal or habitat;

(iv) a habitat corridor;

(v) a wetland; and

(vi) the biodiversity values within a reserve, including a road reserve or a stock route.

(b) any proposed measures to be undertaken to ameliorate any such potential adverse impact.

Development consent must not be granted to development unless the consent authority is satisfied that:

(a) the development is designed, sited and managed to avoid any potential adverse environmental impact; or

(b) if a potential adverse impact cannot be avoided, the development:

(i) is designed and sited so as to have minimum adverse impact; and

(ii) incorporates effective measures so as to have minimal adverse impact; and

(iii) mitigates any residual adverse impact through the restoration of any existing disturbed or modified area on the site.

Consideration of impacts and mitigation for biodiversity have been included in Section 6.5 (Flora and Fauna) and Appendix C (specialist flora and fauna assessment report) of the EIS.

Groundwater

Clause 7.6 of the Wagga Wagga LEP includes provision for development within areas identified as "Groundwater" and requires the consent authority to be satisfied that the development:

(a) is unlikely to adversely impact on existing groundwater sources, and

(b) is unlikely to adversely impact on future extraction from groundwater sources for domestic and stock water supplies, and

(c) is designed to prevent adverse environmental impacts, including the risk of contamination of groundwater sources from on-site storage or disposal facilities.

Consideration of impacts and mitigation for groundwater have been included in Section 6.4 (Water Quality, Hydrology and Soils) and Section 6.14.2.3 for hazards associated with storage of chemicals on site and their containment in the event of a spill.

2.4 State Environmental Planning Policies

A description and consideration of the relevance of State Environmental Planning Policies (SEPPs) that may be applicable to the Proposal are provided below.

2.4.1 State Environmental Planning Policy (Infrastructure) 2007

The aim of the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) is to facilitate the effective delivery of infrastructure across the State by:

- improving regulatory certainty and efficiency through a consistent planning regime for infrastructure and the provision of services, and
- providing greater flexibility in the location of infrastructure and service facilities, and
- allowing for the efficient development, redevelopment or disposal of surplus government owned land, and
- identifying the environmental assessment category into which different types of infrastructure and services development fall (including identifying certain development of minimal environmental impact as exempt development), and
- identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure development, and
- providing for consultation with relevant public authorities about certain development during the assessment process or prior to development commencing.

Division 24 of the Infrastructure SEPP outlines planning provisions for water supply systems.

A water treatment facility is defined under Clause 124 as *a facility for the treatment of water (such as a desalination plant or a recycled or reclaimed water plant) whether the water produced is potable or not, and includes residuals treatment, storage and disposal facilities, but does not include a water recycling facility within the meaning of Division 18 (Sewerage systems).*

Clause 125(3) enables development for a water treatment facility to be undertaken without development consent in the following land use zones:

- RU1 Primary Production
- RU2 Rural Landscape
- RU4 Rural Small Holdings
- IN1 General Industrial
- IN3 Heavy Industrial
- SP1 Special Activities
- SP2 Infrastructure

The Wagga Wagga WTP site is zoned IN2 Light Industrial under the Wagga Wagga LEP. Therefore it is not a prescribed zone where works for a water treatment facility can be undertaken without development consent.

2.4.2 State Environmental Planning Policy (State and Regional Development) 2011

Clause 8 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) declares development to be State Significant Development (SSD) for the purposes of the EP&A Act if:

- the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and
- the development is specified in Schedule 1 or 2 of the SRD SEPP.

Clause 21(1) of Schedule 1 of the SRD SEPP specifies development for the purpose of water storage or water treatment facilities (not including desalination plants) that has a capital investment value of more than $30 million to be SSD. The Proposal would require a capital investment greater than $30 million and requires development consent under Part 4 of the EP&A Act. It is therefore deemed to be SSD.

2.4.3 State Environmental Planning Policy (Major Development) 2005

The aim of the *State Environmental Planning Policy (Major Development) 2005* (Major Development SEPP) is to facilitate:

- the development, redevelopment or protection of important urban, coastal and regional sites of economic, environmental or social significance to NSW; and
- service delivery outcomes for a range of public services and to provide for the development of major sites for a public purpose or redevelopment of major sites no longer appropriate or suitable for public purposes.

There are no provisions in the Major Development SEPP applicable to the proposed works. The WTP site has not been declared a State Significant site under the SEPP.

2.4.4 State Environmental Planning Policy 19 – Bushland in Urban Areas

The aim of this policy is to protect and preserve bushland within the urban areas referred to in Schedule 1 of the SEPP due to natural heritage, ecological, recreational, educational, scientific or aesthetic values.

Wagga Wagga is not listed (under Schedule 1) as an area to which this policy applies.

2.4.5 State Environmental Planning Policy 33 — Hazardous and Offensive Development

State Environmental Planning Policy 33 — Hazardous and Offensive Development (SEPP 33) provides a systematic approach to planning and assessing proposals for potentially hazardous and offensive development for the purpose of industry or storage.

The following definitions are included in SEPP 33:

- *potentially hazardous industry* means a development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:
  (a) to human health, life or property, or
  (b) to the biophysical environment,
- *potentially offensive industry* means a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.

Part 3, Clause 12 of SEPP 33 requires that a person who proposes to make a development application to carry out development for the purposes of a potentially hazardous industry must prepare a Preliminary Hazard Analysis (PHA) in accordance with the current circulars or guidelines published by the Department of Planning and Environment, and submit the analysis with the development application.

Section 6.14.2.3 of this EIS includes discussion of the hazards and risks that have been considered. Potentially hazard industry requirements have been triggered due to the proposed storage of sodium hydroxide and sodium hypochlorite on the site in excess of threshold volumes outlined in SEPP 33 Guidelines.

A PHA has been prepared for the Proposal and is presented in Appendix B of this EIS.

2.4.6 State Environmental Planning Policy 44 – Koala Habitat Protection

State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44) aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas. The Wagga Wagga LGA is listed as one of the local government areas to which the SEPP applies.

The principles of SEPP 44 have been applied in the flora and fauna assessment (see Section 6.5).

2.4.7 State Environmental Planning Policy 55 – Remediation of Land

State Environmental Planning Policy 55 – Remediation of Land (SEPP 55) provides a statewide planning approach to the remediation of contaminated land.

The SEPP specifies when consent is required, and when it is not required, for remediation works. A search of the Environment Protection Authority contaminated sites register did not identify any contaminated sites within the Proposal area. No further consideration of this SEPP is required for this EIS.

2.5 State Legislation

A description and consideration of the relevance of State legislation that may be applicable to the proposal is provided below.

2.5.1 Protection of the Environment Operations Act 1997

Regulatory Authority: Environment Protection Authority (EPA)

Description: The *Protection of the Environment Operations Act 1997* (POEO Act) is the primary legislation regulating pollution control and waste disposal in NSW. It establishes a structure for regulating polluting activities through Environment Protection Licences (EPLs). Activities listed under Schedule 1 of the POEO Act are scheduled activities which require an environment protection licence (EPL).

Relevance: Water treatment plants are not a scheduled activity under Schedule 1 of the POEO Act. Section 120 of the POEO Act prohibits the pollution of waters. Water pollution is only permitted to occur if it is in accordance with an EPL issued under the POEO Act.

RWCC currently holds EPL 614 to discharge supernatant from the WTP to Marshalls Creek. The licence authorises up to 1000 kL to be discharged per day, and a Total Suspended Solids (TSS) level of 30 mg/L. RWCC is required to undertake weekly monitoring of TSS at the discharge point to Marshalls Creek. The impact of the new WTP on discharges to Marshalls Creek is addressed in Section 6.4 of this EIS. RWCC would be required to seek variation of the existing EPL for supernatant discharge as the volumes are expected to exceed the licensed levels during periods when the WTP is treating water with high turbidity levels. Waste generated during construction would be managed in accordance with the POEO Act and associated regulations.

RWCC has a pollution incident response management plan (PIRMP) prepared in accordance with the *Protection of the Environment Operations (General) Regulation* 2009. The Construction Environmental Management Plan and Operational plan would make reference to RWCC's PIRMP and would be prepared to be consistent with the plan. On-site concrete batching may be required. It is not anticipated that the quantities generated would exceed the thresholds in Schedule 1 for cement works which would trigger the requirement for an EPL. The threshold where an EPL is required is a capacity to produce more than 150 tonnes of cement or lime per day or 30,000 tonnes of cement or lime per year.

2.5.2 Local Government Act 1993

Regulatory Authority: NSW Office of Water on behalf of the Minister for Primary Industries

Description: The *Local Government Act 1993* (LG Act) provides the legal framework for the operation of the local government in NSW.

Relevance: Section 60 of the LG Act states that approval is required to construct or extend water treatment works. Approval would therefore be required under Section 60 of the LG Act for the new WTP.

2.5.3 Water Management Act 2000/ Water Act 1912

Regulatory Authority: NSW Office of Water

Description: Provides for the preparation and implementation of Water Management Plans, Works Approvals and Water Sharing / Licencing agreements. The *Water Management Act 2000* (WM Act) regulates controlled activities within 40 m of a watercourse and extraction of water within an area covered by a Water Sharing Plan (WSP).

In the absence of coverage by water sharing plans under the WM Act, the *Water Act 1912* continues to regulate the use of water, including licensing requirements for water extraction.

Relevance: The Murrumbidgee River is subject to the *Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2003* 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.

RWCC currently holds a water access licence issued under the WM Act to extract 7805 ML/year from the Murrumbidgee River (Water Access Licence 40AL400024). RWCC also has a 1000 ML high security licence (number 40AL405344). 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.

Depending on prevailing conditions at the time of construction, some groundwater may be encountered during construction of the river water intake. Approval for dewatering during construction would be required from NSW Office of Water for this component, depending on conditions and volume. With regard to groundwater extraction during operation of the new WTP, RWCC is not intending to increase its extraction limit, hence it is expected that there would be minimal change to the existing groundwater recharge rates (see Section 6.4 for further details).

RWCC is exempt from the requirements to obtain a controlled activities approval for works within 40 m of a waterway, as it is a public authority (Clause 38 of the *Water Management (General) Regulation 2011)*. However, the design and construction of works within 40 m of watercourses are to be undertaken in accordance with the Office of Water's *Guidelines for Controlled Activities (2012).*

A water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the *Water Management Act* 2000 do not apply to SSD.

2.5.4 Threatened Species Conservation Act 1995

Regulatory Authority: Office of Environment and Heritage

Description: The *Threatened Species Conservation Act 1995* (TSC Act) identifies threatened species, populations, endangered ecological communities, critical habitats and key threatening processes. It establishes assessment requirements and a planning approval process for proposals that may impact these environmental values.

Relevance: An assessment of significance of impact on threatened species, endangered populations and endangered ecological communities (EECs) that are likely to occur in the study area is presented in the Flora and Fauna Assessment Report included as Appendix C to this EIS. The assessment of significance (Seven Part Test) concludes that the Proposal is unlikely to have a significant impact on any of the threatened species, endangered populations or EECs currently listed in the schedules to the TSC Act.

2.5.5 Fisheries Management Act 1994

Regulatory Authority: Department of Primary Industries (NSW Fisheries)

Description: The *Fisheries Management Act 1994* (FM Act) regulates activities that pose a threat of damage to aquatic habitats, threatened species, populations or ecological communities. The FM Act requires an assessment of whether threatened species of fish and marine vegetation, populations or ecological communities are likely to be affected by the activity.

The FM Act also provides for the management of dredging and reclamation work and requires approvals for specific activities on 'waterfront land'. Any structure (such as a weir, causeway or dam) that may inhibit or obstruct the movement of fish within a waterway generally requires approval under Part 7 of the Act.

Relevance: An assessment of impact on threatened fish species and the *Aquatic Ecological Community in Natural Drainage System of the Lower Murray River Catchment* has been undertaken (see Flora and Fauna Assessment Report in Appendix C and summary in Section 6.5 of this EIS).

A permit is required for any dredging and reclamation works in 'waterland' undertaken by a local government authority, in accordance with Section 200 of the FM Act. This does not apply if the work is authorised by a relevant public authority. For this SSD application, the works would be approved by a relevant public authority, therefore a separate approval is not required under the FM Act.

Permits under section 201 (dredging and reclamation), 205 (harm to marine vegetation) or 219 (blocking fish passage) of the FM Act do not apply to SSD.

2.5.6 Environmentally Hazardous Chemicals Act 1985

Regulatory Authority: Environment Protection Authority

Description: The *Environmentally Hazardous Chemicals Act 1985* (EHC Act) provides for control of the effect of chemicals and chemical wastes on the environment.

Relevance: Any chemical wastes generated as part of the proposed works would need to be managed in accordance with the EHC Act.

2.5.7 Noxious Weeds Act 1993

Regulatory Authority: Department of Primary Industries

Description: The *Noxious Weeds Act 1993* (NW Act) emphasises the importance of whole-community action for weed control and establishes a framework for council declaration of noxious weeds. The NW Act provides for the identification and control of noxious weeds. It requires owners of land to control the spread of noxious weeds on their property.

Relevance: Noxious weeds recorded in the study area are discussed in Section 6.5 of this EIS.

2.5.8 Heritage Act 1977

Regulatory Authority: Office of Environment and Heritage

Description: The *Heritage Act 1997 p*rovides for the protection of non-indigenous heritage. Section 148 requires notification to the Heritage Branch of any discovery of relics.

Relevance: There are no heritage items listed on the State Heritage Register under the *Heritage Act 1977* at the WTP site. A Historic Heritage investigation was undertaken and is included in Section 6.6. It is noted that the WTP is listed as a heritage item on the LEP. No relics are anticipated to be excavated during construction. Approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977* do not apply to SSD.

2.5.9 National Parks and Wildlife Act 1974

Regulatory Authority: Office of Environment and Heritage

Description: The objectives of the *National Parks and Wildlife Act 1974* (NPW Act) are to conserve and preserve nature; conserve objects, places or features (including biological diversity) of cultural value within the landscape; foster public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation; and provide for the management of land reserved under this Act.

Relevance: An Aboriginal Heritage Assessment has been undertaken by **ngh**environmental (see Section 6.7). Aboriginal Heritage Impact Permit provisions under s90 of the NPW Act do not apply to SSD. No Aboriginal sites have been identified at the WTP site.

2.5.10 Contaminated Land Management Act 1997

Regulatory Authority: Environment Protection Authority

Description: The *Contaminated Land Management Act 1997* (CLM Act) enables EPA to respond to contamination that risks causing significant harm to human health or the environment, and sets out criteria for determining whether such a risk exists. The onus is on the landholder to advise EPA if it suspects that land represents a significant risk of harm.

Relevance: A search of the EPA contaminated sites register did not identify any contaminated or remediation sites under Section 21 of the CLM Act located at the WTP site.

2.5.11 Work Health and Safety Act 2011

Regulatory Authority: WorkCover Authority of NSW

Description: The storage and handling of dangerous goods is regulated under Part 7.1 of the *Work Health and Safety Regulation 2011*.

Relevance: WorkCover must be notified if any dangerous goods, stored and handled above statutory defined quantities, are used during construction or operation of the assets.

The quantities of dangerous goods to be stored onsite at the WTP would require notification to WorkCover.

A register of hazardous chemicals used, handled or stored at the workplace must be kept and include:

- a list of hazardous chemicals used, handled or stored, and
- the current safety data sheet for each hazardous chemical listed.

2.5.12 Public Health Act 1991

Regulatory Authority: NSW Health

Description: The objective of the *Public Health Act 1991* is to control public health risk and to protect public health.

Relevance: Under the Act, the Minister for Health has powers to issue orders and direct public authorities to take action to prevent public health risks. There are no approval requirements under this Act relevant to the proposed works. Nonetheless, an assessment of risks to Public Health has been included in Section 6.14.1.

2.5.13 Crown Lands Act 1989

Regulatory Authority: Trade & Investment - Crown Lands

Description: The aim of the *Crown Lands Act* 1989 is to ensure that Crown land is managed for the benefit of the people of New South Wales.

Relevance: The bed and bank of the river where the river intake is proposed to be located is Crown Land. A lease or a licence will need to be granted to authorise the works.

Clause 49(4) of the *EP&A Regulation 2000* indicates that the consent of the Crown is not required for lodgement of a development application if the development application is for SSD made by a public authority.

2.5.14 Fluoridation of Public Water Supplies Act 1957

Regulatory Authority: NSW Health

Description: Under the *Fluoridation of Public Water Supplies Act 1957*, a water supply authority may, subject to the provisions of the Act and regulations, add fluorine to any public water supply under its control. Section 6(1A) and Section 6A provides that the Secretary (of the Department of Health) can direct a water supply authority to add fluorine to any public water supply under its control.

Relevance: The proposed process includes fluoridation of water. Fluoridation would be undertaken in accordance with the Act and regulation requirements. The *Code of Practice for the Fluoridation of Public Water Supplies* has been published by the NSW Department of Health to provide the technical requirements for the design and operation of fluoridation dosing. It is the responsibility of the fluoridating water supply authority to ensure that they comply with this Code of Practice.

The design of the fluoridation process associated with the new WTP has been undertaken in accordance with the Code of Practice.

2.6 Commonwealth Legislation

2.6.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) regulates the assessment and approval of activities that will have or is likely to have a significant impact on matters of National Environmental Significance (NES matters), activities by Commonwealth government agencies and activities by any person on Commonwealth land.

Currently, NES Matters include:

- World Heritage properties
- National Heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Nationally listed threatened species and ecological communities,
- migratory species (protected under international agreements)
- Commonwealth marine areas
- Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development.

An EPBC Act protected matters search and site visit concluded that the only NES matters applicable to the Proposal are nationally listed threatened species and migratory species (see Flora and Fauna Assessment Report included as Appendix C to this EIS). An assessment of the impacts of the Proposal determined that the proposed works do not constitute an activity which may have a significant adverse impact on any NES matter.

2.6.1 Native Title Act 1993

The *Native Title Act 1993* provides for the recognition and protection of native title and for establishing a mechanism for determining claims to native title. There are no claims that would impact on the proposed works.

2.7 Director-General's Requirements

The EIS has considered the potential environmental impacts of the proposed activity in accordance with clauses 6 and 7 in Schedule 2 of the EP&A Regulation and the Director-General's Requirements (DGRs) issued by the NSW Department of Planning and Environment (DPE) on 15th January 2014 (see Appendix A). The DGRs were issued in accordance with clause 3 of Schedule 2 of the EP&A Regulation. A summary of the DGRs and cross references where each requirement is addressed within the EIS is provided in Table 2-2.

Table 2-2 Director General's Requirements

Item	Aspect	Requirements	Where addressed in EIS
1	**General Requirements**	The Environmental Impact Statement (EIS) must be prepared in accordance with and meet the minimum requirements of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (Regulation), with particular reference to the information required by clauses 6 and 7 of that schedule. The EIS must also include the following: • construction methods, location and alignment of project components, operation details including changes to existing operations, system capacity, treatment technology and water quality standards, wet weather and flood event management and interfaces with existing infrastructure, energy requirements and any staging; • an assessment of the need for, scale, scope, operational mode and location of the project in relation to predicted water usage and demand; and • an analysis of site suitability with respect to potential land use conflicts with existing and future land uses, taking into account local and strategic land use objectives.	Section 3.7 (construction works) Section 3.4 (project components) Sections 3.1, 3.4, 3.5 (operation details including changes to existing operations) Section 4.3 (system capacity) Section 4.2 (water quality standards) Section 3.3 (treatment technology) Section 6.4 (wet weather and flood event management Section 6.13 (energy requirements) Sections 3.4 and 3.7 (staging) Section 4 (assessment of the need for, scale, scope, operational mode and location of the project in relation to predicted water usage and demand) Section 3.8.2 (site suitability)
2	**Strategic Justification**	Clearly outline the strategic context of the project, having regard to existing and future development in the area and relevant government policies and strategies; and Describe the need for and objectives of the project, including its relevance to the overall water treatment and management scheme for the area; alternatives considered (both alignments and technologies), and an assessment and justification of the environmental costs and benefits of the project relative to alternatives.	Section 4

Item	Aspect	Requirements	Where addressed in EIS
3	**Water Quality, Hydrology and Soils**	Include an assessment of water quality, hydrology and soil impacts (including impacts to groundwater) taking into account applicable NSW Government policies including applicable Water Sharing Plans. The assessment is to: • consider impacts arising from the construction of new infrastructure and changes to operation of the treatment plant, management of sludge solids and supernatant; • assess the potential impacts to groundwater, creeks, wetlands, drainage lines and from flooding associated with the project; • assess impacts to licenced water users and basic landholder rights; and • include management measures to prevent, monitor or minimise impacts including precautionary discharges or overflows and subsequent impacts to nearby riparian corridors and waterways, notification systems, response capability and contingency measures.	Section 6.4.
4	**Ecological Impacts**	Include a flora and fauna assessment consistent with the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005): • taking into consideration aquatic and terrestrial impacts on any threatened species (particularly the *Grey-headed Flying-fox*, *Murray Cod*, *Trout Cod* and *Silver Perch)*, populations, ecological communities (including the *Aquatic Ecological Community in Natural Drainage System of the Lower Murray River Catchment*), critical habitat, riparian, instream ecology, water and groundwater dependent ecosystems including consideration of the *NSW Groundwater Dependent Ecosystems Policy* and any impacts to local or regional biodiversity corridors;	Section 6.5 and Appendix C

Item	Aspect	Requirements	Where addressed in EIS
		• with details of how flora and fauna impacts would be managed (details of any proposed screening of the river intake to minimise impacts to aquatic fauna are to be included); and	
		• consideration of the *NSW Offset Principles for Major Projects* (July 2013) where applicable. Sufficient certainty must be provided to demonstrate that viable and achievable options to offset impacts are available where impacts are unavoidable.	Section 6.5.3
5	**Non-indigenous Heritage**	Include an assessment of the potential impact on non-indigenous heritage values/items and proposed mitigation measures, consistent with the NSW *Heritage Manual* (1996). Where impacts to State or locally listed non-indigenous heritage items are proposed, a Statement of Heritage Impact must be included for these items and measures identified to mitigate and manage impacts.	Section 6.6 and Appendix D
7	**Aboriginal Heritage**	Include an assessment of the potential impact on Aboriginal heritage values/items and proposed mitigation measures in accordance with the Draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005).	Section 6.7 and Appendix G
8	**Human Health**	The Environmental Assessment must identify any change to risk to human health, including mitigation measures and management to ensure appropriate standards are met.	Section 6.14
9	**Odour**	Include an assessment of any potential odour sources associated with construction and changes to operation and management measures to minimise any potential odour impacts to sensitive receivers.	Section 6.8

Item	Aspect	Requirements	Where addressed in EIS
10	**Noise and Vibration**	Include an assessment of noise and vibration impacts during construction and operation and in a cumulative context with existing development. The assessment must consider the following guidelines, as relevant: *Interim Construction Noise Guidelines* (DECC 2009), *Industrial Noise Policy* (EPA, 2000) and *Road Noise Policy* (DECCW 2011).	Section 6.9 and Appendix F
11	**Traffic and Transport**	Include an assessment of impacts to the local and regional road and rail network, including direct impacts from construction or operational traffic. The assessment shall include details of the nature/mode of traffic generated and estimated traffic volumes and proposed transport routes.	Section 6.10
12	**Visual Amenity**	Include an assessment of changes to visual amenity, with reference to surface components and vegetation removal and include proposed mitigation measures.	Section 6.11
13	**Hazards and Risks**	Include an assessment of the hazards and risk including details of waste and/or chemicals handling, storage and disposal during construction and operation and identification of management measures associated with operation. This is to include details of the treatment and disposal of backwash from the treatment plant.	Sections 6.12, 6.14, Section 3.5.2 (backwash treatment and disposal) and Appendix B
14	**Environmental Risk Analysis**	Notwithstanding the above key assessment requirements, the EIS shall include an environmental risk analysis to identify potential environmental impacts associated with the project (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified, an appropriately detailed assessment of those impacts must be included.	Section 6.1

Item	Aspect	Requirements	Where addressed in EIS
15	**Consultation**	Must undertake an appropriate and justified level of consultation with relevant parties during the preparation of the EIS, including: • local, State or Commonwealth government authorities and service providers including the Department of Health, the Environment Protection Authority, the Office of Environment and Heritage, the Department of Primary Industries (including the NSW Office of Water), the Murrumbidgee Catchment Management Authority, Roads and Maritime Services and Wagga Wagga Council; • specialist interest groups, including local Aboriginal land councils; and • the local community, including affected landowners. The EIS must describe the consultation process, document consultation undertaken and identify any issues raised (including where these have been addressed in the EIS).	Section 5 and Appendix E

2.8 Summary of Approvals

Table 2-3 provides a summary of the approvals that RWCC would be required to obtain prior to construction. The state legislation applicable to these approvals is addressed in Section 2.5 of this EIS.

Table 2-3: Summary of Approvals/Notifications Required

Administering Authority	Nature of Approval/licence/Notification
Department of Planning & Environment (or delegated authority)	Determination of the Development Application (and EIS) under Part 4 of the EP&A Act.
Department of Trade and Investment - Crown Lands	RWCC would be required to arrange a lease agreement with Crown Lands to construct the river intake structure on the bank and bed of the river and to maintain access during operation of the new structure under *Crown Lands Act 1989.*
NSW Office of Water – Urban Water Unit	Section 60 approval under the *Local Government Act* 1993 to construct the WTP
NSW Office of Water	Approval for dewatering groundwater during construction for the installation of the new river intake and removal of the existing river intakes may be required from NSW Office of Water depending on prevailing conditions and volume likely to be dewatered.
NSW Fisheries	Permit may be required for relocating fish during dewatering of coffer dams under the *Fisheries Management Act* 1994.
Environment Protection Authority	EPL variation under Section 58 of the POEO Act 1993 required for discharges to Marshalls Creek expected to exceed current 1ML limit when the WTP is treating river water with high turbidity levels.
WorkCover NSW	Notification of dangerous goods storage in accordance with the *Work Health and Safety Regulation 2011*.

3 Proposal Description

3.1 Existing system

The WTP treats raw water from the Murrumbidgee River as well groundwater from the East Wagga Borefield to a standard that is acceptable for drinking water. The existing Wagga Wagga WTP has the following key process units:

- Aeration of groundwater sourced from the East Wagga Wagga Bores to release Carbon Dioxide (CO_2) and Hydrogen Sulphide;
- Murrumbidgee River raw water pumping station;
- Alum and activated silica dosing at the inlet to the flocculators (to bind small particles in the raw water into larger particles);
- Two upflow clarifiers which settle out solids from the water;
- Four banks of pressure monosand filters to remove particles from the settled water from the clarifiers;
- Dosing of lime (to adjust raw water pH), fluoride (for dental health) and chlorine (for disinfectant);
- Clear water storage to store the treated water and infrastructure for pumping water;
- Wash water handling system for management of water that is used to clean the filters; and
- Sludge (water residuals generated during the treatment process) dewatering infrastructure including centrifuges.

A process flow diagram of the existing system is provided in Figure 3-1, while an aerial view of the location of the key process units on the WTP site is provided in Figure 3-2. Under the EPL, RWCC are licensed to discharge up to 1000 kl of supernatant from the sludge thickener to Marshalls Creek each day, while centrate (wastewater from the centrifuge) is discharged to the Lime Pit Pond (see Figure 3-1) and subsequently pumped back to the Balance Tank.

Infrastructure for the treatment of water at Wagga Wagga WTP was built in stages. Construction of the current plant commenced in the 1930's with the construction of Clarifier 1 (settling tank to remove solids from the water), Filters 1 and 2 (to remove particles from the water), and Clear Water Storage (CWS) 1. Filters 3 and 4 were constructed in the late 1930's, followed by Clarifier 2, CWS 2 and Filter 5 in the early 1950's. Filter 6 was constructed in the early 1960's. A new wash water and sludge handling plant was commissioned in 2006 (NSW Public Works 2013).

The Wagga Wagga WTP is able to produce approximately 44 ML/d of potable water from the Murrumbidgee River under typical river conditions. Raw water for the WTP is extracted from the river by means of seven pumps. Six pumps are located in two deep machinery wells. The seventh pump comprises a submersible unit immersed in the river. The capacities of these raw water pumps range from 60 to 180 L/s (NSW Public Works 2013).

The raw water quality in the Murrumbidgee River at Wagga Wagga can deteriorate significantly with turbidities in excess of 1000 NTU following heavy rain in the region. When turbidity exceeds 100 NTU, the river water is no longer pumped to the WTP and water is sourced from the East Wagga Borefield. However, as regional demand increases the system will be unable to rely solely on the East Wagga Borefield and the Murrumbidgee River source will need to be utilised during high turbidity events.

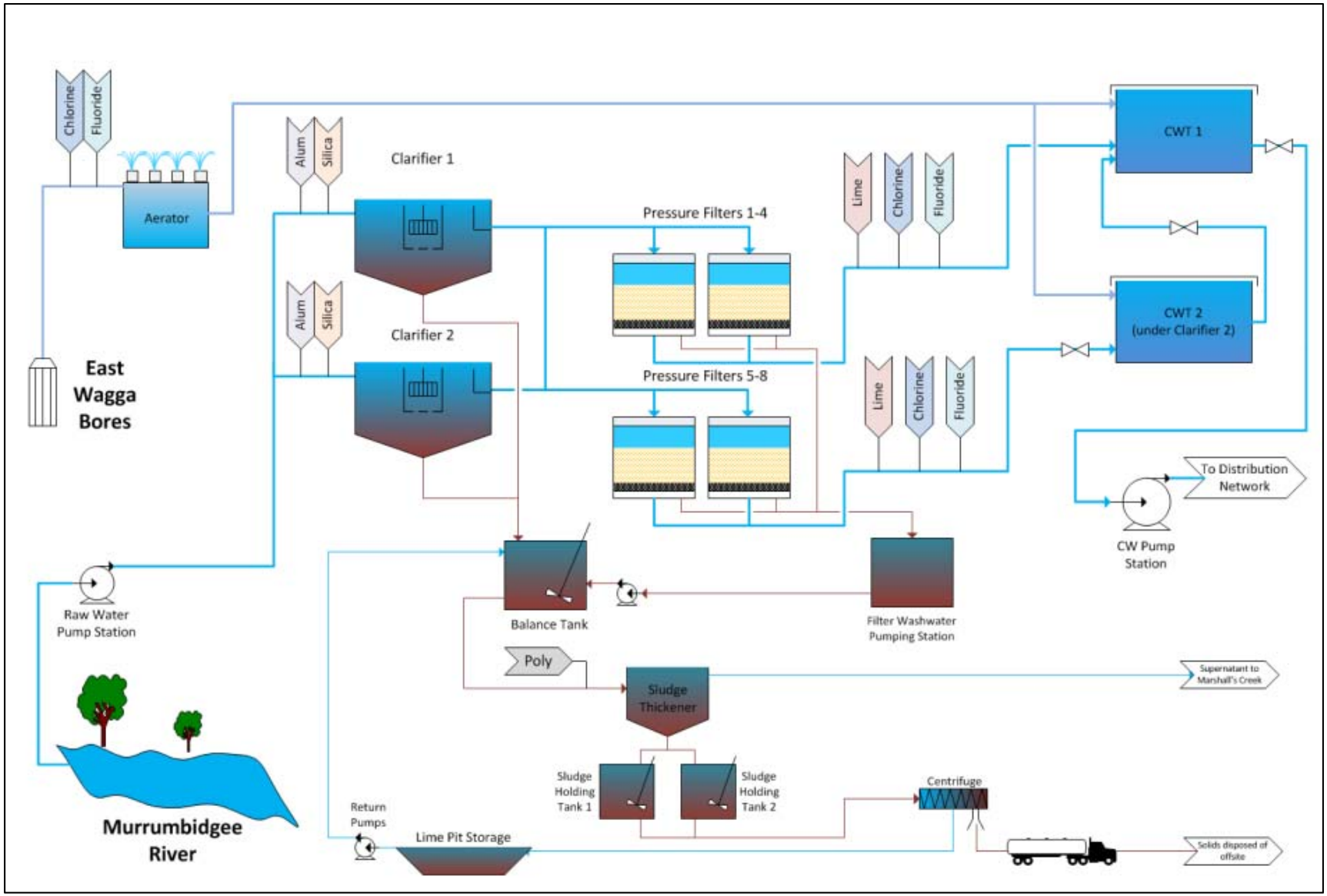
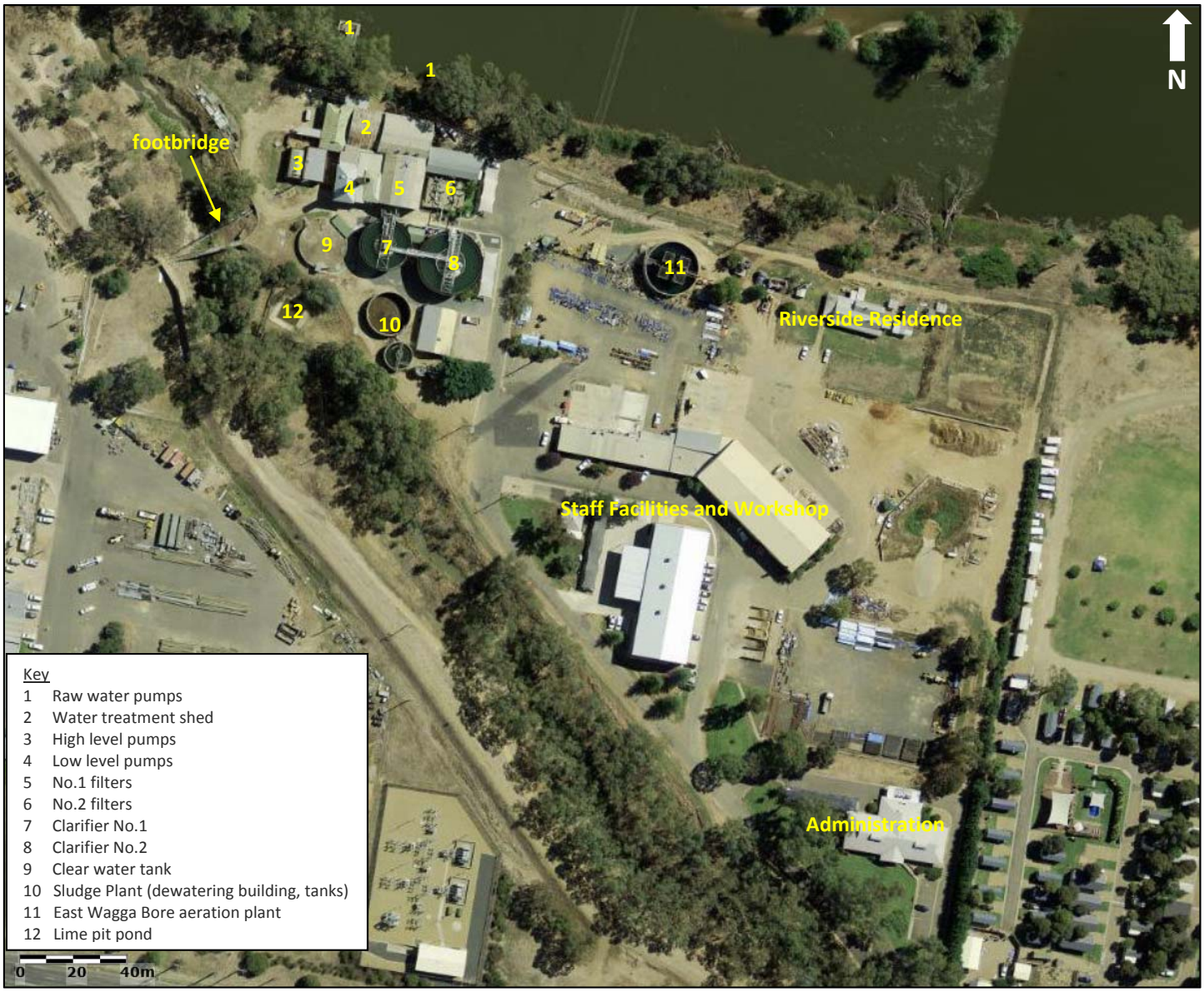


Figure 3-1: Process flow diagram of existing WTP (HWA 2012)



Source: Google (2014)

Figure 3-2: Key process units of existing WTP

3.2 Proposal Objectives

The overall objective of the Proposal is to enable the Wagga Wagga WTP to treat water turbidity levels up to 300 NTU and be capable of maintaining a secure production of 40 ML/d from the Murrumbidgee River in the short to medium term, and 55 ML/d by 2026 to meet predicted 2040 demands (HSC, 2011).

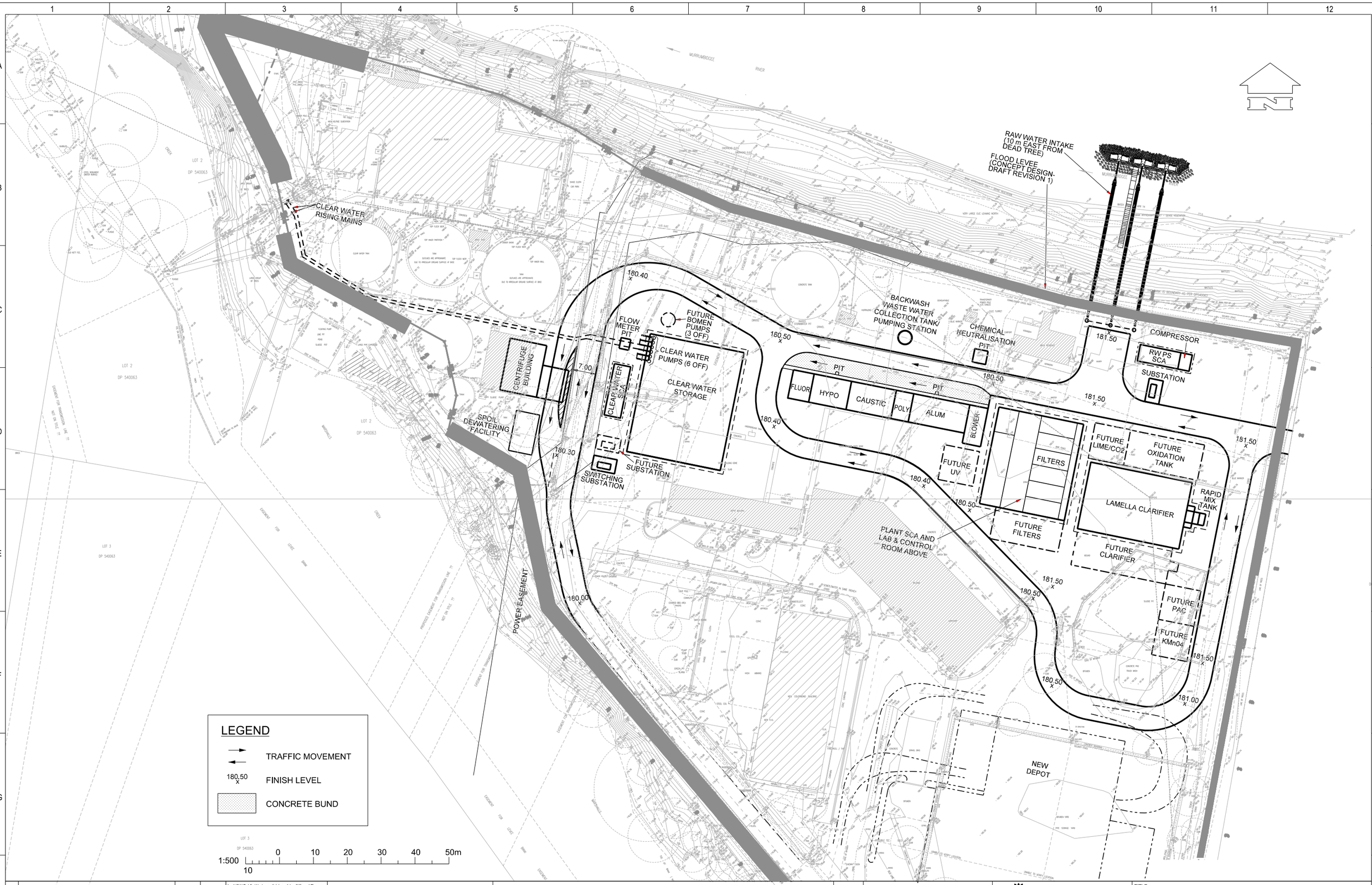
Specific design requirements for the Proposal also include:

- Treated water quality to meet *Australian Drinking Water Guidelines* (NRMMC 2011)
- Flexibility of design and a multi-barrier treatment approach; and
- Maximising the use of existing infrastructure, where feasible.

3.3 Proposed WTP replacement and site layout

A conventional water treatment process has been proposed to meet the Proposal objectives. The proposed water treatment process includes clarification to settle out solids and dual media filtration to remove particles in the water with pre- and post-filter chemical dosing to achieve a WTP production capacity of 55 ML/d (KBR, 2014).

Two options for the WTP layout are being considered (see Figure 3-3 and Figure 3-4), the difference between the two options being that Option 1 includes two (2) Lamella Clarifiers (with provision for a third clarifier in the future), while Option 2 includes two (2) Reactivator Clarifiers with provision for a third clarifier. This EIS has considered either option being selected as the preferred option, as they both meet the Proposal objectives. Further details on the treatment option evaluation are provided in Section 3.8.4.



REV	AMENDMENT DETAILS	APPROVED	DATE
3	ISSUED FOR REVIEW	G.F.	22.07.14
2	ISSUED FOR REVIEW	G.F.	6.05.14
1	ISSUED FOR REVIEW	G.F.	5.05.14
0	ISSUED FOR REVIEW	G.F.	2.05.14

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Office of Finance and Services

NSW PUBLIC WORKS DRAWING No. 123-456 | REV 3

TITLE
RIVERINA WATER COUNTY COUNCIL
WAGGA WAGGA WATER TREATMENT PLANT
PROPOSED LAYOUT
OPTION 1

RWCC DRAWING No.

SHEET WGA/CONCEPT 1

CONFIRM SCALE — 100mm ON A1 ORIGINAL

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Figure 3-3: Proposed Site Layout - Option 1

CLEAR WATER RISING MAINS

RAW WATER INTAKE (10 m EAST FROM DEAD TREE)

FLOOD LEVEE (CONCEPT DESIGN- DRAFT REVISION 1)

FLOW METER PIT

FUTURE BOMEN PUMPS (3 OFF)

CLEAR WATER PUMPS (6 OFF)

CLEAR WATER STORAGE

CENTRIFUGE BUILDING

CLEAR WATER SCA

SPOIL DEWATERING FACILITY

FUTURE SUBSTATION

SWITCHING SUBSTATION

BACKWASH WASTE WATER COLLECTION TANK/ PUMPING STATION

CHEMICAL NEUTRALISATION PIT

PIT

FLUOR

HYPO

CAUSTIC

POLY

ALUM

BLOWER

COMPRESSOR

RW PS SCA

SUBSTATION

FUTURE UV

FILTERS

FUTURE FILTERS

REACTIVATOR CLARIFIER

FUTURE OXIDATION TANK

RAPID MIX TANK

FUTURE PAC

FUTURE KMn04

FUTURE LIME/CO2

FUTURE CLARIFIER

PLANT SCA AND LAB & CONTROL ROOM ABOVE

POWER EASEMENT

NEW DEPOT

180.40

180.50

181.50

180.30

180.00

181.00

7.00

LEGEND

- TRAFFIC MOVEMENT
- 180.50 x FINISH LEVEL
- CONCRETE BUND

1:500 0 10 20 30 40 50m

10

REV	AMENDMENT DETAILS	APPROVED	DATE
3	ISSUED FOR REVIEW	G.F.	22.07.14
2	ISSUED FOR REVIEW	G.F.	6.05.14
1	ISSUED FOR REVIEW	G.F.	5.05.14
0	ISSUED FOR REVIEW	G.F.	2.05.14

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Office of Finance and Services

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TITLE
RIVERINA WATER COUNTY COUNCIL
WAGGA WAGGA WATER TREATMENT PLANT
PROPOSED LAYOUT
OPTION 2

RWCC DRAWING No.

SHEET WGA/CONCEPT 2

CONFIRM SCALE — 100mm ON A1 ORIGINAL

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Figure 3-4: Proposed Site Layout - Option 2

3.4 Proposal Components

3.4.1 Initial stage of new WTP

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

- Raw water intake and pumping station
- Dosing tanks for alum and polymer dosing systems
- Dewatering building with two new centrifuges. The existing centrifuge would be decommissioned once the new plant is in operation.
- Future backwash wastewater collection tank and pumping station
- Option 1 (Lamella Clarifier) or Option 2 (Reactivator Clarifiers). Both options are addressed in this EIS – see Section 3.8.4 for evaluation of treatment process options.
- Six dual media filters including backwash pumps and air scour blowers
- Chlorine storage and dosing system and static mixer for clear water storage
- Clear water system upgrade including a new 3 ML clear water storage tank and low level and high level pumping stations each fitted with three pumps
- Electrical works including switchrooms, automation and control infrastructure, electrical substations and two new 1500 kVA transformers
- Fluoride dosing
- pH correction dosing system
- Pipework and valves
- Control room and water quality testing facilities
- Internal access roads

The location of each of the main components of the initial stage of the Proposal is shown in Figure 3-5, along with the components that are to be retained (see Section 3.4.3 for further details on components that are to be retained).

A new raw water intake would be required and would comprise three (3) intake pipes with sliding screens. Each pipe would be installed below ground and would comprise two (2) sections: the lower section would be a 600 mm diameter pipe, while the draft tube extending up the river bank would be 1000 mm diameter with a pump located inside.

A minimum of 1.6 m submergence is required, requiring dredging of the river bed to a depth of 1.7 m below the bed surface to provide 1.3 m additional water depth and to accommodate 0.4 m depth of rock. The length of river bed and lower bank affected by the river intake would be around 30 m and the width would be 4 to 5 m.

Suitable rock would be placed around the screens and along the lower bank to protect the intake structure and stabilise the bank and bed of the river at the intake location. Rock would be tapered down to be consistent with the river bed and bank profile.

The pumping station would be constructed on the top of the river bank and would include two (2) duty pumps and one (1) stand-by pump.

A schematic diagram of the raw water intake and bank profile at the preferred intake location (see Section 3.8.6 for discussion of options considered for location of raw water intake) is provided in Figure 3-6.

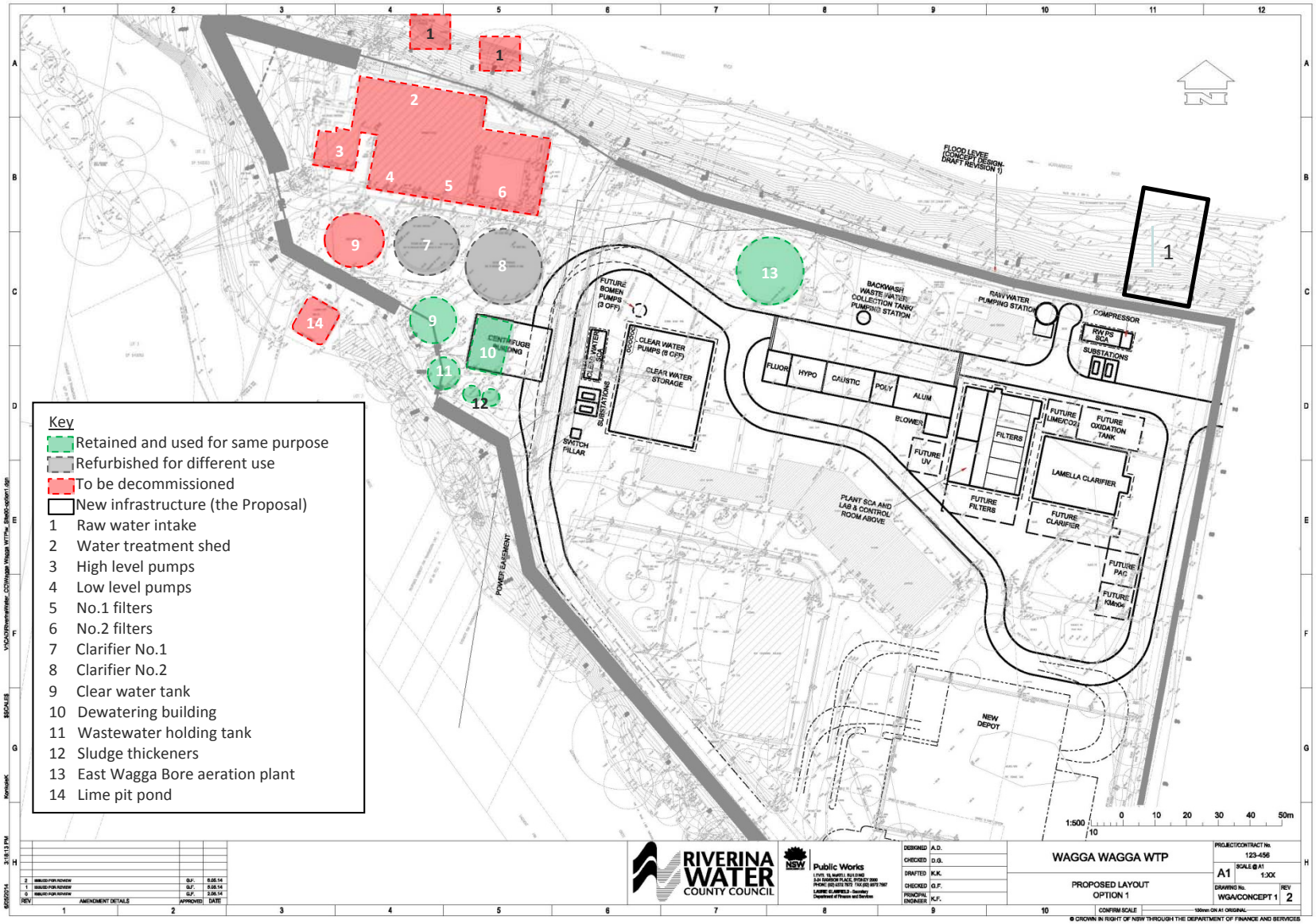

Figure 3-5: Location of Proposal elements to be retained, constructed and decommissioned within the WTP site (based on Option 1 layout)

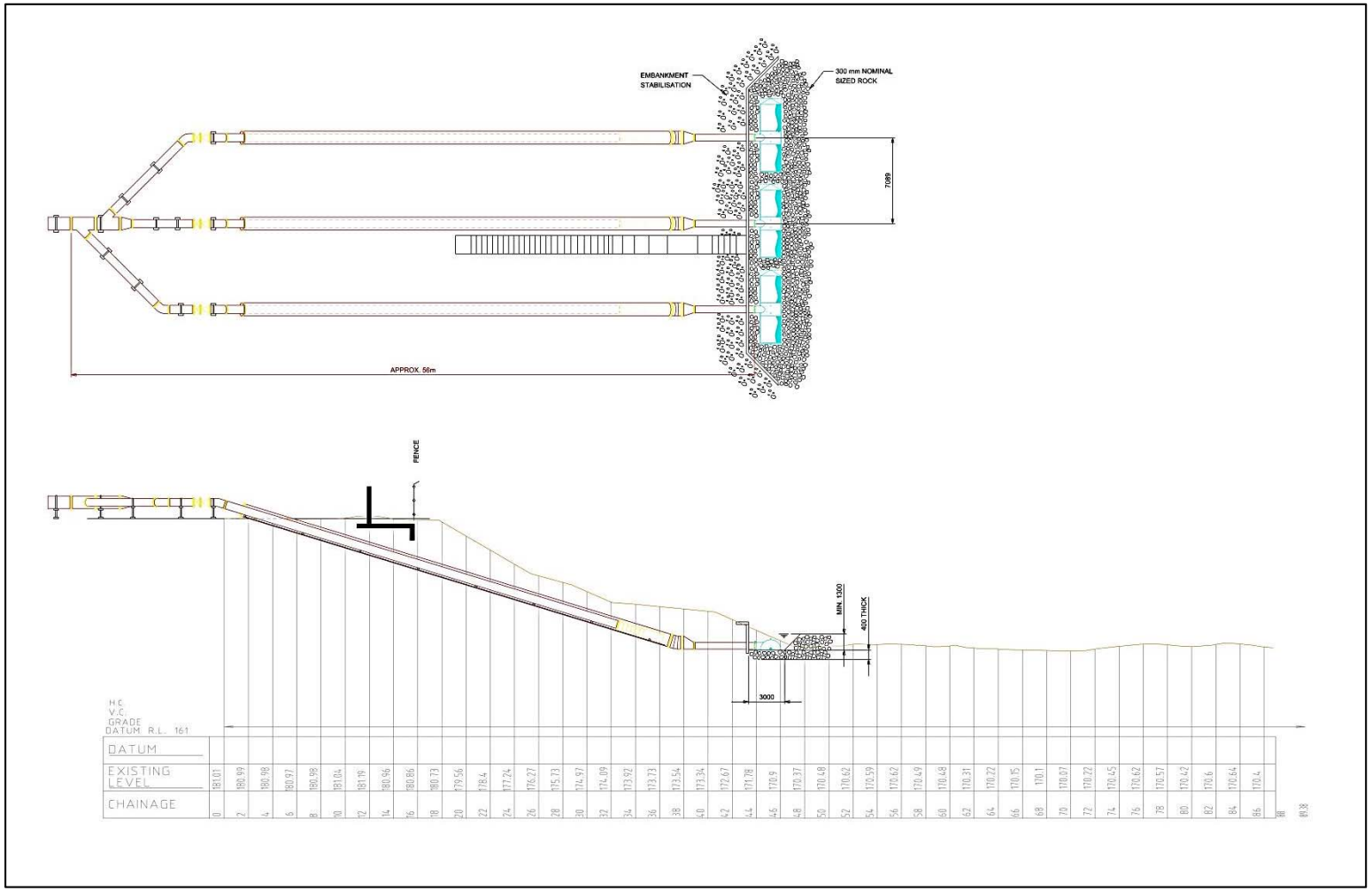

Figure 3-6: Schematic diagram of river water intake and bank profile at preferred intake location

3.4.2 Subsequent stage of new WTP

The subsequent stage of the Proposal would introduce these new elements:

- Lime (to adjust pH), potassium permanganate (to oxidise manganese so that it can be removed by coagulation), powdered activated carbon (PAC) (to reduce taste and odour issues arising from presence of organics and/or algal growth) and carbon dioxide (CO_2) dosing points (to optimise coagulant pH). Each of the future chemical dosing points is indicated by a dashed outline on Figure 3-7 and Figure 3-8.
- Oxidation tank – indicated by dashed outline and 'future' on Figure 3-7 and Figure 3-8.
- Third clarifier – not shown on Figure 3-7 or Figure 3-8.
- Additional filter cells – not shown on Figure 3-7 or Figure 3-8
- Third centrifuge – indicated by dashed outline and 'future' on Figure 3-7 and Figure 3-8
- Introduction of polydiallyldimethyl ammonium chloride (polyDADMAC) in rapid mixer – not shown on Figure 3-7 or Figure 3-8
- Supernatant return tank – indicated by dashed outline and 'future' on Figure 3-7 and Figure 3-8
- Associated pipework and valves (if not already constructed)

UV disinfection on the future supernatant line (not shown on Figure 3-7 or Figure 3-8) would be recommended as part of the Detailed Design. The future UV system shown on the outlet between the filtered water tank and clear water storage has been included to facilitate better treatment of pathogens, if required in the future.

With the exception of the supernatant return tank and the third centrifuge, all the other future works are related to the type of raw water quality encountered once the new plant is commissioned. Currently RWCC treats raw water up to 100 NTU. The new plant would be treating raw water turbidity up to 300 NTU. Due to the lack of data, there is some degree of uncertainty about the raw water quality encountered. It is likely, therefore, that these future works would be required within 5 to 10 years of the initial stage of the new plant being commissioned, as RWCC gathers more information about the raw water being treated.

The requirement of a third centrifuge is to treat wastewater for the ultimate plant capacity of 55 ML/d. The supernatant return tank is being deferred to future works, as supernatant discharge to Marshalls Creek is part of the current operating philosophy and this would continue when the new plant is operational. In addition, there is a risk in returning the supernatant to the head of the plant as it may contain pathogens that have been removed through the process. Generally, supernatant being returned to the plant inlet would need to be treated, preferably by ultra-violet (UV) processes.

3.4.3 Existing infrastructure to be re-used or refurbished

The following existing treatment components would be retained and utilised for a different function as part of the WTP replacement:

- Clarifiers 1 as the wastewater holding tank;
- Clarifier 2 as the thickener
- Washwater balance tank as a thickened sludge holding tank. This tank is already connected to the existing clarifiers.

The following existing treatment components would be retained and continue to be utilised for their existing purpose:

- East Wagga Borefield aeration plant

3.5 Proposal Treatment Process

The process flow for the proposed new WTP is described in the following sections, and shown in Figure 3-7 (for Option 1) and Figure 3-8 (for Option 2).

3.5.1 Raw Water to Potable Water

The treatment process for raw water to potable water would have the following flow:

- Pumping from the Murrumbidgee River to the rapid mix tank. Dosing points along this line include alum, caustic soda (pH adjustment) and pre-chlorine (oxidise manganese and iron).
- The subsequent stage of works would introduce PAC and potassium permanganate dosing prior to the raw water reaching an oxidising tank, and lime and CO_2 dosing before reaching the rapid mix tank. PolyDADMAC (polymer for flocculation) would also be introduced to the rapid mix tank during this stage.
- Polymer dosing in the rapid mix tank (with polyDADMAC introduced at a later stage as stated above).
- Flocculation and clarification.
- Filter through dual media filters and dosed with chlorine and fluoride before transfer to the clear water tank.
- Addition of UV disinfectant dosing prior to chlorine and fluoride dosing in the subsequent stage of works.
- Caustic soda dosing before being distributed to the water reticulation systems.

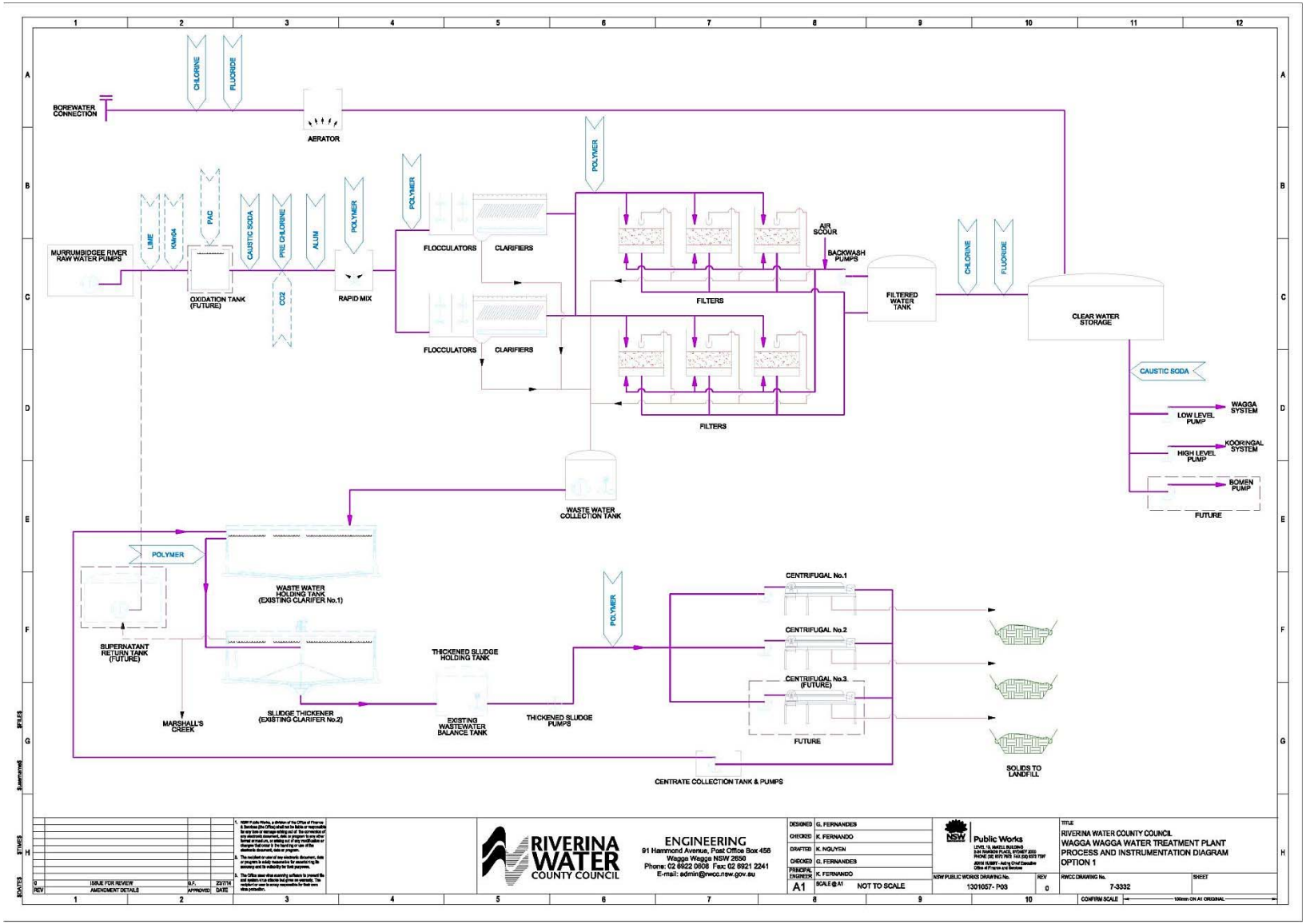

Figure 3-7: Process flow diagram for Option 1

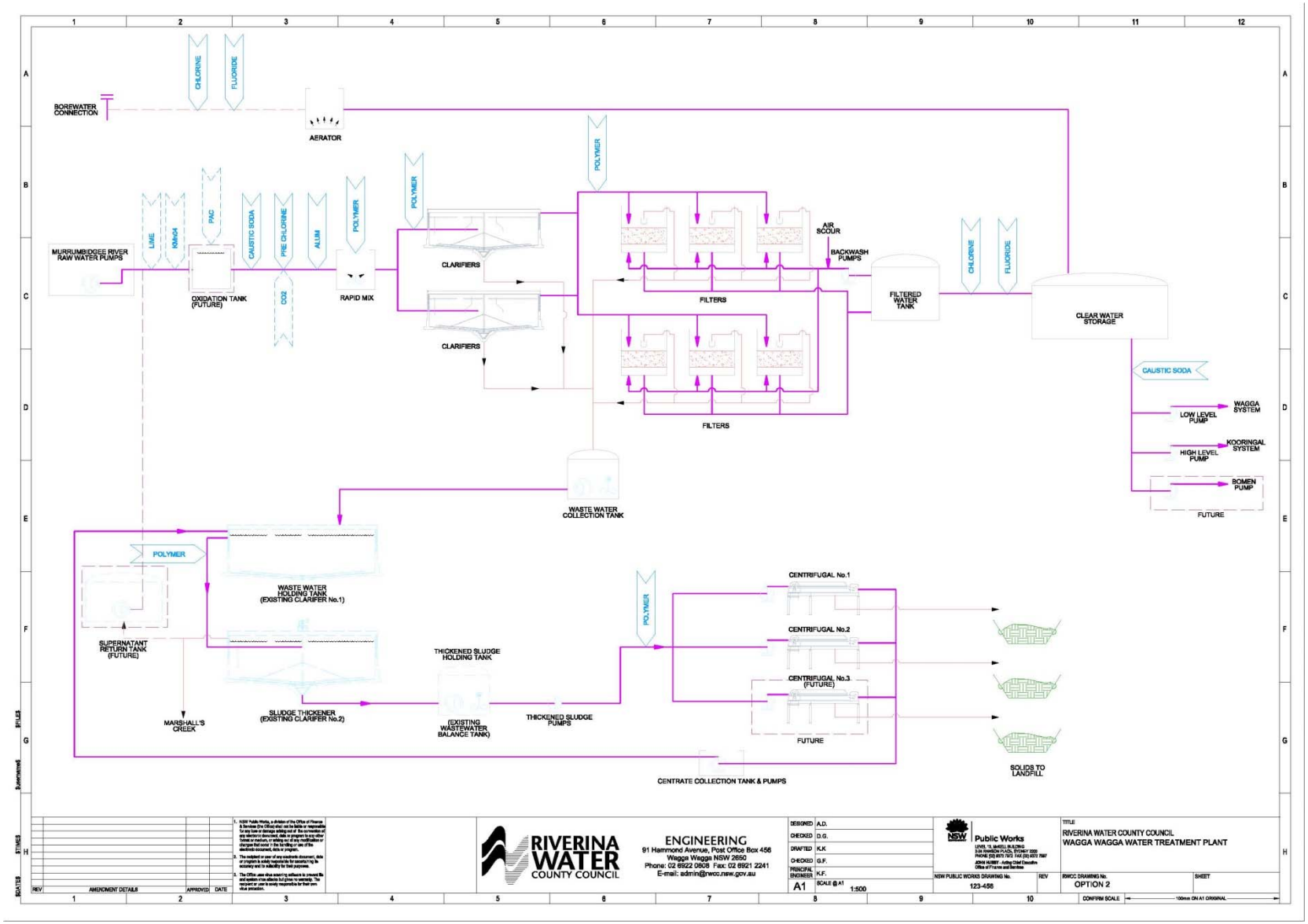

Figure 3-8: Process flow diagram for Option 2

3.5.2 Wastewater and Sludge Handling

During development of the Detail Design, the wastewater handling and treatment philosophy for the new WTP has changed from that which was presented in the Preliminary Environmental Assessment submitted with the application for the Director-General's requirements. The philosophy adopted in the new plant would be the same as the existing plant. All wastewater (clarifier underflow and filter backwash) would be collected and transferred to a holding tank (refurbished existing Clarifier 1). The wastewater would then be transferred to a thickener (refurbished existing Clarifier 2). The thickened sludge would then be stored in a thickened sludge holding tank (refurbished existing wastewater balance tank). From the thickened sludge holding tank the sludge would be pumped to the centrifuge where it would be dewatered. There would be two liquid waste streams generated, the centrate from the centrifuge which would be returned to the wastewater holding tank and re-processed, and the thickener overflow which would be discharged to Marshalls Creek. The latter would be the only wastewater discharge from the plant.

As a result of the first stage of the WTP replacement, the quantity of supernatant discharged to Marshalls Creek from the sludge thickener would increase due to the greater volumes of filter backwash wastewater produced. The next stage of works would involve incorporation of a supernatant return tank whereby, after balancing, supernatant would be pumped to the raw water line for recirculation in the treatment process, resulting in the cessation of discharge to Marshalls Creek.

RWCC's EPA licence allows for 1 ML/day of wastewater to be to be discharged to Marshalls Creek at 30 mg/L of supernatant suspended solids. The volume of wastewater discharged to the creek would be dependent on two factors:

- the flow rate that the plant is treating; and
- the turbidity of the raw water.

Under normal operating conditions, and at a rate of 55 ML/day, wastewater discharge from the new plant would be expected to be as high as 0.45 ML/d but could increase to 2.22 ML/d when treating raw water with 300 NTU turbidity as more frequent filter backwashing would be required. 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.

EPL 614 requires RWCC to undertake weekly monitoring of Total Suspended Solids (mg/L) at the discharge point and provide monitoring results to the EPA in an annual return.

3.6 Chemical dosing systems

3.6.1 Chemicals proposed to be used in the initial stage

Chemicals proposed to be used in the treatment process in the initial stage of the new WTP include:

- Sodium Hydroxide (caustic soda)
- Aluminium Sulphate (or Aluminium Chlorohydrate) (Alum)
- Polyacrylamide (polymer)
- Sodium Hypochlorite (NaOCl) (chlorine)
- Sodium Silicofluoride (Na_2SiF_6) (fluoride)

The following provides a description of each of the chemicals proposed to be used and the reason that they are required.

- Sodium Hydroxide

Sodium Hydroxide (NaOH), also known as caustic soda, is an alkali used to adjust raw water and final water pH. Caustic soda solution would be delivered by road tanker to on-site storage tanks from which dosing pumps would deliver a metered amount of chemical. Caustic soda would be supplied as liquid with 30 % w/w (percentage weight to weight) NaOH, Specific Gravity (SG) ≈ 1.33.

- Aluminium Sulphate

Aluminium Sulphate ($Al_2(SO_4)_3$), also known as alum, is a coagulant used to remove dissolved organic matter and colloidal particles. Alum would be delivered by road tanker to on-site storage tanks from which dosing pumps would deliver a metered amount of chemical into a carrier stream which would be pumped into the dosing point. Alum would be supplied as a liquid with approximately 8 % w/w $Al_2(SO_4)3.14H_2O$), SG ≈ 1.31.

- Aluminium Chlorohydrate

Aluminium Chlorohydrate (ACH, $Al_2Cl(OH)_5$ – optional alternative coagulant) is a coagulant to remove dissolved organic matter and colloidal particles with minimal impact on treated water pH. ACH will be delivered by road tanker to on-site storage tanks from which dosing pumps will deliver a metered amount of chemical into a carrier stream which will be pumped into the dosing point. ACH would be supplied as liquid with 23 % w/w Al_2O_3 (≈ 50 % w/w $Al_2Cl(OH)_5{\cdot}2.5H_2O$), SG ≈ 1.32.

Typically either alum or ACH can be used over a broad range of conditions, which should be established over a season of operation. However, ACH is generally preferred for coagulation during typical raw water conditions, as this reduces alkali dosing requirements and simplifies the treatment process. Alum is usually required during poor raw water quality conditions, particularly high organics loads, and also often when low turbidities occur.

- Polyacrylamide

Polyacrylamide is a polymer that assists in binding particles together for better removal. Dry polymer crystals would be delivered on pallets in 25 kg bags which an operator would empty into a hopper as required. Dry polymer would be metered from the hopper into a batch tank and mixed with process water. After sufficient mixing, the batch tank would be emptied into a day tank from which dosing pumps would deliver a metered amount of solution into a carrier stream which would be pumped to the dosing points. Two separate polyacrylamide batching and dosing systems are proposed – one for the main process and one for the wastewater handling system.

The polyacrylamide dosing system would include multiple dosing points which would allow polymer dosing as a coagulant aid, and filter aid for maximum operational flexibility and process optimisation. In addition, polyacrylamide batching and dosing systems would also be provided to assist in and thickening and, separately, centrifuge dewatering.

- Sodium Hypochlorite (NaOCl)

Sodium Hypochlorite is a disinfectant and oxidising agent. Sodium hypochlorite solution would be delivered by tanker to on-site storage tanks. Dosing pumps would deliver a metered amount of solution into a carrier stream which would be pumped into the dosing point(s).

Three chlorine dosing points would be provided: to the raw water for treatment of tastes, odours and algae when required, prior to the filters for oxidation of metals and organics; to the filtered water for final disinfection; and to provide a chlorine residual prior to distribution. Sodium hypochlorite would be supplied as liquid with 12.5 % w/w NaOCl, SG ≈ 1.21.

- Sodium Silicofluoride (Na_2SiF_6)

Sodium Silicofluoride is used for fluoridation of the filtered water and bore water prior to distribution for the purpose of protecting dental health in the community.

Powdered sodium silicofluoride would be delivered in 1 tonne bulk bags and would be loaded into a hopper as required. A constant-strength solution would be dosed to the respective dosing points by flow-paced dosing pumps in order to achieve the target fluoride concentration.

3.6.2 Chemicals proposed to be used in the subsequent stage

Chemicals proposed to be used in the subsequent stage of the new WTP would depend on raw water quality and monitoring of the effectiveness of the operation of the WTP. Potential chemicals that may be considered in the future stage of the WTP are shown in Table 3-1.

Table 3-1: Potential Chemicals to be Used in Subsequent Stage of the New WTP

Chemical Proposed to be used	Purpose
Alkali - Calcium hydroxide (Hydrated lime, $Ca(OH)_2$)	Adjust raw water pH and alkalinity
Carbon dioxide (CO_2)	Optimise coagulant pH
Potassium Permanganate ($KMnO_4$)	Oxidise manganese so that it can be removed by coagulation
Powdered Activated Carbon (PAC)	Reduce taste and odour issues arising from presence of organics and/or algal growth

3.7 Construction Works

3.7.1 Construction of WTP replacement

As part of the new WTP, new buildings would be required for the plant and filter process machinery, chemical storage and dosing systems, control rooms, and to house the new Main Control Centre and instrumentation and control equipment. Activities occurring during construction of the new WTP would include:

- Building construction – concrete slab floors at ground level, pre-cast concrete panels with steel frames, colorbond roof and roller doors for chemical storage areas. An allowance has been made to install a gantry crane .along the filter gallery for removal/installation of equipment if access to equipment with a forklift is not possible.
- Concrete batching – concrete used on-site may be a combination of pre-mixed concrete delivered to site as well as on-site concrete batching, depending on the approach adopted by the construction contractor.
- Infrastructure construction/installation – construction and installation of tanks, connecting pipelines and dosing points.
- Refurbishment – removal of decommissioned elements and retrofitting existing infrastructure to be retained and reused.
- Earthworks - excavation (up to 4 m depth) and importation of fill for the clarifiers, filters and related structures.
- Earthworks - excavation (up to 5 m depth) for construction of the clear water storage and filter wastewater collection tank.
- Road construction – minimum 7m wide access road to and around the new clear water storage and from the existing access road to the new WTP including a turning and hardstand area in front of the new WTP.
- Electrical works – installation of switchrooms, automation and control infrastructure, electrical substations, two new 1500 kVA transformers and associated cabling.
- Ancillary works – concrete areas, access paths, railings, signage etc.
- Demolition works – removal of the two existing raw water intakes.
- Instream works – construction of coffer dams around existing river water intakes to facilitate their removal.
- Restoration works – river bank stabilisation works following removal of the existing raw water intakes (e.g. rip rap, jutte matting, tubestock planting) and turfing of unsealed / unpaved areas.

3.7.2 Construction of River Water Intake

Activities occurring during construction of the river water intake would include:

- Excavation of the river bank to install the draft pipes.
- Excavation and dredging of the bank and bed of the river for the raw water intake and screens.
- Placement of 300 mm (nominal diameter) rock along the lower bank and on the bed of the river as stabilisation.
- Instream works – construction of coffer dams around existing river water intakes to facilitate their removal, and around the new river intake construction site.
- Restoration works – river bank stabilisation works at the new and existing raw water intakes (eg rip rap, jutte matting, tubestock planting)

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 40m and up to a depth of around two metres (see Figure 3-6). The river bed itself would require excavation to a depth of around 1.7m below existing bed level to achieve sufficient submergence of the intake pipes. A temporary coffer dam, possibly comprising sheet-piling, would be required during construction of the river intake. The construction contractor would be required

to develop a methodology for installing the coffer dam, dewatering, and removal of the dam following construction of the river intake. It is expected that the construction site (including coffer dam) would extend no more than 10 m into the river channel, with the intake structure extending around 3 m into the river channel post-construction. At the location of the new river intake, the width of the river is around 100 m, with a sandbar located slightly downstream of the construction site and around 50 m from the bank.

3.7.3 Construction Plant and Equipment

Construction plant and equipment may include, but would not be limited to, the following:

- Delivery trucks
- Mobile crane
- Backhoe
- Grinder
- Excavator
- Compactor
- Front End Loader
- Concrete vibrators
- Grader
- Concrete trucks
- Generator
- Roller
- Scraper
- Air Compressors
- De-watering Pumps

3.7.4 Construction Period

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.

3.7.5 Potable water supply during construction

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 permitted, potable water supply to Wagga Wagga residential, commercial and industrial customers would not be permitted to be disrupted at any time.

To ensure continuity of potable water supply, the following aspects would be considered during any tie-ins and construction during WTP shutdowns:

- Each work activity shall be thoroughly planned with contingency and risk mitigation measures considered and ready for implementation.
- All stakeholders shall be informed of the planned works and kept informed of progress against plan.
- There shall 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 shall occur during times that allow the planned works to occur considering the likely potable water demand during the durations of the works and volume of stored potable water in the system (i.e. working overnight or during the seasons when the WTP is off-line may be required).
- The construction contractor is to abandon or reschedule works at the direction of RWCC if changes in conditions necessitate e.g. change in demand profile of potable water customers.

The Wagga Wagga WTP is fortunate in that the bore water system can supply the potable water demand for part of the year so the WTP can be shut down for a significant amount of time. This capability would be invaluable for the major modifications works required to the existing plant, however the timing of construction activities needs to be carefully planned to take advantage of this flexibility (KBR 2014).

3.7.6 Testing and Commissioning

The commissioning of the new WTP would generally follow the completion of the construction program. Commissioning activities can be grouped into the following major areas:

- Construction verification
- Pre-commissioning
- Process commissioning
- Post commissioning

Construction verification involves the checking of individual components, mechanical and structural integrity, and electrical and control systems without applying power. This stage, undertaken in parallel with the final stages of construction, would include, among other tests/checks, flushing and cleaning, and hydrostatic and pneumatic testing of piping systems. Pre-commissioning would commence when it is safe to start applying power to the equipment, generally near the end of the construction phase. Pre-commissioning would involve testing the equipment under power, initially as individual components and, finally, as an integrated process plant. Process commissioning would involve process start-up, tuning controllers, correcting any operating sequence problems, improving operational reliability and performance testing the process. The post-commissioning would be carried out with the aim of increasing the performance of the process.

3.8 Proposal Alternatives

A number of alternatives for various aspects/ elements of the Proposal have been investigated, as outlined below.

3.8.1 Do-nothing Option

The current strategy of isolating the river water source when the river is experiencing high turbidity levels as a result of rain or storm events, and sourcing raw water solely from the East Wagga Borefield is not sustainable in the long term. Regional demand for potable water is expected to increase in the future and it is likely that the river source may need to be utilised during periods of high turbidity as the Borefield would be unable to meet treated water demand. A number of plant design and condition deficiencies restrict sustainable production at the predicted water demand levels during dirty river events where turbidity is high. The 'Do-nothing Option' would not address RWCC's objective of maintaining a safe and secure treated water supply for the greater Wagga Wagga area into the future. Strategic justification for the Proposal is further discussed in Section 4 of this EIS.

3.8.2 Site Location

The existing Wagga Wagga WTP site was the only site considered for the new WTP. The WTP site is located in a predominantly light industrial / commercial area (apart from Easts Riverview Holiday Park adjoining the eastern side boundary) and has been utilised for water treatment since the late 19th century. The site is highly disturbed, with remnant vegetation generally restricted to the riparian corridors along Marshalls Creek and the Murrumbidgee River. The WTP site is generally flat and is of sufficient area to accommodate the proposed infrastructure. Apart from the new raw water intake and pumping station, the new infrastructure would be confined to within the lot that contains the existing WTP, minimising environmental impacts from site preparation works such as vegetation clearing and ground levelling. The WTP would be located close to the Murrumbidgee River water source, minimising environmental costs and impacts associated with pumping water over a long distance and the need for longer lengths of pipeline.

The *Wagga Wagga Spatial Plan 2013* has been prepared by Wagga Wagga City Council to provide strategic indicators for development of Wagga Wagga over the next 30 years. It is the key strategic document used by Wagga Wagga City Council for directing and managing urban growth. The retention of the WTP site in its current location is not incompatible with any of the potential urban areas which have been identified in the plan.

3.8.3 Use of existing infrastructure

As part of the *Upgrade of Wagga Wagga Water Treatment Plant Feasibility Study* undertaken by HWA in 2012, an assessment of the existing infrastructure at the Wagga Wagga WTP was undertaken to ascertain those that are redundant, need to be refurbished or replaced, or are suitable in their current condition for inclusion in the WTP upgrade works. The assessment concluded that it was not feasible for the majority of the existing infrastructure to be incorporated into the new treatment process design for the following reasons:

- Insufficient hydraulic capacity and size for the ultimate 55 ML/d upgrade.
- Issues of reliability due to age and the condition.
- Poor clarifier performance – mixing of coagulant (alum) only occurs within the inlet pipe where alum is added.
- The design of the existing clarifiers is such that they are unable to be fitted with inclined plates for improved settling, primarily due to the bracing and support for the flocculation structures.
- The current wash water handling system would have insufficient capacity to treat the larger volumes of backwash wastewater, sludge and solids produced from the upgraded plant.
- The existing Raw Water Pumping Station (RWPS) is unlikely to be reliable 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 anticipated condition and disadvantages and deficiencies of the current pressure filters.
- Structural uncertainties of existing infrastructure, and
- Cost of retrofitting being unfavourable against the installation of new, modern and more reliable infrastructure.

As discussed in Section 3.4.3 some elements have been able to be retained for the same use or refurbished for alternative use.

3.8.4 Treatment Option Evaluation

In the evaluation of treatment process options, the Feasibility Study undertaken by HWA (2012) considered cost, redundancy, footprint, operability, chemical use, power consumption, ability to adjust to raw water changes, treatment risks and knowledge gaps, maintenance, environmental and construction implications for each available option. The assessment focused on clarification and filtration options with analysis performed on seven clarification options and five filtration options.

In consultation with RWCC and NSW Public Works, the options were reduced as follows:

- Clarification options
  - Inclined Plate Settler
  - Actiflo™
  - Sedimentation Tanks
  - Existing Clarifiers
  - Existing Clarifiers + Dissolved Air Floatation
  - Reactivator Clarifiers
- Filtration options
  - Open Gravity Dual Media filters
  - Membranes: Microfiltration/Ultrafiltration (MF/UF)

For each treatment option there were two additional variations:

- Option a: Maintain the existing Clear Water Storages and converting Clarifier 2 into a new Clear Water Storage (CWS). This option would require:
  - Modifications to Clarifier 2, including baffling to increase the disinfection C(t) requirements.
  - A new low lift pumping station to pump filtered water to Clarifier 2.
  - Retaining the existing Clear Water Pumping Station (CWPS).
- Option b: Construct a new Clear Water Storage. This option would require:
  - A CWS to provide sufficient disinfection C(t) requirements.
  - A new CWPS.

Process elements common to all options include:

- Raw water pumping upgrades
- Modifications to chemical storage and dosing for:
  - Aluminium Sulphate
  - Hydrated Lime
  - Carbon Dioxide
  - Polymer
  - Chlorine
- Wash water handling and sludge dewatering
- Clear water pumping
- Power
- SCADA Control

Based on cost, dual media filters were selected over membranes as the preferred filtration option (see Table 3-2). Dual media filters are considered to be a conservative, reliable, user-friendly option when compared to membranes (HWA 2012).

Table 3-2: Filtration Option Cost Comparison (source: HWA 2012)

Filtration Option	Capital Cost Estimate
Dual Media Filters	$7,920,000
High Flux Membranes (excluding pre-treatment costs)	$19,500,000
Low Flux Membranes	$20,170,000

A shortlisting workshop was held on the 10 February 2012. The workshop was held to discuss the options identified and work through the assessment process. The shortlisting process identified three preferred options to be considered further. These included:

- Inclined plates and Dual Media Filters
- Actiflo™ and Dual Media Filters
- Reactivator Clarifiers and Dual Media Filters

HWA (2012) provides preliminary base cost estimates for the three short-listed options which were ascertained using a combination of:

- Market pricing.
- Benchmarking of recent projects.
- First principals estimating.
- Preliminary designs, sketches and scope of works.

Table 3-3: Cost Estimates for all three Upgrade Options (source: HWA 2012)

Upgrade Options	Total Project Cost Estimate
Option 1: Inclined plates and Dual Media Filters	$37,889,000
Option 2: Reactivator Clarifiers and Dual Media Filters	$38,599,000
Option 3: Actiflo™ and Dual Media Filters	$38,096,000

As all options were quite similar, with the major difference being the clarifications stage, and the capital and operating expenses were similar, a non-financial comparison was required. A comparison matrix based on non-financial criteria was therefore developed in order to identify a preferred option. The assessment matrix was sent to all parties who attended the final Options Design Workshop held on 12 April 2012. The highest scoring option when comparing non-financial criteria was the Inclined Plates option with an overall score of 80%. The Reactivator Clarifier was placed second with 77% and finally the Actiflo™ option was third with 62%. At feasibility design level, there was insufficient difference between the three options to categorically select one as preferred or reject any option outright (HWA 2012). This EIS has been based on either Option 1 or 2 being selected as the preferred option, with refinements identified during the concept development as outlined in Section 3.8.5.

3.8.5 Concept Development

Prior to commencing the concept design, a detailed review of the Feasibility Study Report was undertaken by Kellogg Brown and Root (KBR) and City Water Technology (CWT) in conjunction with RWCC and NSW Public Works, resulting in the following changes to the scope of works, as documented in KBR (2014):

- Potassium permanganate dosing system, powdered activated carbon (PAC) dosing system, and raw water oxidation tank to be allowed for as future options.
- Lime and carbon dioxide (CO_2) system allowed for as a future option to reduce capital costs upfront.
- Caustic soda dosing for both pre-filter and post-filter alkali requirements to reduce infrastructure requirements compared with separate alkali dosing systems.
- Separate polymer dosing systems for process (coagulation aid and filtration aid) and, sludge thickening and sludge dewatering to optimize treatment.
- Inclined plate sedimentation tanks or solids contact sludge recirculation type clarifiers only (Actiflo™ clarification system determined to be least suitable option for Wagga Wagga WTP after clarification options study).
- UV disinfection option on the entire treated water stream, rather than only the supernatant return line, to be allowed for as a future option after a preliminary cost-benefit analysis.
- One additional centrifuge to be allowed for in the initial upgrade with a third centrifuge as part of the future upgrade to reduce unnecessary capital costs upfront.
- Alternative wastewater system design based on batch settlers to remove the bulk of the wastewater from the system in the first step, thus reducing tank sizes and enabling more existing tanks to be utilized.
- Chlorine gas dosing was subsequently changed to sodium hypochlorite dosing.
- Fluoride dosing system was subsequently included in the scope to replace the existing system.
- Supernatant return tank included as a future option.

With regard to the supernatant return tank being deferred to future works, supernatant discharge to Marshalls Creek is part of the current operating philosophy and this will continue when the new plant is operational. In addition, there is a risk in returning the supernatant to the head of the plant as it may contain pathogens that have been removed through the process. Generally, supernatant being returned to the plant inlet would need to be treated, preferably by ultra-violet (UV) processes.

Cost estimates provided in KBR (2014) for construction of the proposed WTP replacement are $56.072 Million for Option 1 and $54.113 Million for Option 2. Costings would be refined during detail design, with any cost savings identified.

3.8.6 Options for River Intake Location

Four options for the river intake location were identified by NSW Public Works and RWCC for consideration during a site inspection on 15th May 2014. The location of each of the identified options (Options 1 to 4) is shown on Figure 3-9. A summary of the ecological constraints associated with each option is provided in Table 3-4 along with a photo of each location.

3.8.7 Raw water intake structure

The raw water intake structure presented in the Concept Design Report (KBR 2014) comprised the following components:

- new intake pipe with inlet screens;
- wet well;
- three submersible centrifugal pumps; and
- a rising main with raw water analysis instrumentation and chemical dosing points.

The wet well arrangement proposed in the Concept Design Report possesses a large number of potential construction risks, including:

- the need to construct a 6 to 7 m diameter well to a depth of about 15 m;
- the cost of dewatering;
- the need to drill the intake pipeline at a depth of 14 m from the well into the river; and
- high potential for construction cost overrun.

Despite these risks, this option may still be retained in the specification as an alternative option.

During development of the Detailed Design of the raw water intake, an alternative raw water intake was proposed, consisting of the following components:

- Three (3) intake pipes with sliding screens;
- Three (3) draft tubes with pump located inside; and
- Two (2) duty pumps and one (1) stand-by pump.

The adopted raw intake design is described further in Section 3.4 of this EIS.

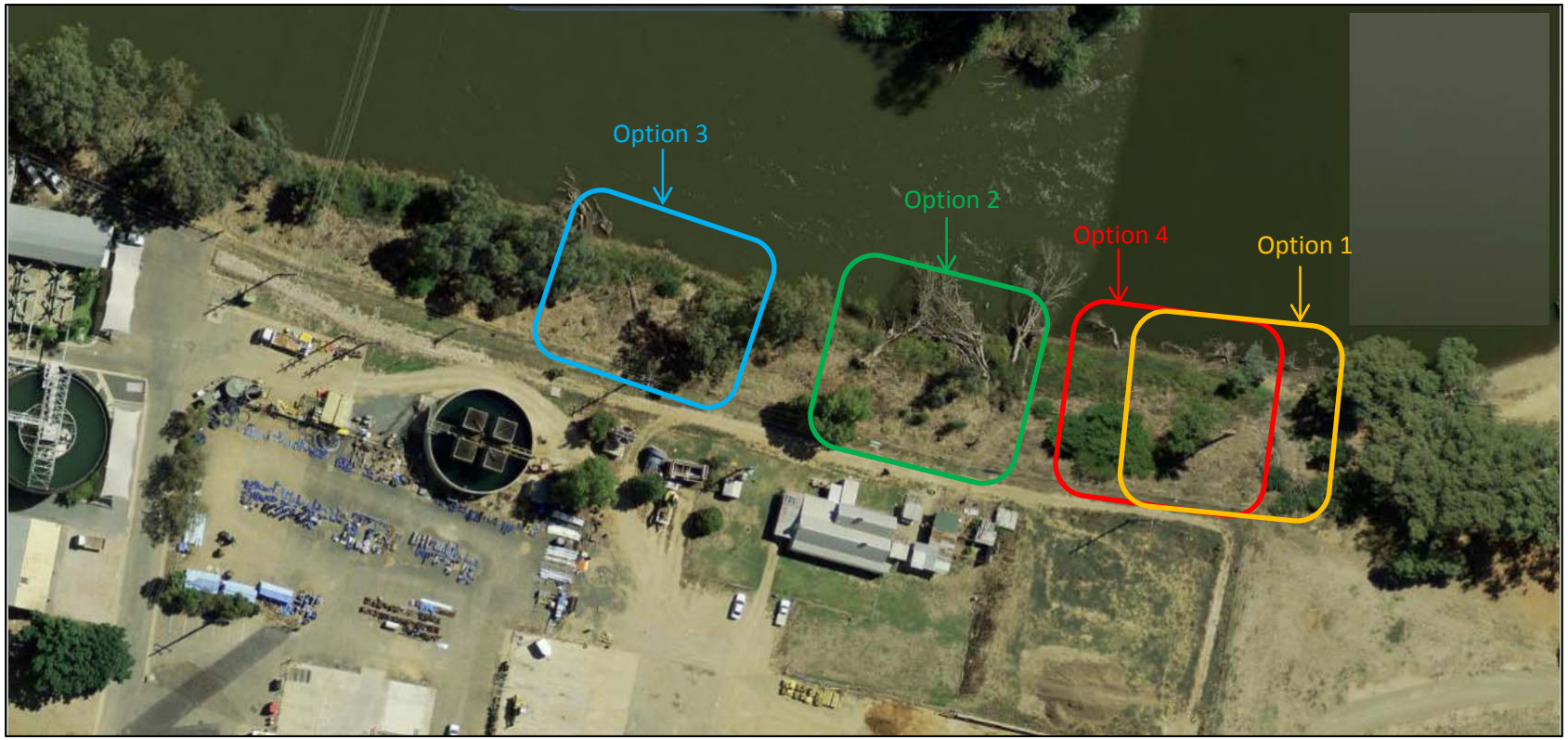

Figure 3-9: Options considered for location of river water intake

Table 3-4: Options assessed for river intake location

Option No.	Photo	Environmental Constraints
1	 **Photo 1: River water intake Option 1**	Preferred option from an ecological perspective. No large snags would require removal and vegetation clearing would be limited to removal of weedy groundcover and a few young trees. No large River Red Gums would require removal.
2	 **Photo 2: River water intake Option 2**	This option presents the highest risk of ecological impact as construction of the river water intake would require the removal and relocation of large snags, potentially affecting threatened aquatic species such as Murray Cod, Trout Cod and Silver Perch.

Option No.	Photo	Environmental Constraints
3	 **Photo 3: River water intake Option 3**  **Photo 4: River Red Gums leaning over Option 3**	Option 3 is an area dominated by introduced weeds and grasses, providing minimal habitat for habitat (see Photo 3). Constructing the water intake structure at this location would have minimal impact on threatened biodiversity. However, it is likely that two River Red Gums leaning over Option 3 (see Photo 4) would require removal as they pose a risk of falling on the intake structure. The removal of these two trees would impact on potential habitat for Squirrel Glider, Brown Treecreeper, Black Falcon, Little Lorikeet, Swift Parrot, Little Eagle, Black-chinned Honeyeater, Barking Owl and Superb Parrot. In addition, this option is closer to the location of Platypus sightings and potential Platypus habitat in the vicinity of the existing water intake structures located downstream.

Option No.	Photo	Environmental Constraints
4	 **Photo 5: River water intake Option 4**	This option is situated between Option 1 and Option 2, approximately 10 m upstream from the large snags (shown at left on Photo 5). Constructing the intake at this location would avoid the removal of the large snags situated within Option 2. Removal of native vegetation would be limited to wattles (*Acacia* sp) and young Eucalypts, with no removal of large trees, including River Red Gum and River Oak. Whilst the wattles and young eucalypts may provide potential foraging habitat for the threatened Squirrel Glider and Brown Treecreeper, as well as other non-threatened species, it is considered unlikely that the removal of this habitat would adversely affect local populations of threatened species.