Upper South Creek Advanced Water Recycling Centre

Sydney WATER

Environmental Impact Statement

Volume 4 Environmental Management and Synthesis

September 2021

14 Environmental management

This chapter summarises Sydney Water's approach to environmental management during construction and operation of the project.

Sydney Water will effectively manage the project's environmental impacts throughout construction and operation by:

- implementing the management measures identified throughout the EIS and summarised in Chapter 15
- complying with conditions of approval and any other licence or approval obligations
- incorporating environmental obligations and performance expectations into procurement processes for supply chains and contractors
- ongoing management and monitoring of the project's environmental performance including by assigning an environmental representative to the project and auditing project environmental compliance.

Given management measures are identified in this Environmental Impact Statement (EIS), the approval authority, Department of Planning, Industry and Environment (DPIE), is effectively responsible for endorsing them. In approving the project, DPIE takes into consideration any submissions from the community and other stakeholders in informing a decision about any conditions of approval. The conditions of approval may specify endorsement or approval of certain management measures by DPIE or other agencies, including in management plans.

14.1 Construction environmental management

Sydney Water's construction contractor(s) will develop a Construction Environmental Management Plan (CEMP) for the project to manage environmental impacts during construction. This is a standard part of Sydney Water's contractual specifications, which specify minimum content for a CEMP and the need to capture any obligations from the EIS and conditions of approval. The CEMP will be consistent with DPIE's environmental management plan guideline for infrastructure projects (DPIE, 2020). This outlines the recommended content of a CEMP, including a framework for continuing management, mitigation, monitoring and auditing. The CEMP will include a range of sub-plans to address specific environmental risks, including:

- Biodiversity Management Plan
- Heritage Management Plan
- Noise and Vibration Management Plan
- Rehabilitation Management Plan
- Soil and Water Management Plan

- Sustainability Management Plan
- Traffic Management Plan
- Waste Management Plan.

Sydney Water's construction contractor(s) will also develop a Commissioning Management Plan. In addition to a range of other content, this will include environmental management measures relevant to commissioning. Sydney Water will also develop an Urban Design and Landscaping Plan for the AWRC site.

If Sydney Water engages more than one principal construction contractor, each contractor would develop their own CEMP, sub-plans and commissioning plan that covers their scope of work.

14.2 Operational environmental management

Table 14-1 identifies Sydney Water's existing management systems that will be applied during project operation. These systems are based on international standards and apply across Sydney Water's asset operation. They capture accountabilities, processes, policies and procedures to manage quality, safety, environment and asset-related risks. They also provide a platform for continual improvement of Sydney Water's management processes. Sydney Water expects these systems to evolve over time. For example, Sydney Water is planning to integrate them into a single management system. If Sydney Water engages another party to operate the AWRC, they would also be required to have equivalent management systems.

In 2017, Sydney Water developed an operational environmental management roadmap which demonstrated to DPIE how its management systems fulfil the requirements of a project-specific Operational Environmental Management Plan (OEMP). As a result, DPIE approved modifications to existing conditions of approval for Sydney Water's State significant projects. Sydney Water proposes to continue this established approach for the project. By managing operations in accordance with Sydney Water's existing management systems (or contractor management systems) there is no need for a project OEMP. Sydney Water will incorporate operational management measures from Chapter 15 and any operational phase conditions of approval into the relevant component of its existing management systems.

Table 14-1 Current Sydney Water management systems

Management system	Standard	Scope of system
Asset management system	Certified to ISO 55001:2014 (Asset management)	This system covers all activities associated with Sydney Water's asset value chain such as creation, reuse/disposal, renewals, maintenance, condition and performance.

Management system	Standard	Scope of system
Environmental management system	Certified to ISO 14001:2015 (Environmental management systems)	This system provides a framework to develop, implement, monitor and review Sydney Water's environmental objectives, actions and targets. It includes environmental criteria, standards and mechanisms to monitor performance and regulatory compliance.
Quality management system	Certified to ISO 9001:2015 (Quality management systems)	This system outlines Sydney Water's way of working, including in relation to risk management, document and records management, strategy and planning, business processes, assurance and audit, people capability and business performance and improvement.
Work health and safety management system	Certified to AS/NZS 4801:2001 (Occupational health and safety management systems)	This system manages Sydney Water's approach to work health and safety, including in relation to responsibilities and accountabilities, planning and improvement, risk management, consultation and communication, contractor and supplier management, training and competency, incident and emergency management, performance and reporting, and health, wellbeing and occupational hygiene.

15 Project synthesis

This chapter synthesises the Environmental Impact Statement by describing the project, and its uncertainties, residual impacts and management measures. It also provides a justification for proceeding with the project.

15.1 Relevant Secretary's Environmental Assessment Requirements

Table 15-1 lists the Secretary's Environmental Assessment Requirements (SEARs) addressed in this chapter and the section in which they are addressed.

Table 15-1 SEARs addressed in project synthesis chapter

SEARs	EIS section where requirement addressed
General Requirements (h) a chapter that synthesises the environmental impact assessment and provides:	
i. a succinct but complete description of the project for which approval is sought.	Section 15.2
ii. a description of any uncertainties that still exist around design, construction methodologies and/or operational methodologies and how these will be resolved in the next stages of the project.	Section 15.3
iii. a compilation of the impacts of the project that have not been avoided.	Section 15.4
iv. a compilation of the proposed measures associated with each impact to avoid or minimise (through design refinements or ongoing management during construction and operation) or offset these impacts.	Section 15.4
v. a compilation of the outcome(s) the proponent will achieve.	Section 15.5
vi. the reasons justifying carrying out the project as proposed, having regard to the biophysical, economic and social considerations, including ecologically sustainable development and cumulative impacts.	Section 15.6 Biophysical, social and economic impacts (including cumulative effects) discussed in section 15.6.3 and ecologically sustainable development discussed in section 15.6.4.

SEARs	EIS section where requirement addressed
vii. a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS.	Section 15.4

15.2 Project summary

This section summarises the key elements of the project which are described in full in Chapter 4.

15.2.1 Project overview

Western Sydney is growing and wastewater services are needed by 2025 to enable population growth and economic development of the Western Sydney Aerotropolis Growth Area (WSAGA), South West Growth Area (SWGA) and the new Western Sydney International Airport. Sydney Water's wastewater servicing area for this catchment is known as the Upper South Creek Servicing Area. It includes already established suburbs such as Oran Park and Leppington, and the new precincts of Bradfield and the Northern Gateway.

Sydney Water is proposing to build and operate a project to provide wastewater services to this area as shown in Figure 15-1. The project will comprise:

- a new Advanced Water Recycling Centre (AWRC) to collect wastewater from businesses and homes and treat it to produce high-quality treated water, renewable energy and biosolids for beneficial reuse
- a new green space area around the AWRC, adjacent to South Creek and Kemps Creek, to support the ongoing development of a green spine through Western Sydney
- new infrastructure from the AWRC to South Creek, to release excess treated water during significant wet weather events, estimated to occur about 3 – 14 days each year
- a new treated water pipeline from the AWRC to Nepean River at Wallacia Weir, to release high-quality treated water to the river during normal weather conditions
- a new environmental flows pipeline from Wallacia to Warragamba River, to release high-quality treated water to the river just below the Warragamba Dam
- a new brine pipeline from the AWRC connecting into Sydney Water's existing wastewater system to transport brine to the Malabar Wastewater Treatment Plant
- a range of ancillary infrastructure.

The AWRC will be located in Kemps Creek, in the Penrith local government area (LGA). The pipelines cross Penrith, Wollondilly, Liverpool, Fairfield and Canterbury-Bankstown LGAs.

A major opportunity for recovery and supply of bioresources like heat, electricity, gas, carbon dioxide and nutrients can be unlocked by the integration of organic waste processing with wastewater treatment and recycling. This is out of scope for the current project and would be covered in separate approvals. However, the AWRC could provide the foundational element for a circular economy hub.

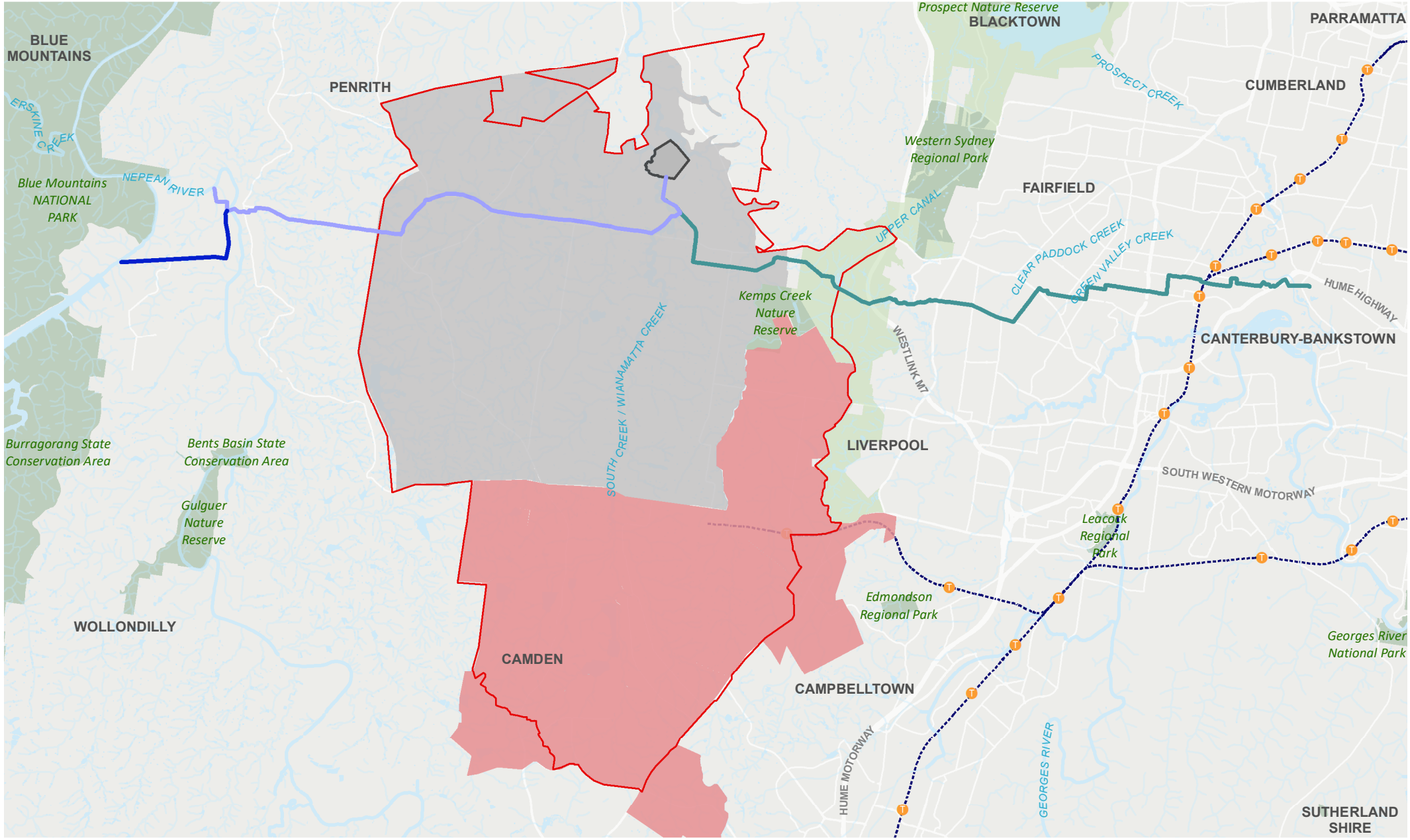

Figure 15-1 Project and servicing area

Source: Aurecon, Sydney Water, LPI, Nearmap, ESRI
Projection: GDA2020 MGA Zone 56

15.2.2 Project staging and timing

Stage 1 of the project includes:

- building and operating the AWRC to treat an average dry weather flow (ADWF) of up to 50 megalitres per day (ML/day)
- building all pipelines to cater for up to 100 ML/day flow at the AWRC (but only operating them to transport and release volumes produced by the Stage 1).

Future stages will only require expansion of the AWRC. Current growth projections suggest the ultimate capacity of the AWRC will need to be up to 100 ML/day. The timing and size of these stages will be established over time to align with growth in the servicing area.

Sydney Water expects to start building the project in mid-2022 and to start operating it in mid-2025.

15.2.3 Project design

AWRC site

The AWRC site is about 78 ha on Lot 211 DP127676, Part of Lot 21 DP 258414 and Part of Lot 104 DP1271336. It includes an operational area and a green space area.

The key project components in the operational area include:

- AWRC which includes buildings, infrastructure and equipment for wastewater treatment
- ancillary infrastructure including pumping stations, administration building, carparking, internal roads, renewable energy generation, onsite detention basins, chemical storage and switchrooms.

The key project components in the green space area include:

- landscaping to develop a green space that enhances biodiversity, uses best practice water sensitive urban design and provides visual screening of the AWRC
- infrastructure to release treated water and stormwater to South Creek.

There is an additional opportunity for this green space to be developed into a publicly accessible recreation area to form part of the Wianamatta-South Creek parkland proposed in the Western Sydney Aerotropolis Plan.

Treated water pipeline

The treated water pipeline is planned to be about 16.7 km long and up to 1.2 m in diameter. The treated water pipeline will transfer treated water from the transfer pumping station at the AWRC, to the release point at Nepean River, upstream of Wallacia Weir. The treated water pipeline also includes a release structure to Nepean River.

Environmental flows pipeline

The environmental flows pipeline is planned to be about 4.5 km long and up to one metre in diameter. It will transfer advanced treated water from the treated water pipeline to Warragamba River, downstream of Warragamba Dam. It also includes a flow splitter to divert water from the treated water pipeline and a release structure to Warragamba River. This presents an opportunity for the project to contribute to the NSW Government's plan for a new environmental flows regime from Warragamba Dam. Sydney Water is exploring with Department of Planning, Industry and Environment (DPIE) if the project can contribute to this new environmental flows regime by releasing treated water to Nepean River at Wallacia Weir, and avoiding the significant cost of building the environmental flows pipeline.

Brine pipeline

The brine pipeline will be about 24 km long and about 0.6 m in diameter. The advanced treatment process at the AWRC will produce a brine waste product, which will be transferred from the AWRC to the existing Malabar wastewater system at Lansdowne.

All pipelines will be built underground and include a range of ancillary infrastructure such as valves.

15.2.4 Project operation

AWRC

The AWRC will produce treated water at three different quality levels:

1. Advanced (very high-quality) treated water.
2. Tertiary (high-quality) treated water.
3. Wet weather quality (lowest level of treatment – primary treatment).

During normal dry weather operating conditions, all advanced treated water up to 1.3 times ADWF will be released to Warragamba River or Nepean River. Beyond 1.3 times AWDF, the AWRC will be operating under wet weather flows scenarios which include:

- During flows up to 1.7 times ADWF, treated water will be released to Nepean River via the treated water pipeline. This treated water will be a combination of advanced and tertiary treated water, with a minimum quality of tertiary treated water.
- Once flows exceed 1.7 times ADWF, advanced treated water will also be released to South Creek via the South Creek release infrastructure. Based on historical climate and Sydney Water treatment plant data, releases to South Creek are expected between 3-14 days per year.
- Once flows exceed three times ADWF, tertiary treated water will be released to Nepean River and a blend of advanced treated water and wet weather quality water will also be released to South Creek.

The AWRC will also provide storage for brine, for situations where the Malabar wastewater system is at capacity. This will allow discharge of brine to be delayed until capacity is available in the Malabar wastewater system. When brine storage reaches capacity, the advanced treatment process will be temporarily switched off. In this rare case, only wet weather quality water will be released to South Creek.

The treatment process at the AWRC will be typical of a world's best practice wastewater treatment plant, including steps such as screening, grit removal, treatment including advanced treatment processes such as reverse osmosis, disinfection and solids management. It also includes a range of design measures to minimise impacts including odour control, renewable energy generation through co-generation and off-site beneficial reuse of biosolids in accordance with Sydney Water's existing program.

The AWRC will operate 24 hours per day, seven days per week and require up to 10 operational staff.

Treated water and environmental flows pipelines

The default operating regime for the treated water pipeline is for the transfer pump station at the AWRC to pump advanced treated water to Warragamba River via the treated water and environmental flows pipelines.

If the volume is less than 1.3 times ADWF the flow splitter diverts the flow to Warragamba River via the environmental flows pipeline. If the volume of treated water from the AWRC is greater than 1.3 times ADWF (or the environmental flows pipeline is not built) the flow will be to Nepean River via the treated water pipeline. Sydney Water is seeking flexibility in the operating releases if the environmental flows pipeline is built, to establish an approach that aligns with the NSW Government's future environmental flow regime and ensures efficient operation of the pipelines.

Brine pipeline

Brine will be pumped from the transfer pump station at the AWRC to the Malabar wastewater system at Lansdowne. The brine pipeline has been designed as a fully enclosed system with air entry and exit via air valves. There are no discharge points along the pipeline except at the connection to the Malabar wastewater system at Lansdowne. If the brine pipeline needs to be emptied for maintenance, this will be done via scour valves and tankering of the contents offsite, with no releases into the local environment.

15.2.5 Project construction

AWRC

Construction at the AWRC site is likely to take 36 months across the following overlapping phases:

- Phase 1 – site establishment and mobilisation.
- Phase 2 – site earthworks, stockpiling, storage and removal of materials.
- Phase 3 – civil works.

- Phase 4 – AWRC structure construction.
- Phase 5 – mechanical and electrical installation.
- Phase 6 – landscaping works and rehabilitation.
- Phase 7 – commissioning.

Pipelines

Pipelines will be primarily built using open trenching. The typical construction corridor width for open trench construction is 15 m – 30 m. Generally, a narrower corridor is adopted when constraints like vegetation or water bodies are present. Where there are no constraints, a wider corridor is adopted, allowing room for movement of machinery, people and construction materials.

Tunnelling methods will be used along some sections of the pipelines including for crossing rail lines, and some roads and waterways.

There are five main phases of pipeline construction:

- Phase 1 – site establishment and mobilisation, installation of environmental controls, eg erosion and sediment control.
- Phase 2 – site earthworks, including excavation for trenches and launch and receival pits for trenchless pipe sections.
- Phase 3 – installation of pipe bedding material and pipeline, as well as backfilling of trench. Civil works such as pipeline and ancillary infrastructure will also be installed during this stage.
- Phase 4 – commissioning.
- Phase 5 – landscaping works and rehabilitation.

Construction of the pipelines will likely occur in several locations at one time, rather than moving progressively from one end to the other, and each location is likely to be in a different phase at different times. The construction program will be established by the construction contractor(s) during detailed design and construction planning.

Construction of pipelines is likely to occur over the entire 36-month construction phase, starting from mid-2022. Open trench construction will progress at a rate of about 12 m – 24 m per day and have a duration of between eight to 10 weeks in any given area. Tunnelling construction will have a duration of between one to six months depending on the location and depth of bore.

Construction and commissioning across the project

Some site investigations and early works will be required before the main construction work begins. These works are generally low impact activities relating to preparing the work sites, gathering additional information and installing some environmental controls.

Building the project requires an extensive range of heavy construction equipment including excavators, cranes, graders, dozers, front-end loaders, trucks, light vehicles, and smaller construction equipment such as hand tools. It will also require a range of materials including concrete, steel, pipes, frames, cladding, bitumen, sand, gravel, gyprock and mortar. The project will produce a range of wastes, including excess spoil.

The number of construction staff will depend on the schedule of works and construction program which will be developed during the detailed design and construction planning phase of the project. It is likely multiple crews will be working at various places along the pipeline at the same time. The pipelines will have about 200 construction staff and the AWRC about 200 construction staff at any given time during construction. This number will fluctuate across the construction program and represents peak construction. These workers generate traffic movements travelling to and from work. Vehicle movements are also generated by heavy vehicles to move equipment, waste and spoil.

The project will also require construction compounds to store equipment and materials and provide site office facilities and parking for construction staff. They will be required throughout the construction phase of the project at several locations close to the project.

Sydney Water has identified 15 compounds in the EIS. Sydney Water may not need all compounds that are proposed, or alternative locations may be required. Depending on the type of compound, they will be required for different lengths of time during construction. In general, main compounds will be required for the entire 36-month construction duration, and smaller satellite and tunnelling compounds will be required for about 3-12 months.

Where reasonable and feasible, construction will be carried out during standard working hours as defined by the Interim Construction Noise Guidelines (DECC, 2009). Due to the size and duration of the project, out of hours work will be required for certain locations and activities of the project. These include:

- delivery of oversized plant or structures that police or other authorities determine to require special arrangements to transport along public roads
- trenched pipeline construction along busy roads, such as along the brine pipeline alignment, to minimise traffic impacts
- works that cannot be completed within the standard respite periods for engineering reasons. This includes large trenchless pipeline construction sections such as tunnelling for the environmental flows pipeline which might require 24 hours drilling for three to six months.

Commissioning is the process of managing all activities required to verify and document the compliance, performance, functionality and transitioning to operation of new assets. It is required for all project components, including AWRC treatment process trains, pump stations, electrical, control elements and pipelines. Commissioning will occur throughout construction, as sections of pipelines and components of the AWRC are installed. After commissioning, there will likely be a proving period as the operational arrangement of the treatment processes is optimised. During this proving period, treated water and brine quality is likely to be variable which will require flexibility in the Environment Protection Licence water quality release limits.

The AWRC and pipelines are unlikely to be decommissioned, as this is not Sydney Water's usual practice for this type of infrastructure. Instead, infrastructure will be repaired and upgraded throughout its design life to maintain its operation.

15.3 Project uncertainties

Chapter 4 describes in detail the flexibility sought in the approval to manage project elements that are uncertain. Table 15-2 summarises the key project uncertainties relevant to the planning approval and how Sydney Water plans to resolve them. These uncertainties have arisen for the following reasons:

- The project assessed in the EIS is based on a reference design and will be refined and changed during a more detailed design process by Sydney Water's construction contractor(s).
- Project sizing and staging is influenced by external factors such as whether population projections occur as expected. These factors often evolve over time.
- Some aspects of the project are influenced by key cross-government decisions for which planning is still underway at the time of writing the EIS. These include WSAGA and metropolitan water planning.

Table 15-2 Project uncertainties and how they will be resolved

Project uncertainties	How Sydney Water will resolve
Treatment technology or equipment at the AWRC site	During detailed design
Location, layout and structure sizes of the AWRC and its ancillary infrastructure within the operational area	During detailed design
Location and design of retention and detention basins	During detailed design
Urban design and landscaping at the AWRC site	During detailed design for urban design. During landscaping design in construction phase.
Location and design of the release infrastructure to South Creek	During detailed design
Location and size of pipelines provided they are located within the impact assessment area	During detailed design
Location of environmental flows pipeline tunnelling alignment	During detailed design and construction planning
Location of ancillary infrastructure on pipelines	During detailed design
Proportion of renewable energy generated between solar and cogeneration	During detailed design
Treated water quality during commissioning and early stages of operation	During commissioning planning in construction phase
Ancillary construction compound locations and layout	During detailed design and construction planning

Project uncertainties	How Sydney Water will resolve
Access tracks to pipelines	During detailed design, prior to and during construction
Timing for construction and installation for some Stage 1 components	During detailed design, prior to and during construction and operation
Pipeline construction methodology	During detailed design, prior to and during construction
Location of construction activities in the impact area or impact assessment area	During detailed design, prior to and during construction
Locations and timings in which out of hours works are required	During detailed design, prior to and during construction
Release location of water from AWRC and pipeline commissioning	During detailed design, during construction and commissioning
Size of Stage 1 and future stages of the AWRC, provided Stage 1 is 50 ML/day or less and future stages do not exceed 100 ML/day	During detailed design and operation
Incremental operating capacity of Stage 1	During detailed design and operation
Delivery of the environmental flows pipeline - to build it later than other Stage 1 components and/or to align with NSW Government decisions on whether it is required	During detailed design and operation, in consultation with DPIE

15.4 Project impacts and management measures

Sydney Water has avoided and minimised a range of environmental impacts through project design, as outlined in Chapter 3.

Section 15.3 summarises the project's residual impacts and the measures Sydney Water will implement to manage them. The measures apply in one or more of the following project phases:

- Detailed design – these are typically measures that are relevant as the project is being designed. Detailed design primarily occurs prior to construction but may also continue for some components while construction is underway.
- Prior to construction – these are typically measures that will be established before starting construction of relevant project components.
- During construction – these are measures that will be applied while the project is being built.
- Post-construction and commissioning – these are measures that occur once construction has finished, either to close out construction activities or as part of commissioning the project components once they are built.

- During operation – these are measures that occur after the project has been commissioned and either temporarily or on an ongoing basis during operation.
- Ongoing – these are measures that are not linked to a specific project phase and will occur as needed throughout the project's life cycle.

These project phases are likely to overlap as different components of the project are delivered at different times. Where a measure applies to more than one project phase, this is noted in the table. This may occur, for example, where a measure is established prior to construction then implemented during construction.

Sydney Water also proposes a range of waterway monitoring, which is outlined in Table 15-3.

Table 15-3 Project impacts and management measures

Reference	Impact	Management measure	Timing
General			
G01	Environmental management during construction	Prepare and implement a Construction Environmental Management Plan (CEMP) consistent with *Environmental Management Plan Guideline – Guideline for Infrastructure Projects* (DPIE, 2020). The CEMP will include construction environmental management measures outlined in this table and may be divided into sub-plans. The CEMP must be endorsed by Sydney Water's environmental representative and approved by Sydney Water's project manager before construction activities commence. Induct all project staff and contractors into the CEMP requirements before they start site work on the project.	Prior to construction During construction
G02	Environmental management during operation	Operate the project in accordance with Sydney Water's existing management systems (or equivalent contractor management systems), including: • Asset Management System (ISO 55001) • Quality Management System (ISO 9001) • Health and Safety Management System (AS/NZ 4801) • Environmental Management System (ISO 14001) Incorporate any ongoing operational measures from this table into the relevant existing management system.	During operation
G03	Environmental management during early works	Prepare and implement an environmental work method statement(s) for low-impact early works. The work method statement must be endorsed by Sydney Water's environmental representative and approved by Sydney Water's project manager before early works commence.	Prior to construction

Reference	Impact	Management measure	Timing
G04	Environmental management during commissioning	Incorporate commissioning-related environmental management measures from this table into the project's commissioning management plan.	Post-construction and commissioning
G05	Environmental restoration of construction impacts	Develop and implement a Rehabilitation Management Plan to restore pipeline work sites as soon as possible to pre-existing condition or as otherwise agreed with relevant landowner or council. This plan will also include the following: • Removing all equipment, materials and environmental controls from site. • Where like for like re-vegetation is not possible (for example to minimise risk to pipelines from tree roots), consider vegetation suited to the infrastructure requirements and environmental conditions. • Where street trees cannot be replaced like for like, consider other opportunities to reduce impacts to streetscape character and visual amenity. • Return disturbed areas to preconstruction ground level where practical. • Rehabilitate areas of native vegetation removal to the highest ecological condition possible. • In areas of native vegetation removal, reuse felled vegetation (logs and tree-hollows) and other habitat features such as rocks/boulders to increase the habitat values. • In areas of native vegetation removal, use locally sourced (local provenance) seed stock only. All species installed are to be locally indigenous and suitable and characteristic of the surrounding Plant Community Types (PCTs). • Where possible reuse stockpiled vegetation as part of rehabilitation works. • Where open trenching of waterways is required, enhance aquatic habitat and restore creeks to an improved state.	Post-construction and commissioning

Reference	Impact	Management measure	Timing
G06	Environmental management during construction	Develop and implement construction site layout plans as part of the project's CEMP. Development of the plans should consider the following as a minimum: • For any locations with potential for flooding impacts (eg waterway crossings, compounds C1, C2, C3, C4, C8, C9, C14): • determining the existing flood risk at each location • locating stockpiles and equipment storage areas away from drainage pathways, and where possible in elevated positions or at alternative sites • locating site buildings outside the 1% AEP flood extent, where possible. If not possible, allow for flood waters to pass underneath buildings • maximise the offset distance between noisy plant and adjacent sensitive receivers, including directing noise-emitting plant away from sensitive receivers • show locations of waste storage and stockpiles of materials within each of the construction compounds (including contingency for unexpected volumes and longer-term storage of waste such as excess spoil if commercial arrangements for reuse or disposal are delayed).	Detailed design Prior to construction During construction
G07	Risk of brine pipeline failure	Undertake a detailed risk assessment of pipeline failures. If any further management measures are identified, incorporate these into the design or into the standard operating procedure for the pipelines as relevant.	Detailed design
G08	Inadequate communication and consultation during design and construction	Develop and implement a Community and Stakeholder Engagement Plan (CSEP) that will outline the following engagement activities: • ongoing consultation with landowners, stakeholders, local councils, businesses and other government agencies • notifications of construction impacts to impacted communities and how these will be managed, including significantly impacted residents near long-term compounds and pipeline tunnelling locations	Detailed design Prior to construction During construction

Reference	Impact	Management measure	Timing
		• regular project updates to nearby communities, including information on positive impacts and long-term project benefits • processes for community complaints and response management system • a dedicated 1800 toll free number for enquiries • a dedicated email address and website for the project • resident notifications regarding: – start of construction – significant milestones – major detours, traffic disruptions and controls – after hours work • communication of key messages in a range of languages to reflect diversity of the community • vehicle management signs to communicate traffic changes to road users and communicate traffic management plans. The CSEP will also outline the scope of ongoing community and stakeholder engagement that is appropriate and required when construction is completed.	

Reference	Impact	Management measure	Timing
G09	Customer complaints during construction	Develop and implement a Complaints Management Record that will document the following information for each complaint and record it in Sydney Water's customer relationship systems: • date and time complaint received • type of communication (letter/email/phone call) • name, address and contact number of the complainant • nature of the complaint • action taken in response (including follow up with the complainant) • details on whether a resolution was reached • details on whether mediation was required/used • monitoring to confirm the complaint was resolved.	During construction
G10	Impacts to utilities	Continue to consult and coordinate with other major projects and utility providers that may be impacted during construction, or where cumulative impacts may occur.	Prior to construction During construction
G11	Work commencing without required legislative approvals	Obtain all relevant approvals required under legislation as outlined in Chapter 5.	Prior to construction During construction
Strategic context			
SC01	Impact of land use zoning and population growth on project staging	Consult with DPIE, government departments, local councils, developers and landowners about the progress of development and land use zoning in the Upper South Creek servicing area to inform ongoing growth sensitivity analysis, project sizing and staging.	Ongoing

Reference	Impact	Management measure	Timing
SC02	Impact of government water strategy and planning on decision to build environmental flows pipeline	Consult with DPIE (Water) on the details of the optimal treated water release location and approach and how this can be incorporated into the Greater Sydney Water Strategy and water sharing plans. This will inform Sydney Water's decision about whether to build the environmental flows pipeline.	Detailed design
SC03	Impacts on Western Sydney Parklands	Consult with Greater Sydney Parklands to ensure impacts on the parkland and rehabilitation of disturbed areas are appropriately managed, to coordinate any interactions between project infrastructure and future recreation or other facilities proposed in the Cecil Park precinct or as part of the Southern Parklands Framework.	Detailed design During construction
Urban design			
UD01	Visual impact of AWRC site structures and parkland area	Prepare an Urban Design and Landscaping Plan for the AWRC site aligning with the themes and principles outlined in Table 4-4 and consider the opportunities identified in Table 4-4 as the urban design progresses. This plan will also: • address constraints associated with bushfire, flooding, and airport safeguarding • incorporate vegetation management that considers the principles of Guidelines for Vegetation Management Plans on Waterfront Land (NSW Office of Water, 2012) and the Western Sydney Aerotropolis Riparian Revegetation Strategy (once finalised) • include architectural design to soften the industrial aesthetic. • consider integrating the heritage character of the site with the treatment and finishes of the new design.	Detailed design

Reference	Impact	Management measure	Timing
UD02	Alignment of AWRC site urban design with NSW government aspiration for South Creek green spine	Consult with the DPIE teams responsible for place management and green spaces in preparing the Urban Design and Landscaping Plan to ensure the project aligns with the NSW government's vision for the green spine along South Creek.	Detailed design
Waterways			
WW01	Impacts on geomorphology from construction in waterways (general)	Design and implement construction methodologies for works in waterways to appropriately manage site-specific geomorphic conditions in each waterway (for example dispersive soils in South Creek), seeking inputs from a qualified geomorphologist where needed.	Detailed design During construction
WW02	Instream works temporarily change the flow of water resulting in erosion and changes to hydraulic conditions and the geomorphology of a waterway	• Minimise the duration of instream works and where practical, conduct instream work during periods of low flow. • Minimise the 'wet area' impacted during the installation of trenched crossings.	During construction

Reference	Impact	Management measure	Timing
WW03	Use of equipment and machinery in waterways reduces bank and bed stability and leads to resuspension of sediment	Whenever possible: • operate equipment on land or from a floating barge to minimise disturbance to the banks and bed of the water body • use temporary crossing structures or other practices to cross watercourses with steep and/or highly erodible banks and beds. • limit machinery fording of the watercourse to a one-time event (ie over and back).	During construction
WW04	Clearing of riparian vegetation and excavation activities within and adjacent to waterways causes erosion and sedimentation of waterways, impacting downstream geomorphology	Isolate works in waterways using booms, silt curtains or similar to contain suspended sediment.	During construction
WW05	Construction in waterways reduces bed and bank stability and geomorphology of channel is altered by gradient change (slumping)	Undertake the following measures: • Store materials excavated from the trench above the top of bank until the materials can be backfilled into the trench. The top 10 to 50 cm of channel substrate should be stored separately and replaced during backfilling, where practical or material of the same quality should be used. • Restore bed and banks of the watercourse or water body to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient should be restored. Consider principles in relevant	During construction

Reference	Impact	Management measure	Timing
		policy and guidelines including Fish Habitat Conservation and Management (DPI, 2013a) and Why do fish need to cross the road? (Fairfull and Witheridge, 2003).	
WW06	Construction in waterways reduces bed and bank stability	When using an isolated construction method such as a coffer dam, do not remove the isolation method until all works, including backfilling, contouring and stabilisation have taken place.	During construction
WW07	Construction in waterways reduces bank stability	If replacement rock reinforcement or armouring is required to stabilise eroding or exposed areas, ensure that appropriately sized, clean rock is used; and that rock is installed at a similar slope to maintain a uniform bank and natural stream alignment.	Detailed design During construction
WW08	Geomorphology and aquatic ecology impacts of trenchless construction on waterways, including frac-outs and streambed slumping	Determine failure-threshold criteria to indicate when a trenchless crossing method has failed, and construction works will be stopped. Examples of failure-threshold criteria may include: • an in-water frac-out that cannot be contained or mitigated • streambed slumping • schedule delays resulting from unexpected equipment failure or weather.	Detailed design During construction
WW09	Geomorphology impacts of trenchless construction on waterways (general)	Determine an alternative crossing method (eg contingency crossing plan) in the event the trenchless crossing method is not successful.	Detailed design During construction

Reference	Impact	Management measure	Timing
WW10	Tunnelling of waterways reduces bank stability and cause erosion and sedimentation	Locate the entry and exit points back from the channel, beyond the top of bank to allow containment of any sediment or other substances above the top of bank. Restore entry and exit points to pre-construction conditions.	During construction
WW11	Removal of riparian vegetation reduces bank stability at Warragamba River release	Consider riparian planting and natural bank stabilisation measures in the detailed design phase.	Detailed design
WW12	Release of treated water causes erosion of the bank or bed of Warragamba River	Ensure that the erosion control extends sufficiently into the river. Confirm the existing substrate prior to construction to determine the likelihood of erosion as well as the scale of time over which erosion can be expected to occur. If non-cohesive substrate or easily eroded substrate is identified, instream works may be required for protection of the riverbed.	Detailed design
WW13	Impacts to bank stability from construction and operation of release structures	Implement subsurface drainage controls, where appropriate, to maintain groundwater and surface water interactions and to maintain the stability of any reclaimed land. The type and location of subsurface drainage controls should be determined through onsite investigation with considerations for: subsurface flow potential, erodibility of backfill materials, and degree of slope.	Detailed design During construction
WW14	Impacts to aquatic ecology and fish passage	Design and install coffer dams and temporary in-stream structures associated with open trenching in accordance with the Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013a).	Detailed design During construction

Reference	Impact	Management measure	Timing
WW15	Aquatic ecology impacts of trenched construction on waterways from flow modification and erosion and sedimentation	Temporary in-stream structures should be installed during low-flow periods, and measures established in the CEMP about how high flow events will be managed to limit erosion of the structures and associated sedimentation of downstream waterways.	Detailed design During construction
WW16	Aquatic ecology impacts of trenched construction on waterways, including impacts to fish and water quality	For dewatering of temporary in-stream structures: • notify NSW DPI seven days prior to any dewatering activities in order to organise potential fish rescue activities. A separate s.37 permit may be required from NSW DPI to relocate fish. • pump water a minimum of 30 m away from the waterway so it preferentially does not re-enter the waterway. If water is to re-enter the waterway, ANZECC water quality guidelines (or Wianamatta -South Creek Water Quality Objectives) the waterway objectives need to be adhered to.	During construction
WW17	Impacts on fish migration	Where practical, open trenching of waterways, particularly Kemps Creek and South Creek are to be avoided between late April and early June, and late October to late December, to minimise disruption of downstream and upstream Australian Bass migration.	During construction
WW18	Disturbance to vegetated riparian zone impacts at AWRC site	Establish a vegetated riparian zone (VRZ) on the AWRC site (40 m from South Creek and wetland areas and 30 m from Kemps Creek) and apply an offset where operational areas of the AWRC encroach on this, in accordance with the principles of Guideline for Controlled Activities on Waterfront Land (NSW Office of Water, 2012).	Post construction

Reference	Impact	Management measure	Timing
WW19	Aquatic ecology impacts of outlet structures (South Creek, Nepean River, Warragamba River)	Design release structures considering the principles in Guidelines for Outlet Structures on Waterfront Land (NSW Office of Water, 2012).	During detailed design
WW20	Mixing of waterway releases	Consider opportunities, where practical, to improve mixing and dilution of releases (for example investigating options for submerging release structures). The feasibility/acceptance of alternative options would need to be assessed against a number of key considerations including (but not limited to) engineering requirements, operations and maintenance risk, geomorphology and energy dissipation requirements.	During detailed design
WW21	Impacts on South Creek from wet weather releases during low flows	Investigate whether there are any scenarios where treated water releases to South Creek could occur when creek flows are low and still increasing in response to rainfall. If necessary and where feasible, identify opportunities to minimise releases while flows are still increasing in South Creek.	Detailed design
	Geomorphology impacts of building release structures	This impact is appropriately managed by other measures in this 'Waterways' section of the table, including WW01-7.	Detailed design During construction
	Erosion and sedimentation of waterways	This impact is appropriately managed by measures in the 'Surface water' section of this table.	Prior to construction During construction
	Spoil transport from stockpiles into waterways	This impact is appropriately managed by measures in the 'Surface water' section of this table.	During construction

Reference	Impact	Management measure	Timing
	Geomorphology and aquatic ecology impacts of trenchless construction on waterways associated with groundwater interaction	This impact is appropriately managed by measures in the 'Surface water' section of this table.	Detailed design
Terrestrial biodiversity			
TB01	Biodiversity impacts	Prepare and implement a Biodiversity Management Plan as part of the project's CEMP. The plan will include: • identification of no go zones and physical delineation of vegetation to be cleared and/or protected on site, including installation of appropriate signage prior to works commencing • construction phase terrestrial biodiversity measures from this table • roles and responsibilities • monitoring and auditing requirements • measures to prevent the spread of weeds, pathogens and to manage biosecurity.	Prior to construction During construction
TB02	Removal of native vegetation and fauna habitats, including threatened species	Vegetation trimming or removal is not to proceed without written authorisation from the Sydney Water Project Manager or delegate.	Prior to construction During construction

Reference	Impact	Management measure	Timing
TB03	Removal of native vegetation and fauna habitats, including threatened species	Minimise vegetation clearance and disturbance, including impacts to standing dead trees and riparian zones. Where possible, limit clearing to trimming rather than the removal of whole plants.	Prior to construction During construction
TB04	Removal of native vegetation and fauna habitats, including threatened species	Adjust construction methodology (for example avoid area, hand excavate, implement exclusion fencing) to protect sensitive areas where possible (such as mature trees, known threatened species, populations or ecological communities).	Prior to construction During construction
TB05	Removal of native vegetation and fauna habitats, including threatened species	Protect trees in accordance with the requirements of Australian Standard 4970-2009 for the Protection of Trees on Development Sites. Engage a qualified arborist where roots >50mm are impacted within the Tree Protection Zone.	Prior to construction During construction
TB06	Impacts to fauna	Engage qualified ecologists to undertake pre-clearance inspections (including fauna relocation) of vegetation for potential fauna prior to clearing or trimming, including the banks of larger watercourses to be impacted.	Prior to construction During construction
TB07	Impacts to fauna - microbats	Where practicable do not undertake works that impact directly on potential microbat habitat at Warragamba River during breeding season (November to February).	During construction
TB08	Impact to vegetation outside impact area	If any damage occurs to vegetation outside of the impact area stop work in that area and notify the Sydney Water Project Manager or delegate.	During construction

Reference	Impact	Management measure	Timing
TB09	Impacts on the habitat of threatened species associated with human made structures at the Warragamba environmental flows release structure.	Install passive roost exclusion measures over the vertical shaft as follows: • Install during either spring (March to May) or autumn (September to October). • Undertake repeated stag watching surveys prior to installation of exclusion measures to confirm the presence of microbats within the habitat, and to determine when all bats have left the potential roost. • Once all bats have exited the habitat, install a permanent cap over the opening of the shaft using material such as spray polyurethane foam or foam concrete seals (used for capping mine shafts / adits). • Undertake repeat stag watching post installation of the exclusion measures to confirm the successful exclusion of microbats.	Prior to construction
TB10	Residual impacts to biodiversity	Prepare a Biodiversity Offset Strategy in accordance with the NSW Biodiversity Offset Scheme to address the species and ecosystem credit requirements outlined in section 9.1.10.	Prior to construction
	Inadvertent impacts on grey-headed flying fox habitat or vegetation near the environmental flows release structure	This impact is appropriately managed by measures in the 'Noise and vibration' and 'Landscape character and visual' sections of this table.	Prior to construction During construction

Reference	Impact	Management measure	Timing
Surface water			
SW01	Construction surface water impacts	Prepare and implement a Soil and Water Management Plan as part of the project's CEMP. The plan will include: • construction phase surface water, groundwater, contaminated land and soils and waterways management measures from this table • roles and responsibilities • monitoring and auditing requirements	Detailed design During construction
SW02	Increased runoff, reduced infiltration and pollutant loading to South Creek, including exacerbated downstream flooding conditions	Design, install and maintain stormwater management measures on the AWRC site (including a range of Water Sensitive Urban Design measures) to ensure: • operational releases to South Creek achieve water quality and flow objectives (Western Sydney Planning Partnership, 2020) for South Creek and pollution load reduction targets in Penrith City Council DCP (2014) • operational efficiency of installed measures • post-development peak flows do not exceed pre-development peak flows for the 50%, 5% and 1% AEP storm events.	Detailed design During construction During operation
SW03	Increased runoff may exacerbate flooding conditions in South Creek downstream of AWRC	Progressively construct operational stormwater management measures for potential use and contribution to stormwater management during construction, if practical.	Detailed design During construction

Reference	Impact	Management measure	Timing
SW04	Excessive irrigation of the green space area on AWRC site may lead to localised increases in saline groundwater levels and saturated saline soils	Develop and implement an irrigation procedure that as a minimum: • identifies an irrigation rate that considers the local deficit between rainfall and evapotranspiration identified in the Surface Water Impact Assessment (Aurecon Arup 2021) to avoid salinisation • avoids watering areas without vegetation cover • is tailored to address the ultimate landscape and site design.	Detailed design During operation
SW05	Sediment laden and contaminated surface runoff, including releases from sedimentation basins, entering waterways	Implement and maintain sediment and erosion control measures and install sedimentation basins in appropriate locations considering the guidance in Managing Urban Stormwater, Soils and Construction Volume 1, 4th Edition (Landcom, 2004). Management measures will be developed considering the guidance provided in the project's Surface Water Impact Assessment (Aurecon, Arup, 2021d).	Prior to construction During construction
SW06	Spills of chemicals, fuels and partially treated wastewater on the AWRC site mean contaminants may enter waterways	Store chemicals, fuels and oils in bunded areas on the AWRC site.	During operation

Reference	Impact	Management measure	Timing
SW07	Spills of chemicals, fuels and partially treated wastewater on the site mean contaminants may enter waterways	Develop and implement the following as part of the CEMP: • spill response procedure in accordance with Australian Spill Control Industry Standard for Spill Response Kits (ASCIS 2695) • vehicle, plant and equipment maintenance and refuelling procedure.	During construction
	Discharges occurring via scour valves to waterways	This impact is appropriately managed by measure G02 in this table.	During operation
	Stockpiles and excavations with acid sulfate soils (ASS)	This impact is appropriately managed by measures in the 'Surface water' and 'Contaminated land and soils' sections of this table and applies to compound C14 and brine pipeline construction near Georges River and Prospect Creek.	During construction
	Saline groundwater encountered during excavation may enter surface water	This impact is appropriately managed by measures in the 'Groundwater' section of this table.	During construction
	Contaminated waste material entering waterways	This impact is appropriately managed by measures in the 'Waste management' section of this table.	During construction

Reference	Impact	Management measure	Timing
	Water required for construction activities such as dust suppression may impact local or regional water resources	This impact is appropriately managed by other measures in the 'Surface water' section of this table.	During construction
	Overtopping of coffer dams during higher river flow events may mobilise sediments	This impact is appropriately managed by measures in the 'Waterways' section of this table.	During construction
	Drilling fluid escaping to the surface enters surface water runoff	This impact is appropriately managed by measures in the 'Groundwater' section of this table.	During construction
	Disruption of surface water connectivity where waterway crossings constructed by tunnelling	This impact is appropriately managed by measures in the 'Groundwater' section of this table.	During construction

Reference	Impact	Management measure	Timing
	Vegetation removal on or near watercourses may cause bank damage and expose soil surfaces	This impact is appropriately managed by measures in the 'Terrestrial biodiversity' and 'Waterways' sections of this table.	During construction
	Temporary obstruction and interference of normal drainage channels during trenching causing upstream ponding and sedimentation	This impact is appropriately managed by measures in the 'Waterways' section of this table.	During construction
	Water leaking from the pipelines during operation	This impact is appropriately managed by measure G02 in this table.	During operation
Flooding			
FL01	Working on or near flood-prone land	Develop and implement a construction and operational flood preparedness procedure in consultation with NSW SES, Wollondilly Shire Council and Penrith City Council and in accordance with the Flood Impact study in Appendix L. As a minimum, this will include: • monitoring procedures for rainfall and flood warnings (Flood Watch, Early Warning Network)	Prior to construction During construction During operation

Reference	Impact	Management measure	Timing
		• actions to be completed prior, during and post flood events • identifying evacuation routes, rescue procedures and steps to resume normal operations. • reporting requirements and corrective actions	
	Construction activities near waterways have potential to change local flooding conditions	This impact is appropriately managed by measure G06 in this table.	Prior to construction During construction
	Coffer dams and flow barriers at Warragamba River and Nepean River have potential to change flooding conditions.	This impact is appropriately managed by measure G06 and the 'Waterways' section in this table.	During construction
Groundwater			
GW01	Drawdown of groundwater from dewatering activities - general	Identify appropriate trench/shaft support systems (for example sheet piling) in areas with higher hydraulic conductivity and storage properties to minimise groundwater drawdown. This includes all areas mapped as Quarternary alluvial sediments/deposits (Mid-Nepean hydrogeological landscape (HGL), Mulgoa HGL, Upper South Creek HGL, Upper South Creek (Variant A) HGL and Moorebank HGL).	Detailed design During construction

Reference	Impact	Management measure	Timing
GW02	Drawdown of groundwater - AWRC	Monitor baseline groundwater levels at the AWRC site and levels in South Creek, by: • installing two additional groundwater monitoring wells mid-way between the South Creek and the north western boundary of the site. These will be a shallow and a deep well targeting the upper alluvial aquifer and the residual soil profile. • installing a level gauge at South Creek. Continuous loggers will be installed to monitor water levels. Results will be used to establish baseline conditions, verify the existing surface water and groundwater connectivity and assist in developing a risk-based approach to managing groundwater impacts at the site.	Prior to construction During construction
GW03	Drawdown of groundwater and impact to South Creek - AWRC	Develop a risk-based approach to managing drawdowns and impacts to South Creek during construction at the AWRC. This approach should include: • Monitoring the difference in elevation between South Creek and groundwater levels. • Identify trigger values and associated management measures to take should groundwater levels fall below the water level in South Creek. Management measures should be commensurate with the potential risk of impact to South Creek and nearby GDEs.	Prior to construction During construction
GW04	Drawdown of groundwater from tunnelling construction	Determine the most appropriate trenchless construction techniques to minimise groundwater drawdown, for example 'key' the launch and reception shafts into underlying material with relatively low permeability (eg competent bedrock) to reduce the amount of groundwater entering through the floor and inadvertently scouring the stream bed to the depth of the pipe.	Detailed design

Reference	Impact	Management measure	Timing
GW05	Increased hydraulic connection between aquifers	Develop options to minimise the potential of increased hydraulic connection between aquifers during pipeline trenching. This will include consideration of the following: • Installation of permanent vertical cut-offs within the trench to prevent the lateral migration of groundwater along the alignment of the pipelines. • Horizontal trench cut-offs where perched aquifers are encountered, to prevent lateral migration and dewatering of the system. Maintenance of the perched layers may also be achieved through backfilling to prevent vertical migration.	Detailed design
GW06	Mobilisation and migration of saline or contaminated groundwater	Adopt a staged approach to dewatering by dewatering in discrete, smaller areas that align with the construction schedule.	During construction
GW07	Mobilisation and migration of saline or contaminated groundwater	Construct adjacent recharge trenches to maintain saturation in high risk areas. If the extent of the drawdown is likely to include an area with existing contamination, consider constructing recharge trenches to limit the cone of depression and create a hydraulic barrier that could prevent the migration of contaminants.	During construction
GW08	Disposal of saline or contaminated groundwater. Disposal of contaminated hydrostatic test water.	Develop and implement a dewatering procedure that identifies how extracted groundwater will be managed. Including requirements for storage, transport, testing and disposal. Disposal options to be considered include: • discharge to land • discharge to stormwater or waterway in accordance with Sydney Water's Water Quality Management During Operational Activities (D0001667) • discharge to the wastewater system in accordance with Sydney Water discharge criteria	Prior to construction During construction

Reference	Impact	Management measure	Timing
		• tanker by a licensed waste contractor and dispose off-site to an appropriately licensed facility.	
GW09	Frac-outs and groundwater seepage during tunnelling construction	Undertake a risk assessment at trenchless crossings to determine the likelihood of 'frac-outs' and need for any design changes or additional management measures, including consideration of: • refining the design to intersect more competent rock and avoid any preferential pathways such as fault lines, fractures, unconsolidated material • casing at the entry / exit points where there are unconsolidated materials, reduced ground cover and reduced bearing pressure • the need for and location of drill pressure relief wells to provide a pathway for controlled release of drilling fluid pressures • geotechnical conditions at each tunnelling site and the maximum allowable drilling fluid pressures.	Detailed design
GW10	Frac-outs and groundwater seepage during tunnelling construction	Develop a Drilling Fluid Management procedure to avoid impacts, including: • potential risk for 'frac-outs' at tunnelled crossings • approach to identify and manage frac-outs • contain and monitor drilling fluid at entry/exit points until it can be transported to a licensed waste facility • reuse and/or disposal of drilling fluids by appropriately qualified personnel to a licensed facility • prioritising the use of fluids that reduce the risk of seepage into groundwater from boreholes.	Prior to construction During construction

Reference	Impact	Management measure	Timing
GW11	Tunnelling beneath Warragamba Pipelines and waterways	As part of geotechnical program, investigate: • groundwater levels along tunnelled section of environmental flows pipeline. Identify any additional measures required to prevent groundwater seepage into the Warragamba Pipelines Corridor. • potential surface water - groundwater linkages around watercourses. If needed, consider options to avoid disrupting the connectivity.	Detailed design
GW12	Dewatering and drawdowns during maintenance activities at AWRC site	Consider the inclusion of vertical and horizontal drainage layers and 'chimneys' with coarse filter material to achieve desired drawdowns against the underground structures more quickly and reduce the amount of dewatering required.	Detailed design
GW13	Dewatering and drawdowns during maintenance activities at AWRC site	Adopt a staged approach to dewatering by dewatering in discrete, smaller areas that align more closely to the maintenance schedule.	During operation
Contaminated land and soils			
CLS01	Disturbance of saline soils, acid sulfate soils (ASS), contamination and sodic soils	Develop and implement a soil sampling program to assess excavated soils for salinity, acid sulfate soils (ASS), contamination and sodicity. If identified: • Saline soils will be managed in accordance with NSW Department of Primary Industries (2014) Salinity Training Handbook and NSW guidelines for salinity management. • Develop an ASS management plan (ASSMP) in accordance with the NSW ASSMAC (1998) guidelines and consideration of the Department of Agriculture	Detailed design Prior to construction During construction

Reference	Impact	Management measure	Timing
		and Water Resources '*National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual,* that includes: – identification of ASS locations – handling and storage procedure to avoid and minimise exposure of stockpiles – where stockpiles are exposed, treat exposed areas with lime • Excavation of sodic soils will be avoided if possible. If not possible to avoid excavation, they will not be reused within the project for landscaping or surface rehabilitation Undertake soil sampling investigations in accordance with ASC NEPM (2013), Sampling Design Guidelines (NSW EPA, 1995), Consultants Reporting on Contaminated Land, (NSW EPA, 2020) and Assessment and Management of Hazardous Ground Gases (NSW EPA, 2020).	
CLS02	Demolition of structures that may contain asbestos containing material	Undertake a pre-demolition destructive hazardous material survey of any buildings and structures within the AWRC site to confirm hazardous materials and estimate types and volumes.	Prior to construction During construction
CLS03	Disturbance of contaminated soils during construction	Develop and implement a remedial action plan for AECs, if the soil sampling program or pre-demolition destructive hazardous material survey identifies this is required. Prepare this in accordance with the ASC NEPM (2013) and Consultants Reporting on Contaminated Land, (NSW EPA, 2020).	Prior to construction During construction
CLS04	Disturbance and excavation of unexpected contaminated soils	Develop and implement an unexpected finds procedure that will include: • stop work in area suspected of contamination • inspection and verification of the area by a contaminated lands practitioner • collection of soil samples and analysis for chemicals of potential concern (COPC) identified by the inspection	Prior to construction During construction

Reference	Impact	Management measure	Timing
		• collection of soil samples and analysis for chemicals of potential concern (COPC) identified by the inspection • management, risk assessment or remedial action based on the type, extent, waste implications and significance of the COPC • requirement to notify the NSW EPA under section 60 of the CLM Act • remediation in accordance with remedial action plan	
	Contaminated runoff from the operation of vehicles, machinery, spills and leaks entering waterways	This impact is appropriately managed by measures in the 'Surface water' section of this table.	During construction
	Salt mobilisation in soils from excessive irrigation at the AWRC	This impact is appropriately managed by measures in the 'Surface water' section of this table.	During operation
	Erosion of soils from operational releases	This impact is appropriately managed by measures in the 'Surface water' section of this table.	During operation
	Generation of contaminated waste streams	This impact is appropriately managed by measures in the 'Waste management' section of this table.	

Reference	Impact	Management measure	Timing
	Use of saline groundwater from dewatering operations	This impact is appropriately managed by measures in the 'Groundwater' section of this table...	During construction
	Increased erosion and sedimentation of waterways from vegetation removal	This impact is appropriately managed by measures in the 'Surface water' section of this table.	Prior to construction During construction
Aboriginal heritage			
AH01	Impact to Aboriginal sites / Potential Archaeological Deposits (PADs)	Explore opportunities to avoid or further reduce the identified potential impacts to Aboriginal items where practical.	Detailed design
AH02	Impacts to Aboriginal heritage, including unexpected finds	Develop and implement a Heritage Management Plan as part of the CEMP. This will include: • roles and responsibilities • construction phase Aboriginal heritage and non-Aboriginal heritage measures from this table • an unexpected finds procedure for managing any items of potential Aboriginal archaeological, cultural heritage, or non-Aboriginal heritage significance identified during construction • inducting all construction site staff (before they start work) on known Aboriginal and non-Aboriginal heritage items in the impact area and measures to be implemented during construction to avoid impacts. Inductions will include: – briefing on the heritage sensitivity of the site	Prior to construction During construction

Reference	Impact	Management measure	Timing
		– management measures – guidance on identifying unexpected finds – obligations under the *Heritage Act 1977*.	
AH03	Impact to Aboriginal sites / PADs of moderate Aboriginal heritage significance	Undertake archaeological salvage in accordance with an approved Salvage Excavation Methodology, where ground disturbance is proposed within the following sites: • Baines Creek Wallacia PAD 1 • Bents Basin Road Wallacia PAD 1 • Wallacia Weir PAD 1 • Oaky Creek Elizabeth Drive PAD 1 • Elizabeth Drive/Adams Road AFT 1 • TNR AFT 15 • Elizabeth Drive AFT 1 • Elizabeth Drive AFT 3 • Elizabeth Precinct PAD 03 • Fleurs1 Fleurs Radio Telescope (including duplicate recordings M12 A4 and South Creek East (SCE)) • P-CP7 • P-CP12 • PAD-OS-5 Coordinate this program with non-Aboriginal heritage salvage excavation, in locations where salvage is required for both.	Prior to construction

Reference	Impact	Management measure	Timing
AH04	Impacts to sites with existing AHIPs	Construction activities undertaken in the following sites will be in accordance with the existing AHIP conditions: • GLC1 (including Artefact Scatter PAD 2023-846) • IFSC 7 Cecil Park	During construction
AH05	Unexpected finds – Human skeletal remains	In the event that construction activity reveals possible human skeletal material (remains) an unexpected finds human skeletal remains procedure will be implemented in accordance with the Skeletal Remains – Guidelines for the Management of Human Skeletal Remains under the *Heritage Act 1977* (NSW Heritage Office 1998) and the Aboriginal Cultural Heritage Standards and Guidelines Kit (NPWS 1997).	During construction
Non-Aboriginal heritage			
NAH01	Impacts to built heritage – Cabravale Memorial Park	Establish a 'heritage protection zone' around key features of the Cabravale Memorial Park. This will include: • no-go zones and fencing around the Bandstand, 170mm Minenwerfer and Vietnam War Comradeship memorial • where possible, using existing roads and access tracks. Where this is not possible and driving directly over grassed areas is required, applying surface material to the ground cover to spread loads and prevent destruction of these areas • remediating any damage to the landscape upon completion of the work.	Prior to construction
NAH02	Impacts to built heritage - Upper Canal and Liverpool Offtake Reservoir	Construction activities in proximity to the Upper Canal and Warragamba Pipelines will be undertaken in accordance with WaterNSW 'Guideline for Development Adjacent to the Upper Canal and Warragamba Pipelines'. This will include:	Detailed design Prior to construction

Reference	Impact	Management measure	Timing
		• dilapidation survey prior to any construction work commencing • monitoring of vibration and ground movement during tunnelling construction.	
NAH03	Impacts to built heritage – Fleurs Radio Telescope Site	Prior to the removal of identified historic elements related to the Fleurs Radio Telescope site, photographic archival recording will be undertaken by an experienced heritage consultant and in accordance with the Photographic Recording of Heritage Items using Film or Digital Capture, NSW Heritage Office, 2006.	Prior to construction
NAH04	Impacts to built heritage at AWRC site	Prepare a Heritage Interpretation Framework for the project, incorporating the retention of Aboriginal and non-Aboriginal heritage features at the AWRC site where practical. The framework will include consideration of: • incorporating historic features into the AWRC design • interpretive public art and soundscapes • retention and interpretive use of the two parabolic antennas • creation of a heritage display of historic material in the AWRC • preparation of digital interpretive resources related to the history of the site • preparation of an oral history of the Fleurs Field Station.	Detailed design During operation
NAH05	Impacts to Potential Archaeological Sites (PAS) of moderate to high significance	Manage ground disturbance (excavation) in the following PAS areas of moderate to high significance by: • avoiding disturbance where practical • where disturbance cannot be avoided, complete archaeological testing in accordance with the Archaeological Research Design and Excavation Methodology (ARDEM) in Appendix P • complete archaeological salvage and archival recording where this is recommended in archaeological testing.	Detailed design Prior to construction During construction

Reference	Impact	Management measure	Timing
		The sites of moderate to high significance are: • Blaxland's Farm • Blaxland's Gardens • Blaxland's Crossing • McMaster Field Station • Upper Canal • Lennox Reserve • Lansvale Park Coordinate this program with Aboriginal heritage salvage excavation, in locations where salvage is required for both.	
NAH06	Impacts to PAS of low significance	Manage disturbance in the following PAS areas of low significance through an unexpected finds procedure: • McGarvie-Smith Farm • Exeter House and Farm • Fleurs Radiophysics Field Station.	Detailed design Prior to construction During construction
NAH07	Accidental impact to non-Aboriginal heritage item.	Any accidental damage to heritage items is to be treated as an incident, with appropriate recording and notification.	During construction
	Impact to non-Aboriginal heritage – unexpected finds	This impact is appropriately managed by measures in the 'Aboriginal heritage' section of this table.	Prior to construction

Reference	Impact	Management measure	Timing
	Contractors do not understand heritage obligations	This impact is appropriately managed by measures in the 'Aboriginal heritage' section of this table.	During construction
	Impact to heritage character or landscape from above-ground structures on AWRC site	This impact is appropriately managed by measures in the 'Urban design' section of this table.	Detailed design
Air quality			
AQ01	Operational NO_2 emissions	Cogeneration equipment selection will include consideration of engines with the lowest level of NO_2 generation per unit of energy production as far as practical.	Detailed design
AQ02	Construction dust	Include the following measures in the project's CEMP: • Maintain equipment in good working order to comply with the Clean Air Regulations of the Protection of the Environment Operations Act 1997, having appropriate exhaust pollution controls, and meeting Australian Standards for exhaust emissions. • Water exposed areas using a non-drinking water source, where possible. • Cover exposed areas, where possible (for example with tarpaulins or geotextile fabric). • Modify or cease dust-generating work in windy conditions. • When designing site layout, consider opportunities to maximise distance of dust-generating activities from sensitive receivers.	Prior to construction During construction

Reference	Impact	Management measure	Timing
AQ03	Operational odour emissions	Manage odour complaints in accordance with Sydney Water's existing management system processes.	During operation
Noise and vibration			
NV01	Excessive noise generated during construction	Prepare a Construction Noise and Vibration Management Plan (CNVMP) as part of the project's CEMP. This will include: • roles and responsibilities • noise sensitive receiver locations • construction phase noise and vibration management measures from this table • monitoring methodology • community engagement.	Prior to construction During construction
NV02	Noise during out of hours work (OOHW)	Schedule construction works for standard construction hours, where possible. If it is not possible to restrict the works to the day period, then they are to be completed as early as possible in each work shift. Provide appropriate respite to affected receivers in accordance with the Interim Construction Noise Guideline (ICNG).	During construction
NV03	Equipment selection during construction generates excessive noise	Select equipment to minimise noise emissions. For example: • Select equipment with lower noise emissions than alternative equipment. • Use electric/ hydraulic equipment where possible. • Use the minimum size and power requirement to complete a task.	Prior to construction During construction

Reference	Impact	Management measure	Timing
NV04	Inefficient operation and maintenance of equipment resulting in noise impacts	Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways to minimise noise, including: • Site managers to periodically check the site and nearby residences for noise problems so that solutions can be quickly applied. • Avoid the use of radios or stereos outdoors. • Avoid the overuse of public address systems. • Avoid shouting and minimise talking loudly and slamming vehicle doors. • Turn off all plant and equipment when not in use. • Maintain and monitor equipment to ensure proper and efficient operation. • Aligning with Sydney Water's Noise Management Code of Behaviour (SWEMS0056.01)	During construction
NV05	Inefficient use of construction vehicle reverse beepers	Implement and use non-tonal reversing beepers (or an equivalent mechanism) on all construction vehicles and mobile plant, where possible. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.	During construction
NV06	OOHW results in sleep disturbance of sensitive receivers	Consult with residents that will be impacted by OOHW about measures to manage impacts in accordance with the ICNG, including considering alternative accommodation. This includes residents near long term pipeline tunnelling compounds at Bents Basin Road and Lansvale Park.	Prior to construction During construction
NV07	Vibration from construction equipment results in impacts to structures	Investigate opportunities for using alternatives to vibration generating equipment where vibration impacts have the potential to occur.	Prior to construction During construction

Reference	Impact	Management measure	Timing
NV08	Vibration from construction equipment results in impacts to structures	Undertake in-situ vibration monitoring to confirm vibration levels and assess potential impacts where minimum vibration impact distances cannot be achieved. Where the monitoring identifies exceedances in the relevant criteria, or where impacts are identified, additional management measures will be identified and implemented to appropriately manage impacts.	During construction
NV09	Vibration from construction equipment results in impacts to structures	Complete dilapidation and condition surveys on infrastructure and structures at risk from being damaged by vibration during construction, including heritage items.	Detailed design Prior to construction During construction
NV10	Operation noise impacts	Investigate opportunities to reduce the operational noise from the project, particularly at the AWRC. This will include: • pump selection with reduced noise levels • barriers and enclosures around noisy equipment to comply with AS 2436-2010 • building materials.	Detailed design
	Placement of construction equipment results in noise impacts	This impact is appropriately managed by measure G06 in this table.	Prior to construction
	OOHW truck movements results in noise impacts	This impact is appropriately managed by measures in the 'Traffic and transport' section of this table.	Prior to construction During construction

Reference	Impact	Management measure	Timing
	Significant long-term noise and vibration impacts from pipeline tunnelling	This impact is appropriately managed by measure G08 in this table.	Prior to construction During construction
	Construction traffic on local roads results in noise impacts	This impact is appropriately managed by measures in the 'Traffic and transport' section of this table	Prior to construction During construction
	Cumulative impacts from other major projects	This impact is appropriately managed by measure G10 in this table.	Prior to construction During construction
Landscape character and visual			
LCV01	Visual impact of construction areas	Consider opportunities to install temporary screens/ hoarding with finishes to minimise visibility of construction areas and to minimise noise impacts to surrounding sensitive receivers. As a minimum, install temporary screens at compounds C7 from viewpoint (VP) 12, C6 from VP13, C5 from VP17, C2 from VP18, C3 from VP20, C9 from VP23, C10 from VP25, C13 from VP27, C14 from VP28, C15 from VP29.	Detailed design During construction

Reference	Impact	Management measure	Timing
LCV02	Light pollution impacting sensitive receivers and biodiversity	Ensure lighting for construction night-work and operations is in accordance with AS4282-1997 *Control of the obtrusive effect of outdoor lighting to minimise light spill.* Design and implement lighting at AWRC site to reduce light spill towards residential receptors for VP1-5 and VP7-10 and in accordance with NASF Guideline E – Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports.	Detailed design During construction During operation
	Visual impact of AWRC	This impact is appropriately managed by measure G05 in this table.	During operation
	Visual impact of construction compounds	This impact is appropriately managed by measure G05 in this table.	During construction
	Visual impact of AWRC	This impact is appropriately managed by the 'Urban design' section in this table.	Detailed design
	Visual impact from treated water and brine pipeline from tree removal or inappropriate rehabilitation	This impact is appropriately managed by measures in G05 and the 'Biodiversity' section of this table	During construction
Traffic and transport			
TT01	Traffic related impacts to traffic exceeding the	Prepare Site Specific Construction Traffic Management Plans (SSCTMP) in consultation with relevant local councils, impacted residents and businesses, TfNSW and in accordance with relevant guidelines and the Framework	Detailed design Prior to construction

Reference	Impact	Management measure	Timing
	estimated capacity on certain links	Construction Traffic Management Plan (CTMP) (Appendix U). Each SSCTMP will outline: • staging and timing of construction for each area of the project • any changes to traffic conditions, including road closures or diversions • identification of haulage routes • safe alternative routes for pedestrians, cyclists and other active transport in accordance with relevant safety standards • parking arrangements for construction workers • construction access points • measures to minimise impacts on public transport network, including bus stops • opportunities to reduce road traffic noise, including restricting heavy vehicle movements to standard construction hours • measures to minimise impacts to businesses • measures to outline construction interface management with the M12 Motorway project. In addition to the above, SSCTMP will include: • Signage at key locations across the local influence area including Wallacia, and Luddenham to ensure the visitor experience is made as clear and easy as possible. Signage mitigation will also be required throughout busier areas where facilities are clustered together and subject to frequent access such as: – Luddenham Main Street (the Old Northern Road) in Luddenham – Elizabeth Drive in Luddenham and Kemps Creek – Liverpool Road North in Bonnyrigg – St Johns Road, Cabramatta Road and Bartley Street in Cabramatta	During construction

Reference	Impact	Management measure	Timing
		• Specific consideration of the highly urbanised setting in Cabramatta within the local influence area. This includes planning parking changes to reduce potential impacts and planning traffic diversions in consultation with Fairfield Council.	
TT02	Congestion related to traffic exceeding the estimated capacity on certain links	Finalise the Framework CTMP to guide the development of the SSCTMPs.	Prior to construction
TT03	Cumulative impacts to the road network	Investigate opportunities to minimise cumulative impacts along Clifton Avenue and Elizabeth Drive with the M12 Motorway project. Measures outlined in TT01 will also help minimise cumulative impacts from the project on the traffic network.	Detailed design During construction
TT04	Cumulative impacts to the road network	Prioritise the use of arterial and sub-arterial roads over collector and local roads, especially during AM and PM peaks, for construction haulage routes. This will include planning traffic routes to minimise impacts to sensitive receivers on local roads.	Prior to construction During construction
TT05	Operational traffic from the AWRC impacting the traffic network	Where possible, schedule operational deliveries and other operational vehicle movements outside of peak traffic movements on Elizabeth Drive to minimise queuing on Clifton Avenue.	During operation
Human health			
HIA01	Explosion or spillage of methanol during transport	Complete a detailed route evaluation for methanol transport to the AWRC in accordance with HIPAP 11 – Route Selection.	Detailed design During operation

Reference	Impact	Management measure	Timing
HIA02	Impact to human health – AWRC site	In accordance with the NSW Work Health and Safety Regulations 2011: • Store Class 8 substances in accordance with AS 3780-2008. • Prepare a manifest of the hazardous chemicals exceeding manifest quantities. • Prepare an emergency plan that will be provided to NSW Fire and Rescue. • Display warning placards regarding quantities of hazardous chemicals at any entrance where emergency services may enter the workplace.	Detailed design During operation
HIA03	Construction bushfire hazard	No hot works will be undertaken if the Fire Danger Rating is very high or above.	During construction
HIA04	Construction bushfire hazard	All works in bushfire prone areas will be stopped and workers evacuated from the area during Fire Danger Rating of extreme or above.	During construction
HIA05	Impact to human health – AWRC site	Ensure adequate capacity in the AWRC stormwater system to contain water used for firefighting for testing prior to disposal, if required.	Detailed design During operation
Socio-economics			
SELU01	Access to employment	Develop an Australian Industry Participation (AIP) Plan including consideration of the following: • Where practical training to meet minimum competency requirements. • Measures to maximise local procurement and employment. • Measures to increase employment in the long-term unemployed or underrepresented groups in the workforce. • Working with local apprenticeship programs.	Prior to construction During construction

Reference	Impact	Management measure	Timing
SELU02	Negative impacts on commercial operations and businesses	Implement measures for ongoing consultation with the business community including minimum notification periods for works close to business or commercial operations and a means for receiving feedback to reduce impacts to business operation.	Prior to construction During construction
SELU03	Negative impacts on commercial operations and businesses	Where business visibility is impacted by construction activities, provide signage to maintain visibility and wayfinding of businesses and access to businesses during construction.	During construction
SELU04	Interruptions to social infrastructure	Consult and work with local councils during the construction period to minimise impacts to social infrastructure and local events, such as memorials and festivals etc. This includes timing construction activities to minimise impacts to events: • at Luddenham Showground • at Cabravale Memorial Park • on public holidays and school holidays.	Prior to construction During construction
SELU05	Interruptions to social educational and community infrastructure facilities	Consult with: • Educational facilities such as child-care centres and schools to discuss timing and duration of construction. Construction activities should be timed in consideration of exam periods (i.e. NAPLAN and HSC) and school events to minimise impacts. • Community facilities and places of worship to understand potential impacts during times of worship and events/activities including amenity impacts and potential access impacts.	Prior to construction During construction

Reference	Impact	Management measure	Timing
SELU06	Interruptions to social infrastructure	Investigate further ways to mitigate potential impacts associated with construction, in particular the location of construction compounds and additional construction areas at the following locations: • Fowler Reserve, Wallacia • Western Sydney Parklands, Kemps Creek and Cecil Hills • Cabravale Memorial Park, Cabramatta • Lennox Reserve, Lansvale • Lansvale Reserve, Lansvale.	Detailed design
SELU07	Interruptions to emergency services	Continue consultation with emergency services that use the local influence area to understand access requirements so that access can be maintained during construction. This includes consultation with the SES, RFS, Ambulance and Police.	Prior to construction During construction
SELU08	Severance of the community due to construction activities	Investigate opportunities for overcoming physical segregation caused by construction works with a focus on minimising impacts to commonly used active transport routes, enabling community members to access services on the other side of trenches. For example, maintaining access to Cabravale Memorial Park for nearby users.	Prior to construction During construction
SELU09	Community cohesion / Health and Wellbeing / Personal and Property Rights / Fears and Aspirations / Culture	Ensure community and stakeholder management includes: • Education and information sharing around perceived impacts of the AWRC, especially regarding water quality and human health to demonstrate low impacts, as well as positive impacts associated with support for existing and future quality of life. • Targeted engagement with vulnerable groups, including families, young and ageing populations to minimise real and perceived impacts, including in languages relevant to the local community.	Prior to construction During operation

Reference	Impact	Management measure	Timing
		• Publishing and display of findings from monitoring and management processes transparently for the community.	
	Community cohesion impacts	This impact is appropriately managed by measure G08 in this table.	Prior to construction During construction
	Personal property impacts	This impact is appropriately managed by measure G05 and G08 in this table.	Prior to construction During construction Post construction
	Access, movement and connectivity	This impact is appropriately managed by measures in the 'Traffic and transport' section of this table.	Prior to construction During construction
Sustainability			
SU01	Project not achieving sustainable outcomes	• Develop a Sustainability Management Plan that outlines how the project will embed and continually improve sustainability throughout the project. This plan will outline: • the IS rating process, including timeframes for achieving a project IS rating • roles and responsibilities relating to sustainability • how sustainability objectives will be embedded into the construction and operation of the project • how, and if, the future aspirations of Sydney Water can be accommodated and implemented in the project.	Detailed design During construction
SU02	Project not achieving	Investigate opportunities to: • procure recycled or reused materials where the options exist, and comparable performance can be achieved	Detailed design During construction During operation

Reference	Impact	Management measure	Timing
	sustainable outcomes	• reduce material quantities, where possible, while maintaining the design performance • implement passive design measures at the AWRC such as optimum solar orientation, shading and natural ventilation to reduce demand for heating and cooling of occupied site buildings • implement alternative technologies to reduce nitrous oxide emissions from operation of the AWRC.	
SU03	Project not achieving sustainable outcomes	Implement the initiatives identified in the Sustainability Initiatives Register in section 12.1.	Detailed design During construction During operation
SU04	Energy requirements for project exceed energy generated	Supplement 50% of Stage 1 project electricity use with renewable energy generation. If this cannot be achieved through renewable energy generation, investigate other options such as purchasing large scale generation certificates (LGCs) or entering into a power purchasing agreement where electricity is sourced from off-site renewable energy.	Detailed design During operation
Waste management			
W01	Generation and management of all construction waste streams, including liquid waste	Develop and implement a Waste Management Plan as part of the project's CEMP. This plan will include: • opportunities to minimise the generation of spoil • targets for different waste streams with disposal being the least preferred approach, including diverting 75% of spoil from landfill (eg through offsite reuse), recycling rates of 80% for construction and demolition waste and reuse of stormwater for construction activities	Detailed design During construction

Reference	Impact	Management measure	Timing
		• classification of all waste generated by the project in accordance with the EPA waste classification guidelines • site specific measures (in accordance with the compound locations) for waste segregation, storage, handling, collection and transport according to their waste classification, including for liquid wastes • instructions on clear signage to be provided at construction compounds to encourage correct recycling and reduce contamination. • measures to ensure safe storage and transport of waste materials and avoid or minimise any risk of waste or contaminated materials creating dust or other impacts to the community or surrounding sensitive environments • regular monitoring and auditing to assess the performance of waste management activities against the determined targets • training and awareness for all construction personnel • a record keeping system on site so that waste tracking systems can be maintained. This should include the use of the NSW EPA's online waste tracking system where required. Keep records of receipts to prove that waste diversion and recycling targets have been met.	
W02	Generation and management of Special Waste	Develop and implement a procedure for managing special waste in accordance with legislative and policy requirements. This should include as a minimum: • review contaminated spoil volumes identified in the Waste Impact Assessment (Aurecon Arup 2021). Confirm volumes of soils contaminated with ACM as detailed design develops. • identify lawful offsite storage and disposal options (including those listed in the Waste Impact Assessment (Aurecon Arup 2021))	During construction

Reference	Impact	Management measure	Timing
		• if asbestos waste is transported off site, ensure appropriate containment methods are in place including, as a minimum, wrapping asbestos sheets and wetting down soil contaminated with ACM. • ensure transportation of asbestos waste by appropriately qualified personnel.	
W03	Generation and management of hazardous waste from the AWRC and pipeline construction	Store, manage and dispose of hazardous wastes in accordance with legislative and policy requirements, including disposal by a licensed contractor and at a lawful disposal facility.	During construction
W04	Generation and management of General Solid Waste (putrescible)	Investigate opportunities to divert food waste from landfill. This could include the provision of site waste facilities such as bins to separate food waste at source.	Detailed design During construction During operation
	Generation and management of operational waste streams	This impact is appropriately managed by measure G02 in this table.	During operation
Airport operations			
AO01	Contribution of AWRC site to increased risk of wildlife strikes by aircraft	Investigate opportunities for additional design measures at the AWRC site to manage potential wildlife populations. These will include: • covering large (100 m^2) open bodies of still water • exclusionary devices • enclosing waste receptacle areas	Detailed design

Reference	Impact	Management measure	Timing
		• selection of landscaping plant species that are less attractive to wildlife as a food and shelter source • steepening the slopes of basins to deter wildlife.	
AO02	Contribution of AWRC site to increased risk of wildlife strikes by aircraft	Prepare and implement a Wildlife Management Plan for the AWRC site. This plan will include: • wildlife monitoring surveys • regular wildlife hazard assessments • wildlife awareness and management training for AWRC operational staff • implementation of activities to reduce hazardous bird populations • adoption of wildlife deterrent technologies to reduce hazardous bird populations • performance indicators to evaluate implementation and compliance to consent conditions • a review process to regularly assess implementation against performance indicators, identify gaps, and ensure currency • roles and responsibilities for plan implementation and review.	During operation
AO03	Impact to operation of Western Sydney International Airport	Assess consistency of any changes to the location and size of structures, or plume estimations, with Western Sydney International Airport OLS and CASA plume rise assessments outlined in this EIS.	Detailed design
	AWRC lighting impacting the operation of Western Sydney International Airport	This impact is appropriately managed by measures in the 'Landscape character and visual' section of this table.	Detailed design During operation

Reference	Impact	Management measure	Timing
Utilities			
U01	Impacts to TfNSW assets during construction	Prepare and submit civil plans for road crossings to TfNSW to support any required approvals under the Roads Act 1993.	Detailed design
U02	Impacts to utilities and services during construction	Identify any existing utilities that may be at risk of impact from construction. Once identified, complete dilapidation surveys to establish a pre-construction condition assessment of the assets.	Detailed design Prior to construction During construction
U03	Impacts to utilities and services during construction	Repair any utilities that have been directly impacted from project construction activities.	During construction
U04	Impacts to utilities and services during construction	Complete Dial Before You Dig (DBYD) searches of existing services during detailed design and prior to construction. Where required, sensitive services or those critical to the design will be accurately located to AS5488 Quality Level A by potholing. Sydney Water will continue to consult with relevant utility agencies and organisations during detailed design and construction planning.	Detailed design Prior to construction During construction
	Impacts to WaterNSW assets during construction	This impact is appropriately managed by 'Non-Aboriginal heritage' section of this table.	Prior to construction During construction During operation
	Impacts to WaterNSW and TfNSW assets during construction	This impact is appropriately managed by measure G10 in this table.	Detailed design Prior to construction During construction

Table 15-4 Project waterways monitoring

Reference	Monitoring	Monitoring requirement	Timing
Baseline and post-commissioning water quality and aquatic ecology monitoring of waterways			
WW22	Baseline water quality and ecology monitoring program	Continue baseline monitoring program outlined in section 8.2.2 until project starts operating. Complete a report documenting results and analysis at completion of monitoring program. Monitoring results from construction or commissioning phases to be analysed separately to avoid skewing baseline results.	Prior to construction During construction
WW23	Post-commissioning water quality and aquatic ecology monitoring program	Continue water quality, macrophyte and fish surveys outlined in section 8.2.2 for two years post-commissioning. Complete a report documenting results and analysis at completion of monitoring program.	During operation
WW24	Penrith Weir pool and monitoring of water quality and biological parameters	Include an additional monitoring point to the programs outlined in WW22 and WW23 at the Penrith Weir pool (at the bar at the mouth of Glenbrook Creek). Inclusion of this additional point will fill a gap in the current monitoring program and enable a longitudinal assessment of potential change driven by AWRC releases and enable Sydney Water to investigate any ecological changes that occur in the Penrith Weir pool and in particular the Glenbrook Creek bar.	Prior to construction During construction During operation
Monitoring of flow related impacts in waterways			
WW25	Bank erosion and condition monitoring on Nepean River upstream of Wallacia Weir to Bents Basin	Develop and implement a baseline and impact monitoring program of bed and banks prior to the commencement of operational releases. The monitoring program design and reporting will be by a qualified geomorphologist. The baseline monitoring will include an analysis of historical aerial photos to understand historical and potential future geomorphological changes. Following commencement of releases, the monitoring should be undertaken at six monthly intervals for the first two years. After this, monitoring should be undertaken after three, four,	During construction During operation

Reference	Monitoring	Monitoring requirement	Timing
		six, eight and ten years. Monitoring should also be undertaken following three flood events greater than 20% Annual Exceedance Probability (AEP) (1 in 5 year flood). The monitoring will include a report documenting the results and analysis, including identifying changes that can be attributed to the treated water releases. Monitoring will include appropriate methods to establish potential impacts from the project including consideration of the following approaches: • for the riverbed – cross sectional survey. The cross section must be made accurately to a fixed point, with redundancy to cope with disturbance (intentional or otherwise). • for riverbanks – riverbank fixed photo-points at strategic locations, cross section surveys at strategic locations, drone-monitoring baseline survey (topographic and imagery data) for some representative sections of each reach. It is recommended that the baseline survey include a detailed visual inspection by an experienced geomorphologist of the reach between Bents Basin and Wallacia Weir to identify priority site locations for future monitoring.	
WW26	Bank erosion and condition monitoring at each release structure	Undertake baseline and impact monitoring of the structure condition and bank conditions for at least 100m upstream and downstream of each release structure location. The inspections should be undertaken at six monthly intervals for a minimum of 2 years with further review at this time to determine the need for any on-going monitoring. Monitoring methods described in WW25 can be adopted. Should any erosion or sedimentation issues associated with the releases be identified a risk assessment should be completed. This may identify the need for specific remediation measures. Field survey of any erosion sites should be added to the six-monthly monitoring program.	During operation

Reference	Monitoring	Monitoring requirement	Timing
WW27	Pipeline crossing of waterways	Undertake baseline monitoring at each crossing location. Following construction, undertake impact monitoring of the waterway bed and bank conditions, at the open trench crossing locations. The inspections should be undertaken at six monthly intervals, or after an event of about 1 in 20 year ARI, for a minimum of two years with further review at this time to determine the need for any on-going monitoring. The monitoring should include inspection of the waterway bed and bank conditions at the crossing location and for at least 100 m upstream and downstream. Should any erosion or sedimentation issues associated with the releases be identified a risk assessment should be completed. This may identify the need for specific remediation measures. Field survey of any erosion sites should be added to the six-monthly monitoring program.	During operation
WW28	Bank and erosion monitoring on South Creek at the Warragamba pipeline crossing	Undertake baseline and impact monitoring of bed and bank condition along the channel 500 m upstream and downstream of the Warragamba pipeline crossing. The monitoring is to be consistent with WW25 and will seek to identify any geomorphological changes that can be attributed to the releases. Surveys can be undertaken by visual inspection. If impacts observed, further inspection by topographic survey or imagery analysis will be completed. Monitoring is recommended to be undertaken for two years following bed and bank stabilisation works are undertaken by the responsible agency.	During operation
WW29	Changes to wetted perimeter near Glenbrook Creek	Include monitoring of vegetation extent and species composition at the bar at the mouth of Glenbrook Creek as part of the monitoring programs outlined in WW23. A baseline survey is also required prior to works commencing.	Prior to construction During construction During operation

Reference	Monitoring	Monitoring requirement	Timing
Long term monitoring of release streams and ambient water quality			
WW30	Monitoring of treated water releases - general	Analysis of water quality in the final release stream(s) is to be undertaken consistent with the monitoring requirements of the EPL for St Marys AWTP and Penrith WRP. Monitoring locations will be selected to allow for monitoring of representative samples from the AWRC release streams and will account for any mixing of different treated water streams. Daily monitoring of release volumes is to be undertaken using a calibrated flow meter. Monitoring and reporting requirements will be finalised with the EPA during the EPL application process.	During operation
WW31	South Creek treated water release monitoring	Monitoring of the water quality of the wet weather release stream will take place when releases to South Creek commence and the release occurs for longer than two hours. Monitoring indicators, sampling locations and reporting requirements would be in accordance with an EPL issued by the EPA. Hourly monitoring of the release volumes should also be undertaken during a release event, using a suitable calibrated flow meter. All indicators are to be analysed by a NATA accredited laboratory.	During operation
WW32	South Creek ambient water quality monitoring	Monitoring of the water quality of the receiving waters of South Creek is to be undertaken daily when releases occur to South Creek that are longer than two hours in duration. Two monitoring locations are to be sampled, one upstream and one downstream of the release location. The upstream site will act as a background site with the downstream site used to determine the level of impacts from the releases. Monitoring indicators, sampling locations and reporting requirements would be in accordance with an EPL issued by the EPA. As this sampling will be weather dependent, trigger rainfall conditions that are expected to initiate releases to South Creek are to be identified. Procedures will be developed that allow for early notification of expected rainfall events that may exceed the modelled trigger conditions to allow for timely sampling to be undertaken in accordance with planned releases. All indicators are to be analyses by a NATA accredited laboratory.	During operation

Reference	Monitoring	Monitoring requirement	Timing
WW33	Nepean River and Warragamba River treated water release monitoring	Monitoring of the water quality of the wet weather release stream will take place when releases to Nepean River and Warragamba River commence and the release occurs for longer than two hours. Monitoring indicators, sampling locations and reporting requirements would be in accordance with an EPL issued by the EPA. Hourly monitoring of the release volumes should also be undertaken during a release event, using a suitable calibrated flow meter. All indicators are to be analysed by a NATA accredited laboratory.	During operation
WW34	Nepean River and Warragamba River ambient water monitoring	Monitoring of the water quality of the receiving waters of Nepean River and Warragamba is to be undertaken at a frequency consistent with the current STSIMP. Two monitoring locations are to be sampled, one upstream and one downstream of each release location. The upstream site will act as a background site with the downstream site used to determine the level of impacts from the releases. Monitoring indicators, procedures and reporting requirements are to be consistent with the STSIMP. All indicators are to be analysed by a NATA accredited laboratory.	During operation

15.5 Project outcomes

Table 15-5 summarises the key outcomes to be achieved by the project, based on the project objectives and key sustainability commitments made in the EIS.

Table 15-5 Key project outcomes

Project outcomes
Respond to growth Provide wastewater services to the SWGA and WSAGA, in line with the NSW Government's long-term population forecasts and Sydney Water's licence obligations.
Provide cost effective service Provide a cost-effective value for money wastewater treatment service that is financially sustainable for Sydney Water and minimises impact on customer bills.
Minimise disruption Plan, construct and operate the infrastructure required to deliver the service with minimum disruption to the community.
Adaptable solution Incorporate into the solution, alternative futures, addressing a range of demand scenarios (including before 2025), meeting customers changing aspirations.
Sustainable design Obtain an Infrastructure Sustainability Council of Australia (ISCA) rating of at least 'Excellent' and preferably 'Leading' for design and as built stages, with a minimum score of 65 points.
Energy Supplement 50% of Stage 1 project electricity use by: • self-generating renewable energy from installation of solar PV panels and recovered biogas to fuel co-generation • purchasing grid renewable energy.
Circular economy Reuse all biosolids to maximise reuse and recovery of resources. Enable 100% of wastewater treated during normal dry weather conditions to be reused for the purpose of off-setting drinking water supply, including as environmental flows, recycled water for local supply or purified recycled water for drinking in the future. Provide a source of water that can be used for green space and tree canopy irrigation to support urban cooling and greening objectives in Western Sydney.

Project outcomes
Water management Meet EPA nutrient load limits in the Yarramundi 2 subzone. Maintain or improve instream water quality and macroinvertebrate diversity attributable to the project's operational waterway releases. Support customers to develop high quality integrated water management solutions that consider a range of sources including rain/stormwater and recycled water from the AWRC where appropriate.
Sustainable communities Achieve landscape-led design of the AWRC site through developing and implementing an Urban Design and Landscaping Plan. Design stormwater management at the AWRC site with the aim of meeting waterway objectives for South Creek. Celebrate cultural and scientific heritage on the AWRC site.
Environmental impact Manage environmental impacts arising from construction of the project.
Flood management Not contribute to existing flood management issues in the Hawkesbury-Nepean or South Creek catchments.
Climate resilience Manage the impacts of a changing climate by including adaptation measures to support resilience of the project.

15.6 Project justification

This section explains how the project is justified as proposed, given it is critical to the development of the Western Parkland City, that it provides a range of benefits and opportunities and that Sydney Water will minimise and manage its impacts on the community and the environment.

15.6.1 Project need

Significant residential and economic growth is expected in the Upper South Creek Servicing Area over the next 35 years, and wastewater treatment is crucial to enable and support that growth. The growth is driven by:

- opening of the Western Sydney International Airport by 2026 which is a key catalyst for development in the region
- government and private sector investment in the WSAGA
- NSW, Commonwealth and Local government investment in infrastructure, including major new road and rail assets, social infrastructure and utilities

- release of new land areas, particularly for additional housing
- support for the establishment of industrial, manufacturing, agribusiness, commercial and other businesses that will create a large number of high value jobs.

The Western Sydney City Deal includes commitments from a partnership between Commonwealth, NSW and local government that is fundamental in delivering the Western Parkland City vision. The project forms part of the backbone infrastructure to ensure government commitments in the Western Sydney City Deal can be realised.

Being mostly rural, a large proportion of the servicing area is currently serviced by on-site systems such as septic tanks. While these systems are suitable for rural properties with only small numbers of people, they are not suitable in urban environments to treat large wastewater volumes. They are limited by the range of materials they can treat, their high maintenance costs, the poor quality of the water produced and subsequent risk to human health in the event of a failure. As a result, long-term reliance on septic tanks in the servicing area is not acceptable.

Other parts of the Upper South Creek Servicing Area are temporarily connected to Sydney Water's Liverpool and West Camden Water Recycling Plants (WRPs). These plants are experiencing rapid growth in their own catchments, even accounting for expected impacts of the COVID-19 pandemic.

Furthermore, the catchments for these WRPs also have downstream constraints. Liverpool WRP discharges treated water through some of Sydney Water's oldest and largest wastewater networks to the deep ocean outfall at Malabar. This network has limited capacity for any additional flows. West Camden WRP treats wastewater to tertiary quality (with a higher level of nutrients than advanced quality water) which limits its capacity to treat additional wastewater flows. Its network also has limited capacity for additional flows.

Together, this supports the clear need to build a new wastewater treatment plant for the Upper South Creek Servicing Area and to provide an advanced treatment process with reduced nutrient loads so treated water can be released to the Hawkesbury-Nepean river system.

15.6.2 Key project opportunities

In addition to providing this essential wastewater service, the project presents a range of opportunities to improve liveability, sustainability and the environment across Western Sydney. Table 15-6 summarises the key project opportunities including those currently in project scope, and other opportunities enabled by the project.

Table 15-6 Key project opportunities

Project opportunity	In project scope	Opportunities enabled by the project
Enabling a circular economy	High-quality treated water to be used as environmental flows in waterways, which can also be made available for reuse locally. Organic material recovered during secondary wastewater treatment processes, known as biosolids, as an alternative to chemical fertilisers in farming and gardening. Renewable energy from co-generation within the AWRC and solar energy generation.	A circular economy hub in the Western Parkland City with opportunities for digestion of additional waste such as food waste (to generate energy and reduce waste to landfill) or co-location of suitable industries. Contributing to the NSW Government's environmental flows regime from Warragamba Dam to offset drinking water releases. Direct augmentation of Sydney's drinking water supplies, subject to future government decisions and community support.
Supporting the health of South Creek and Nepean River	A green space area on the AWRC site along South Creek to enhance biodiversity on the site, use best practice water sensitive urban design and provide visual screening of the AWRC. The green space area is an important link in the green spine along South Creek envisaged in the NSW Government's vision for the WSAGA. Treated water releases to support flow and water quality objectives in South Creek through best-practice management of stormwater, transferring treated water to Nepean River in normal conditions and releasing advanced treated water to South Creek in wet weather conditions (blended with primary treated water in severe wet weather). High-quality treated water for environmental flows released to Nepean River or Warragamba River. The water is treated to a high level through an advanced treatment process that produces water so clean it could be used for drinking. This helps protect aquatic ecosystems, reduce weeds and the frequency of algal blooms. It also protects the values of the downstream Blue Mountains World Heritage Area.	Public access to the green space area to form part of the Wianamatta-South Creek parkland envisaged in the Western Sydney Aerotropolis Plan.

Project opportunity	In project scope	Opportunities enabled by the project
Liveability, productivity and sustainability in Western Sydney	Produce high-quality recycled water suitable for a range of uses supporting liveability, productivity and sustainability. Urban design of the AWRC and green space area to align with place-making principles and celebrate the site's Aboriginal and non-Aboriginal heritage.	Use recycled water to support some or all of the following uses: • complement stormwater (top-up of rainwater and stormwater tanks/basins), in the irrigation of open spaces and street trees to provide cooling and support recreational or sporting activities and active transport for residents and workers in Western Sydney. • industrial processes and cooling towers to support industries around Western Sydney International Airport • food production in the Agribusiness Precinct.

15.6.3 Biophysical, social and economic impacts

Although the project is essential and presents a range of opportunities to benefit Western Sydney, it is important that environmental impacts are appropriately identified and managed during design, construction and operation.

As a fundamental part of options selection and design for the project, Sydney Water has identified opportunities to avoid and minimise the project's biophysical, social and economic impacts. This included selecting project infrastructure locations and refining alignments to avoid biodiversity and heritage constraints and proposing construction methodologies such as tunnelling or narrower construction corridors to further avoid or minimise impacts. Chapter 3 documents these in more detail.

The EIS has completed a comprehensive assessment of the project's residual impacts, including biophysical and socio-economic impacts as summarised in Table 15-3. Although some impacts remain, they can be effectively managed through the measures outlined in that table.

Cumulative impacts

The EIS has considered cumulative impacts associated with other major projects in the vicinity, including:

- Western Sydney International Airport
- M12 Motorway
- Northern Road upgrade (Glenmore Road to Bringelly Road)

- Sydney Metro – Western Sydney Airport
- Warragamba Dam wall raising.

The assessment also considers the changing nature of the environment in the WSAGA, where much of the project infrastructure is located. Urban development in this area will require extensive construction activity and result in substantial changes in the landscape over time.

Given the measures taken to avoid and minimise impacts and in the context of future urban development, the project makes a small contribution to cumulative impacts.

15.6.4 Ecologically sustainable development

The project aligns with ecologically sustainable development (ESD) principles as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

Table 15-7 summarises how the project aligns with each of the four key principles.

Table 15-7 Project alignment with ESD principles

ESD principle	Project alignment with ESD principles
Precautionary principle	The precautionary principle relates to the scientific uncertainty about environmental impacts during decision-making processes. It states that where there is potential for irreversible environment impact and degradation, the absence of complete scientific certainty should not be a reason to postpone management measures to prevent the potential impact. This principle was considered throughout the options assessment and reference design processes in deciding the preferred location for the AWRC and pipeline alignments and the approach to construction and design. Multi-criteria analysis and risk assessments have been completed throughout the project to ensure serious and adverse damage to the environment is avoided. The EIS communicates and assesses the potential environmental impacts associated with the construction and operation of the project. The EIS has assessed worst-case impacts and has completed detailed technical environmental assessments to minimise environmental risks and identify appropriate environmental management measures. Throughout development of the EIS, Sydney Water has collaborated with the community and relevant government departments and agencies which has further informed the design and impact assessment process. Due to uncertainty in population growth forecasting in the servicing area of the project, multiple sizing and capacity options for the AWRC were considered. The EIS has assessed the worst-case scenario by assessing a larger sized plant. An initial ISCA pathway assessment has been completed to assist the project in moving beyond a compliance approach to one that ensures best practice in sustainability and environmental responsibility. There has been a specific focus on ensuring that the AWRC has reduced its carbon emissions as far as practicable, by reducing the reliance on energy from the grid and incorporating technologies, such as photovoltaic solar and co-generation, to produce energy.

ESD principle	Project alignment with ESD principles
Inter-generational equity	Inter-generational equity relates to the equal distribution of economic, social and environmental costs and benefits for current and future generations. The AWRC will be delivered in stages, meaning it can provide wastewater and recycled water services to current and future generations. The environmental assessment and design of the project has considered intergenerational equity by considering the future ultimate capacity of the system and taking into consideration future sensitive receivers. The project's resilience to future changes in climate has been assessed, with specific adaptation measures incorporated into the design and operation. The AWRC will produce treated water suitable for a range of uses which can contribute to water resilience for future generations where the availability of water may reduce under future climate change scenarios. The components of the AWRC have a specific design life, however, the operation of the AWRC as a whole will be required well into the future and will support the needs of the current and future populations in Western Sydney. The project has been designed with a focus on energy efficiency and reduced carbon footprint during operation. This approach will reduce the reliance on the power grid for energy and incorporate technologies, such as solar and co-generation, to produce energy. This will reduce the greenhouse gas emissions of the project and contribute to slowing climate change. Construction and operation of the project will result in the consumption of fossil fuels, including diesel, which may negatively impact future generations. The project is considered to align with the principle of inter-generational equity firstly through its consideration of the long-term needs of its stakeholders and the community and has sought to embed ESD principles throughout the design and planning process to achieve these desired outcomes. This has resulted in the uptake of sustainability initiatives which have been integrated into the design and the decision-making process to ensure consistent actions towards desired outcomes through the life of the project, while advancing its social, environmental and economic performance. The project will ensure that consumption of resources and materials during construction and operation will be significantly reduced compared to a 'business-as-usual' approach. This will be achieved through applying the rigorous standards prescribed by in the ISCA rating tool. A waste management plan will also be developed to ensure waste is reduced as far as possible and to prioritise diversion from landfill.
Conservation of biological diversity and ecological integrity	Minimising and avoiding impacts to biodiversity and maintaining ecological integrity is a fundamental component of the outcome of the project. Impacts to biodiversity were considered throughout the development of the reference design, including the options selection process for the AWRC as outlined in Chapter 3. The reference design process was completed with the aim to identify biodiversity constraints, avoid, minimise and manage impacts. Sydney Water has designed the project to avoid and minimise impacts to biodiversity where possible, including the use of tunnelling construction methodology for some sections of pipelines. This can be seen in areas such as Lansdowne Reserve for the brine pipeline, and along Elizabeth Drive where the treated water pipeline will be tunnelled under several waterways. Alignment changes to avoid sensitive

ESD principle	Project alignment with ESD principles
	biodiversity, such as through Western Sydney Parklands, and along Park Road, Wallacia were also adopted to minimise the overall biodiversity impact of the project. About 13.77 hectares (ha) of native vegetation across eight plant community types (PCTs) will be cleared for the project. This includes impacts to vegetation listed under the NSW *Biodiversity and Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The project will result in the removal of the following threatened flora individuals / habitat: • Downy Wattle – seven individuals, 0.16 ha of known habitat • Native Pear – zero individuals, 0.03 ha of known habitat • Sydney Bush-pea – zero individuals, 0.01 ha of known habitat • Spiked Rice-flower – zero individuals, 2.99 ha of expert mapped habitat The project will result in the removal of the following habitat of 'known' threatened fauna: • 1.56 ha low potential breeding habitat for the Large Bentwing-bat • 3.48 ha additional species credit forage habitat for Large –eared Pied Bat • 7.62 ha of species credit habitat for Southern Myotis • 8.95 ha of expert mapped habitat for Cumberland Plain Land Snail • 14.45 ha of expert mapped habitat for Dural Land Snail. The total impact area of the project is about 213 ha, covering over 40 kms of linear area. The removal of 13.77 ha of native vegetation equates to just 6% of the total area impacted by the project. Substantial efforts have been made throughout the project to reduce and minimise impact to native vegetation habitats, and this process has resulted in the residual impacts being largely comprised of degraded, fragmented, and edge effected ecological values. The EIS outlines the management measures to further minimise impacts to biodiversity, and how the impacts will be offset. The project also seeks to improve biodiversity on the AWRC site as part of landscaping the green space area. Project impacts on aquatic ecology are expected to be minor, given the high quality of treated water released and minor expected changes to geomorphology and flows.

ESD principle	Project alignment with ESD principles
Improved valuation, pricing and incentive mechanisms	To ensure the successful integration of the principles of ESD and to secure long-term sustainable development, it is important that these measures and incentives are appropriately valued and costed into the project. The project has applied the INSW business case gateway template that specifically addresses the social, economic and environmental sustainability requirements of the project. This will ensure ESD is appropriately considered, valued and priced at each stage of the project lifecycle. This is an important approach to the project as it allows for identification of more sustainable and resilient infrastructure as it can be identified and accounted for effectively in the INSW business case process and recognise the long-term value for the community and the environment. Sydney Water will also provide biodiversity offsets for the project in accordance with the Biodiversity Assessment Method, which essentially places a price on biodiversity impacts.

15.6.5 Conclusion

The project provides essential infrastructure and an opportunity to improve liveability, sustainability and the environment across the Western Parkland City. It also aligns with ESD principles. Through a rigorous options assessment process, the project has been identified as the best option to achieve project objectives.

The EIS has addressed the SEARs and comprehensively assessed the project's biophysical, social, economic and cumulative impacts. The assessment has shown that the project's residual impacts are acceptable and can be effectively managed through implementing a range of management measures.