Review of Environmental Factors

Orchard Hills Water Filtration Plant Reliability Upgrade (Pre-treatment) Project
March 2025

Sydney WATER

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Sydney Water respectfully acknowledges the Traditional Custodians of the land and waters on which we work, live and learn. We pay respect to Elders past and present.

Sydney Water recognises the physical and cultural connection of local Aboriginal communities to waters and the land.

Determination

This Review of Environmental Factors (REF) assesses potential environmental impacts of the Orchard Hills Water Filtration Plant (WFP) Reliability Upgrade (Pre-treatment) project (the proposal). The REF was prepared under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), with Sydney Water both the proponent and determining authority.

The Sydney Water Project Manager is accountable for ensuring the proposal is carried out as described in this REF. An additional environmental impact assessment may be required if the scope of work or work methods described in this REF change significantly following determination.

Certification

I certify that I have reviewed and endorsed this REF and, to the best of my knowledge, it is in accordance with the EP&A Act and the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation). The proposal has been considered against matters listed in section 171 (Appendix A) and the guidelines approved under section 170 of the EP&A Regulation. The information it contains is neither false nor misleading.

Prepared by:	Reviewed and endorsed by:	Endorsed by:
[redacted]	[redacted]	[redacted]
Yameng Lai Environmental Scientist Date: 5 March 2025	Cathy O'Rourke Principal Environmental Scientist Date: 7 March 2025	Robert Prsa Senior Project Manager Date: 7 March 2025

Decision Statement

The main potential construction environmental impacts of the proposal include impacts to biodiversity, water and drainage and impacts from noise and cumulative development. During operation, the proposal would bring positive impacts through improving drinking water supply for customers. The proposal will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats. Therefore, a Species Impact Statement and/or Biodiversity Development Assessment Report is not required.

Given the nature, scale and extent of impacts and implementation of the mitigation measures outlined in this REF, the proposal is unlikely to have a significant impact on the environment. Therefore, an Environmental Impact Statement is not required and the proposal may proceed.

Determined by:		
	Murray Johnson [redacted] Senior Manager Environment and Heritage Water and Environment Services Sydney Water	Date: 11/03/2025

1. Executive summary

Sydney Water plans to enhance the resilience of water treatment processes within the Sydney Water Orchard Hills Water Filtration Plant (WFP). This will improve the capability and resilience of the water delivery network for customers within the Penrith and Blue Mountains local government areas (LGAs). The Orchard Hills WFP is located at the end of The Chase in Orchard Hills NSW which is within the City of Penrith LGA. The Orchard Hills WFP and the proposal is within land owned by Sydney Water, and land owned by the Department of Defence and leased to Sydney Water.

Construction is expected to start in late-2025 and be completed in late-2027.

During the planning phase of this proposal, there were refinements to minimise the environmental impact of the proposal. This process included the adjustment of the proposal area to avoid sensitive mapped areas, including:

- avoiding hollow bearing trees, a stag tree [redacted] *This information has been redacted to protect sensitive Aboriginal heritage information*
- minimising impacts to Cumberland Plain Woodland
- minimising impacts to important habitat areas for the Swift Parrot.

The main construction environmental impacts associated with the proposal are impacts to biodiversity, water and drainage and impacts from noise and cumulative development. A Construction Environmental Management Plan (CEMP) will be prepared by the Delivery Contractor to mitigate potential environmental impacts. During operation, the proposal would bring positive impacts through improving drinking water supply for customers.

The proposal, when operational, would result in positive long-term environmental improvements by improving the reliability and resilience of the Orchard Hills WFP. This would service future growth and enable the sustainable use of resources, aligned with the principles of ecologically sustainable development.

2. Introduction

2.1 Context

Sydney Water provides water, wastewater, recycled water and some stormwater services to over five million people. We operate under the *Sydney Water Act 1994* and have three equal objectives to protect public health, protect the environment and be a successful business.

Sydney Water is a statutory State-owned corporation and is classified as a public authority, and a determining authority for the proposal under Division 5.1 of the EP&A Act. This REF assesses the potential environmental impacts associated with the proposal and identifies mitigation measures that avoid or minimise potential impacts.

2.2 Proposal background and need

Orchard Hills WFP services the Orchard Hills Water Delivery System which supplies drinking water to over 260,000 customers in the Penrith and Blue Mountains local government areas (LGAs). Additionally, during drought or emergency conditions, the Orchard Hills Water Delivery System also supplies water into the Cascades Water Delivery System, which services the Blue Mountains up to Katoomba.

Generally, high volumes of water flowing into Warragamba Dam after large storm events or after extended periods of drought can carry large quantities of soil and leaf materials into the dam and stir up sediments within the dam. This reduces the quality of the raw water that the Orchard Hills WFP receives.

The severity and likelihood of poor quality raw water conditions are increasing due to climate variability. The Orchard Hills WFP, which was built in 1993, does not have the capability to effectively treat poor quality raw water. This results in a risk to drinking water quality and supply continuity. For example, in July 2022, customers were advised to conserve water due to poor quality raw water in Warragamba Dam, caused by storm inflows, that impacted the performance and capacity of the Orchard Hills WFP.

Upgrades are needed to the Orchard Hills WFP to:

- improve the reliability of the Orchard Hills WFP to meet the needs of future populations
- improve resilience of the Orchard Hills WFP against future climate variability
- increase capacity during poor quality raw water conditions to meet customer demands
- ensure drinking water quality complies with the Australian Drinking Water Guidelines (ADWG) during poor quality raw water conditions.

2.3 Proposal objectives

The proposal objectives are to:

- improve the reliability and resilience of the Orchard Hills Water Delivery System during poor quality raw water conditions to ensure:
    - a secure supply of water is available to customers and meets current and future demands

- safe drinking water supplied to customers meets the ADWG and Sydney Water's Operating Licence

- ensure investments are adaptable to future changes in water quality guidelines and raw water quality variability
- achieve an optimal upgrade solution with a value-for-money outcome and minimise whole-of-life costs.

2.4 Consideration of options

An options assessment process was carried out to inform the development of the proposal to ensure that planning, resilience, adaptability, delivery and operational needs were met as well as ensuring environmental and stakeholder impacts were considered. A total of 12 strategic options were developed, including a 'do nothing' option, which are summarised in Table 2-1 below.

Table 2-1 Summary of strategic options

Option	Description	Comments
1	Do nothing - accept risk of non-compliance to ADWG and Operating Licence. Accept risk of water discontinuity.	Not effective as risk of non-compliance is unacceptably high.
2	Operational adjustments - change existing operations with current assets with no additional capability.	Partially effective as operational adjustments will not be able to fully address water quality issues.
3	Change ADWG - negotiate with NSW Health changes to ADWG (exemption to compliance) so able to meet the changes within current capability.	Not effective as negotiations will be unlikely to be successful due to concerns around health risks.
4	Source control - install catchment controls, classification, research and development to control risks, sampling and operational adjustments.	Not effective as this would be difficult to execute considering size of Warragamba Dam and would not solve WFP production capacity issues.
5	Source control - augment raw water sources with supply from desalination plant, purified recycled water or Prospect Reservoir.	Partially effective as not economically viable or achievable within a timely manner and would not solve WFP production capacity issues.
6	Upgrade raw water - provide additional raw water or drinking water storages to provide a buffer during poor quality raw water events.	Not effective as would not solve WFP production capacity issues or adequately protect the system during prolonged poor quality raw water events.
7	Install pre-treatment plant to improve reliability and capacity to meet ADWG and demand.	Effective however does not fully solve WFP production capacity issues as a stand-alone solution.

Option	Description	Comments
8	Install additional filtration capacity to increase capacity.	Effective however does not address ADWG compliance as a stand-alone solution.
9	Interconnection of supply - install assets to transfer drinking water from adjoining water delivery systems to offset reduced capacity.	Partially effective as there is a high capital cost and would not be achievable within a timely manner.
10	New water treatment plant - decommission Orchard Hills WFP and construct a new WFP with capacity and capability to meet ADWG and demand.	Partially effective as it would be an inefficient use of capital cost, does not provide a value-for-money outcome and would not be achievable within a timely manner.
11	Reservoir storage - implement deep cycling of storage reservoirs to provide buffer between production from Orchard Hills WFP and system demands.	Not effective as does not address ADWG compliance or adequately protect the system during prolonged poor quality raw water events.
12	Reservoir storage - install additional network storage reservoirs to provide storage buffer during poor quality raw water conditions.	Not effective as does not address ADWG compliance or adequately protect the system during prolonged poor quality raw water events.

Two strategic options (Option 7 and 8) were selected and further developed into a total of five (5) short-listed options. Each of the short-listed options were then assessed based on their ability to meet the proposal objectives, risks and financial assessment.

2.4.1 Preferred option

Based on assessment of the five (5) short-listed options, Option 3A was selected as the preferred option as it achieved the proposal objectives and had the lowest net present cost and lowest capital cost (Sydney Water 2023).

The implementation of Option 3A was split into two stages, Stage 1 and Stage 2. Stage 1 works are those required to meet the current reliability and resilience needs to ensure ADWG requirements are met during poor quality raw water events. Broadly, this includes a new inlet structure and pre-treatment process, upgraded chemical storage and dosing and sludge treatment and handling. The scope of the Stage 1 works is summarised in Section 3.1 and Figure 3-1 below.

The Stage 2 works are upgrades that would be expected to occur in the future due to changes to the ADWG and increased demands due to growth, and are subject to a separate environmental assessment and are not considered as part of this proposal.

2.5 Consideration of Ecologically Sustainable Development

Table 2-2 considers how the proposal aligns with the principles of ecologically sustainable development.

Table 2-2 Consideration of principles of ecologically sustainable development (ESD)

Principle	Proposal alignment
Precautionary principle - *if there are threats of serious or irreversible environmental damage, lack of scientific uncertainty should not be a reason for postponing measures to prevent environmental degradation. Public and private decisions should be guided by careful evaluation to avoid serious or irreversible damage to the environment where practicable, and an assessment of the risk-weighted consequences of various options.*	The proposal will not result in serious or irreversible environmental damage. Subject matter experts have been engaged to provide assessments and mitigation measures have been designed to reduce scientific uncertainty relating to the proposal.
Inter-generational equity - *the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*	The proposal will help to meet the needs of future generations by providing a reliable water service to an area of future growth and improving the network's resilience.
Conservation of biological diversity and ecological integrity - *conservation of the biological diversity and ecological integrity should be a fundamental consideration in environmental planning and decision-making processes.*	The proposal will not significantly impact on biological diversity or impact ecological integrity. The proposal design was developed to minimise biodiversity impacts such as adjusting the location of the clarifier to avoid hollow bearing trees, avoiding a stag tree and minimising native vegetation clearing where possible. Additionally, ongoing consultation with the Greater Sydney Local Land Services will occur to manage indirect impacts to the adjoining Orchard Hills Offset Area.
Improved valuation, pricing and incentive mechanisms - *environmental factors should be included in the valuation of assets and services, such as 'polluter pays', the users of goods and services should pay prices based on the full life cycle costs (including use of natural resources and ultimate disposal of waste) and environmental goals.*	The proposal will provide cost efficient use of resources and provide optimum outcomes for the community and environment. The proposal has been designed with consideration of the potential future Stage 2 development. This would minimise the need for demolition and reconstruction and reduces the cumulative construction impacts for sensitive receivers.

3. Proposal description

3.1 Proposal details

The following key components are proposed as part of the proposal for Stage 1:

- inlet works structure with lift pump station, inlet screens and handling and out-loading facilities
- pre-treatment process units including flash mix, flocculation and clarification processes
- upgraded chemical storage and dosing equipment
- sludge treatment and handling equipment, including thickening and recycling centrate and supernatant
- hardstand area for mobile dewatering equipment for out-loading of dewatered sludge
- site services including access roads, power (low-voltage and high-voltage), water and a parking area
- backfilling of decommissioned sludge lagoons, including disposal of water and sludge
- stormwater detention basin
- temporary site compounds and laydown areas.

The key components are shown in Figure 3-1 below. Key environmental features and constraints are shown in Figure 3-2 below.

The proposal area includes five (5) potential site compound locations. Compound E was not assessed in the specialist studies however has been generally considered within the REF. If Compound E is confirmed to be required by the Delivery Contractor, additional assessment may be required as outlined in the mitigation measures in Section 6.2.

Similarly, an alternative pipeline alignment outside of the proposal area was not assessed in the specialist studies however it has been generally considered within the REF. During the detail design phase, if the pipeline alignment is confirmed to be outside of the proposal area, additional assessment may be required as outlined in the mitigation measures in Section 6.2 below.

3.1.1 Location and land ownership

The proposal is located at the end of The Chase, Orchard Hills NSW which is within the Penrith LGA. Sydney Water own and operate the Orchard Hills WFP.

The proposal area is primarily located within [redacted] owned by the Department of Defence and under a long term lease to Sydney Water. A portion of the proposal is located within [redacted] owned by the Department of Defence and under a long term lease to Sydney Water, and within [redacted] owned by Sydney Water.

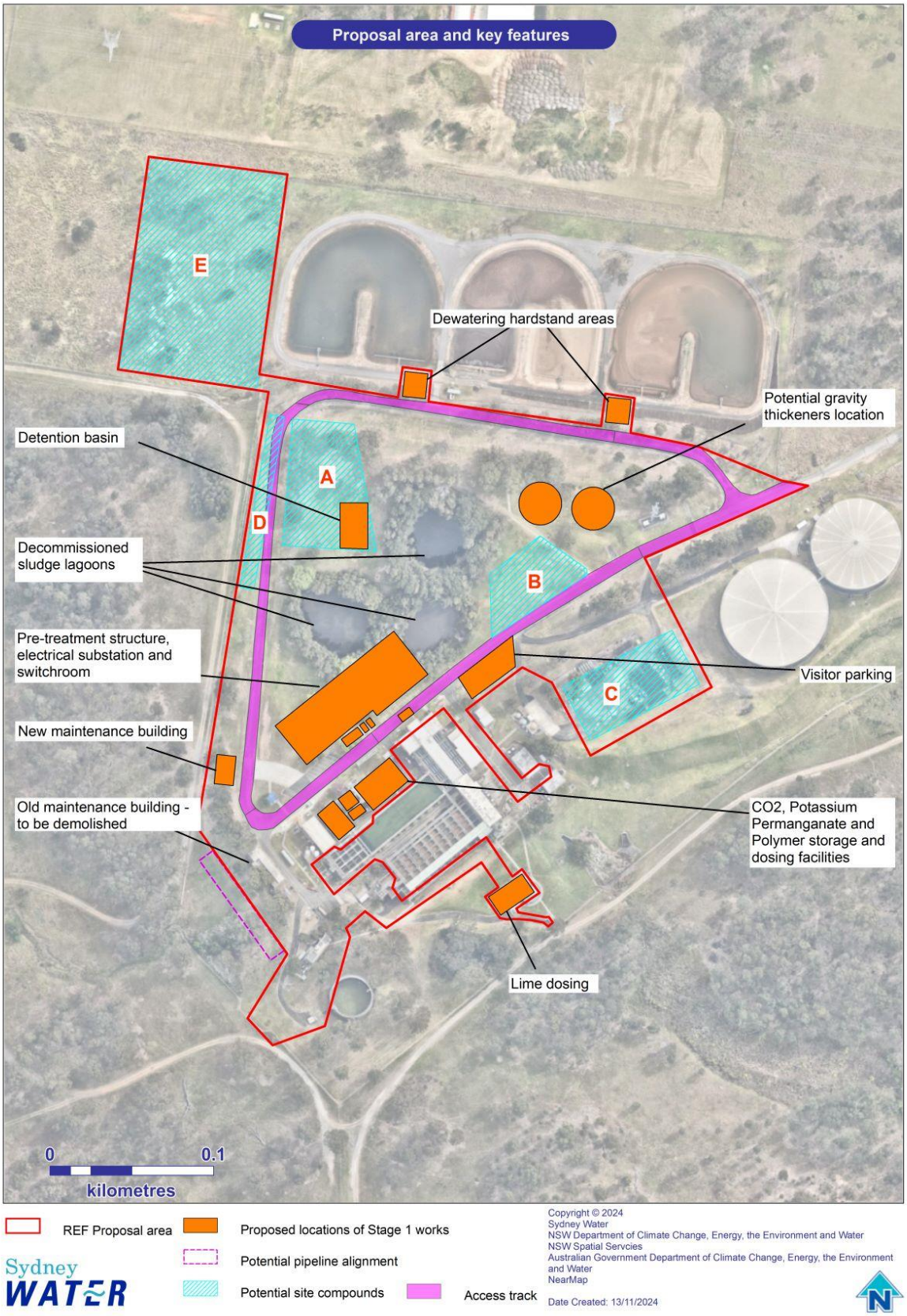

Figure 3-1 Proposal area key features

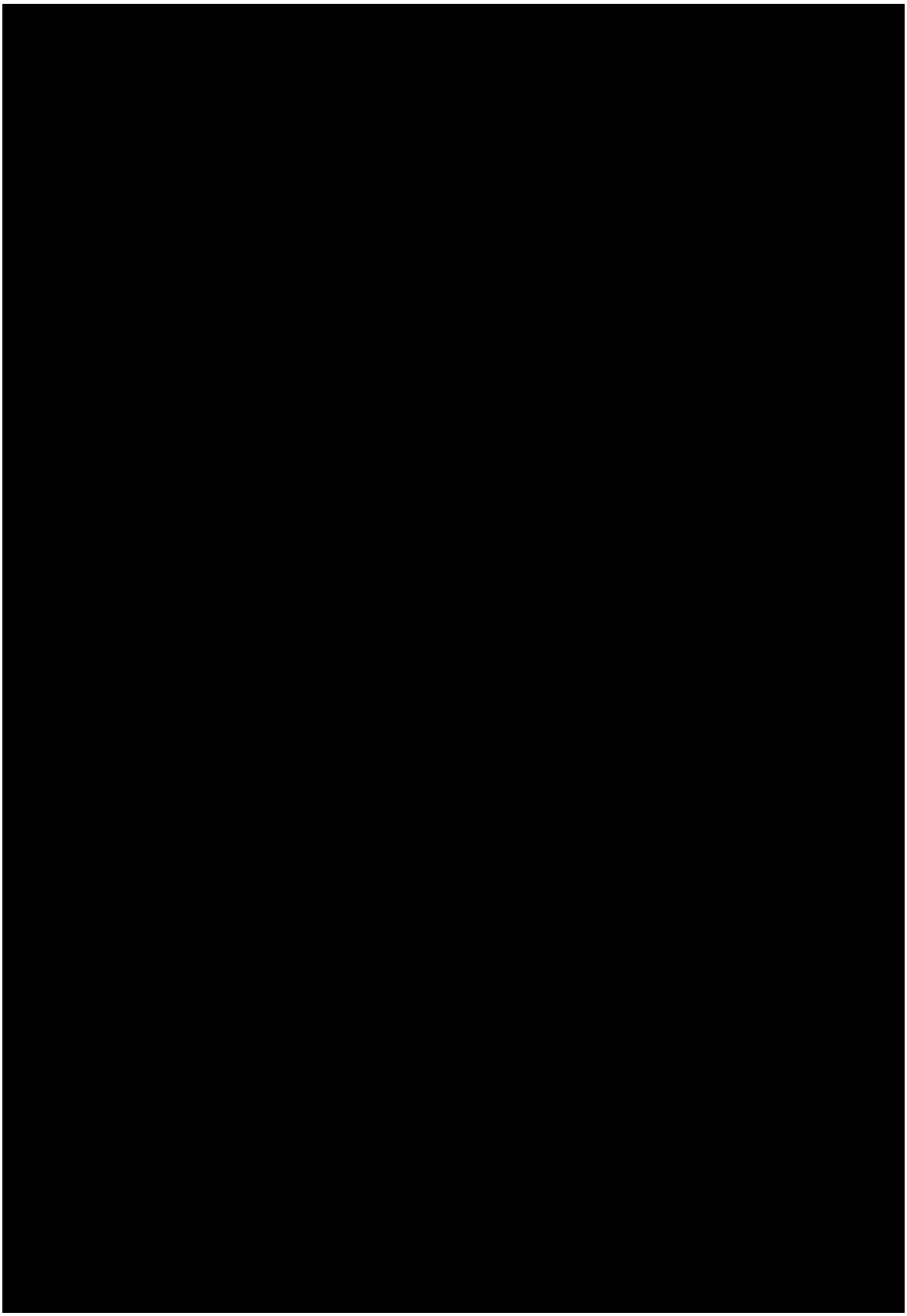

Figure 3-2 Environmental features and constraints

This information has been redacted to protect sensitive Aboriginal heritage information

3.1.2 Site establishment and access tracks

The proposal will be accessed via the existing road network including The Chase, Wentworth Road, Homestead Road, The Northern Road (A9) and the Western Motorway (M4). Existing internal roads within the WFP site will be used during construction. Additional temporary access roads may be required within the proposal area. These will be established in consultation with the Orchard Hills WFP and approved by Sydney Water's Project Manager, as described in the mitigation measures in Section 6.

Site establishment would include vegetation trimming and clearing, the installation of structures such as erosion and sedimentation controls, erection of signage and demarcation of any no-go areas. Site establishment may also include intrusive and non-intrusive surveys, service location, or other investigations required before construction.

3.1.3 Ancillary facilities (compounds)

Construction compounds will likely be required to house site sheds, construction amenities and materials laydown. Indicative locations for the compounds are shown on Figure 3-1. The exact location of these will be chosen by the Delivery Contractor and remain within the proposal area. This will be done in consultation with and approved by Sydney Water's Project Manager, as described in the mitigation measures in Section 6. If the locations are outside of the proposal area, additional assessment may be required as outlined in the mitigation measures in Section 6.2.

3.1.4 Methodology

Construction of the proposal would involve:

- setting up environmental controls
- establishment of site compounds, access roads and hardstand areas
- diversion of existing site services and installation of temporary services
- removal of vegetation
- dewatering, sludge removal and infilling the decommissioned sludge lagoons
- demolition of the existing maintenance building and disused concrete clarifier structures
- installation of new pipework, services and electrical conduits
- construction of new pre-treatment plant and associated works and facilities, including:
    - bulk excavation works and the installation of engineering foundations
    - installation of concrete structures
    - installation of mechanical, electrical and control equipment and services
- testing and commissioning
- site demobilisation and restoration.

3.1.5 Commissioning

Commissioning involves testing and running the new equipment to ensure it works correctly and is integrated with existing plant operations. If a leak or failure is discovered during any of the tests, additional testing and works will be required. Following successful commissioning, the proposal will be integrated with the existing treatment process at Orchard Hills WFP.

3.1.6 Restoration

Disturbed areas will be restored to a condition similar to or better than their pre-existing condition. This may include:

- backfilling
- dismantling, cleaning and restoring site compound areas
- removal of environmental controls
- reuse of cleared vegetation as mulch
- reinstatement of removed habitat such as hollow logs and tree hollows
- revegetation to offset cleared vegetation.

Revegetation will be carried out in accordance with Sydney Water's *SWEMS0025.11 Guideline for native revegetation* following construction. Refer to Section 6.2.3 for further details on native vegetation clearing and offsets.

3.1.7 Materials and equipment

The materials required for construction of the proposal would include general construction materials such as concrete, steelwork, pipework and other materials as required.

Construction of the proposal would involve the use of a range of vehicles, equipment and machinery, which would indicatively include:

- light, medium and heavy vehicles
- concrete truck and pump
- pumps and sediment tanks
- vacuum truck
- compactors
- cranes
- skip bins
- storage containers
- site facilities and amenities
- excavators
- chain saws
- various power tools
- other handheld equipment.

Construction of the proposal would involve excavation. While excavated material would generally be used as backfill, it is likely there will be excess materials, including sludge removed from the decommissioned sludge lagoons. The management of this and other waste material generated by construction is discussed in Section 6.

It is expected that the proposal would require a construction workforce of up to 80 people during peak construction periods.

3.1.8 Work hours

Where possible, work and deliveries will be scheduled to occur during standard daytime hours of:

- 7 am to 6 pm, Monday to Friday
- 8 am to 1 pm, Saturdays.

Some works and deliveries may be scheduled out of hours including:

- deliveries of materials and movements of oversized vehicles, to meet Transport for NSW guidelines and to minimise traffic and access impacts for local residents
- connection of the proposal to the existing WFP, to minimise water supply impacts and disruptions for customers
- emergency works to prevent loss of lives, impact to property or prevent environmental harm.

This would be approved by the Sydney Water Project Manager in line with the mitigation measures described in Section 6.

3.1.9 Proposal timing

Construction is expected to start in late-2025 and be completed in late-2027.

3.1.10 Operational requirements

Once operational, the proposal will require routine maintenance and would involve inspection, testing, cleaning and repairs if needed, similar to that for the existing Orchard Hills WFP.

3.2 Assessment area and changes to the scope of work

The proposal assessed in this REF and associated specialist studies is indicative and based on the reference design (Appendix C – Design drawings) at the time of preparation. The assessment area for each specialist study is defined within the specialist studies. The REF assessment area is shown in Figure 3-1.

The final design and proposal area may change based on detailed design or construction planning by the Delivery Contractor. The general mitigation measures outline when changes to the proposal trigger supplementary environmental impact assessment. If the proposal, construction methods or construction timing described in this REF change significantly, further assessment must be prepared for the amended components in accordance with SWEMS0019.

Changes to the proposal outside the assessment area may only occur:

- to reduce impacts to biodiversity, heritage or human amenity, or

- to avoid engineering (for example, geological, topographical) constraints, and
- after consultation with any potentially affected landowners and relevant agencies.

An addendum REF is not required provided the changes meet the following requirements:

- remains within the assessment area of this REF and has no net additional environmental impact, or
- is outside the assessment area of the REF but reduces the overall environmental impact of the proposal (s.5.4(a) of the Act).

The Delivery Contractor will demonstrate in writing how the changes meet these requirements and Sydney Water's Project Manager will review the request, in consultation with the Environmental and Community Engagement representatives.

4. Consultation

4.1 Community and stakeholder consultation – general

Our approach to community and stakeholder consultation is guided by Sydney Water's community and stakeholder engagement guidelines.

Stakeholder and community engagement is a planned process of initiating and maintaining relationships with external parties who have an interest in our activities. Community and stakeholder engagement:

- enables us to explain strategy, policy, proposals or programs
- gives the community and stakeholders the opportunity to share their knowledge, issues and concerns
- enables us to understand community and stakeholder views in our decision-making processes alongside safety, environment, economic, technical and operational factors.

The nature, scale and extent of the proposal's potential impact has been evaluated in this REF. If our work impacts the community in some way, we will consult with affected groups throughout the proposal. This includes engaging the broader community and stakeholders during planning or strategy development or before making key decisions.

We will also provide Penrith City Council with reasonable notice when we plan to commence the work. Penrith City Council will be consulted about matters identified in environmental planning instruments (refer Section 4.2). This includes public safety issues, temporary works on council land, and full or partial road closures of council managed roads.

A Community and Stakeholder Engagement Plan (CSEP) will be developed for the proposal and will outline the approved method for consultation with nearby residents and stakeholders.

4.2 Consultation required under State Environmental Planning Policies and other legislation

As specified in the State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP) and summarised in Appendix B – Consideration of TISEPP consultation, Sydney Water must consult with councils and other authorities for work in sensitive locations or where the work may impact other agencies' infrastructure or land.

Consultation with the Department of Defence and other stakeholders has occurred through the project development in 2023 through 2025. Ongoing consultation will continue as the design progresses. Discussions and outcomes are summarised in Table 4-1 below.

Table 4-1 Consultation discussion and outcomes

Stakeholder	Description	Summary	Sydney Water response
Department of Defence	The Orchard Hills WFP is located on land owned by the Department of Defence.	• Agreed that Sydney Water will draft the REF and provide to the Department of Defence for review.	• Sydney Water provided the draft REF to the Department of Defence for review on 3 December 2024.
		• The Department of Defence advised that the REF is to be prepared against the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) *Significant Impact Guidelines 1.1 and 1.2*.	• Sydney Water has prepared this REF in line with the *Significant Impact Guidelines 1.1 and 1.2*.
Greater Sydney Local Land Services (GS LLS)	GS LLS manages the Orchard Hills Offset Area which is adjacent to the WFP.	• Raised concerns over the spread of weeds, non-native plants and planted native vegetation from the site into the adjoining offset area.	• Sydney Water will continue to consult with GS LLS to ensure the proposal does not cause the spread of weeds, non-native plants and planted native vegetation from the site into the adjoining offset area.
		• Discussed sludge lagoon dewatering methodology and raised concerns around the potential for discharges of water to erode and stir up sediment downstream along streamlines.	• Sydney Water will continue to consult with GS LLS around dewatering methodologies.
		• Advised that impacts to large, old trees within the site should be avoided.	• Sydney Water will avoid vegetation clearing where possible.

4.3 Community and stakeholder consultation – proposal

Sydney Water provided the draft REF and relevant supporting documents to the Department of Defence and Greater Sydney Local Land Services (GS LLS) for comment on 3 December 2024. Department of Defence responded on 13 December acknowledging receipt of the documents and no further comments were provided. GS LLS responded on 20 January 2025, with comments outlined in Table 4-2 below along with Sydney Water's response.

Table 4-2 Comments from GS LLS and Sydney Water's response

Comment	Sydney Water Response
General comment GS LLS appreciate the consultation on the proposed works and are broadly supportive of the proposed development and design.	Sydney Water notes GS LLS's general support for the proposal.
APZ considerations The *Bushfire Impact and Risk Assessment* (Cool Burn 2024) recommends that a 20 m buffer would minimise the potential impact from bushfire, but notes '*The maintenance building would not be able to meet the 20 m APZ buffer (final location subject to detail design) however the vegetation near it is less dense, and the existing access track also provides additional fire buffer*' GS LLS does not object to the location of buildings proposed near the perimeter of the proposal site specifically the 'New Maintenance building' near the western fenceline. However, Sydney Water should ensure it is comfortable with the hazard status at this location, as Biodiversity Offset requirements under NSW and Federal regulations restrict vegetation management in the Orchard Hills Offset Area.	Sydney Water notes the potential hazards arising due to the building location. As part of the detail design phase, the location of the building will be determined, taking into account APZ buffers. Sydney Water notes that clearing within the Orchard Hills Offset Area would not be permitted.
Weed management during earthworks GS LLS have been working with Sydney Water and their contractor Blue Tongue Ecosystem Services regarding the management of Chilean Needle Grass weed within the facility. Chilean Needle Grass is an extremely aggressive weed. It has a listed Biosecurity Duty under most districts where it has established but is not presently listed for Penrith LGA as it is still new/emergent in Western Sydney. Chilean Needle Grass thrives on disturbed soil and its seed is readily distributed by earthmoving equipment. GS LLS would encourage pre-works and post-works control of this species to reduce the establishment and spread of this species into the adjoining Orchard Hills Offset Area.	Additional mitigation measures have been added to Section 6.2.3 to minimise the proposal's impacts on the spread of Chilean Needle Grass. The project team has flagged GS LLS's comment with Sydney Water's Natural Assets Team who oversee the environmental management of the Orchard Hills WFP.
Dewatering Considerations: General GS LLS would prefer that dewatering is not undertaken into the Orchard Hills Offset Area. Sydney Water have undertaken water quality testing which indicates the water quality does not significantly exceed guidelines for pH, nutrient, or salinity. However, the release of this volume of water over first-order tributaries on highly sodic soil types presents a high risk of erosion and salinity risks to the Orchard Hills Offset Area, and a high risk of damage to access trails. Some minor gullies downslope of Sydney Water facility stormwater outlets are already actively eroding although these receive only minor, occasional stormwater releases from the	Sydney Water notes the potential impacts to erosion and biodiversity within the Orchard Hills Offset Area. The project team will continue to consult with GS LLS and the Department of Defence during the detail design phase to finalise the location and design of proposed scour points. The project team and Delivery Contractor will continue to consult with GS LLS and the Department of

Comment	Sydney Water Response
facility. A chemical leak from a burst Raw Water Valve in 2023 resulted in a remedial release of raw water at approximately 1L/s (approx. 2 million litres total) into the same minor gullies which dewatering would impact. This flow was sufficient to cause erosion damage and to temporarily close access trails, requiring trail remediation works. The impact of dewatering such a large facility on the biodiversity values and management of the Orchard Hills Offset Area is likely to be considerable. If dewatering is undertaken the full range of opportunities should be pursued to reduce the impact to the biodiversity values of the Orchard Hills Offset Area. GS LLS welcome discussion with Sydney Water to further develop ideas in relation to this matter.	Defence during the delivery phase on construction and dewatering methodologies. Opportunities to reduce the volume of discharge are discussed in Section 6.
Dewatering Considerations: access trail drainage planning The broad region identified for dewatering release is at the highpoint in the landscape. There are no formed creeklines within the Defence Estate in these locations and the release will effectively be overland, crossing a number of access trails within the Orchard Hills Offset Area between the facility and the Northern Road. Access trails including the boundary trail used by Defence Security currently have little or (in most cases) no drainage infrastructure to support a water release. Where trail drainage infrastructure is present further downslope (e.g. Rifle Range Trail) these culverts are designed for the very minor natural flows. These culverts were overwhelmed and trails damaged/closed during the 1L/s raw water release in 2023. GS LLS would appreciate further discussions to consider: • location of proposed dewatering release sites • rates/volume of release • flow capacity of Defence trail drainage infrastructure.	Sydney Water notes the potential impacts to trails within the Defence Estate. The project team will continue to consult with GS LLS and the Department of Defence during the detail design phase to finalise the location and design of proposed scour points. Additional mitigation measures have been added to Section 6.
Dewatering Considerations: avoiding flows to Blaxlands Creek Direct any dewatering into the western catchments (draining toward Northern Road) and not the eastern catchments which drain to Blaxlands Creek/South Creek. The Blaxland/South Creek system is the more intact and biodiverse system within the Orchard Hills Offset Area and supports a breeding population of Platypus and other biodiversity assets.	During construction, water from the decommissioned sludge lagoons may be discharged into the environment which would flow west towards the Northern Road. An additional discharge and scour point may be installed. Its location would be investigated during detail design with consideration of topographical and functional constraints.

Comment	Sydney Water Response
	During operation, the discharge of water would only occur during planned maintenance or emergency incidents. It is anticipated that the volume and frequency of discharge would not increase from existing operations. The project team will continue to consult with GS LLS and the Department of Defence during detail design to finalise the location and design of proposed scour points. Additional mitigation measures have been added to Section 6.
Dewatering Considerations: staggered release over long time periods Staggering water release in discrete 'spurts' over a long time period may reduce impacts on soil and vegetation. High-volume flow can develop headcut erosion in sodic soil systems rapidly (within hours) and should be avoided. Conversely, continuous low-volume flows can smother native vegetation, resulting in topsoil exposure and erosion. Releasing water in short stages spaced with rest periods for soil and vegetation to recover may reduce the impact of releases on biodiversity values.	The project team and Delivery Contractor will continue to consult with GS LLS and the Department of Defence to confirm construction and dewatering methodologies. Additional mitigation measures have been added to Section 6.
Dewatering Considerations: Dewatering Monitoring and Remediation Plan GS LLS is responsible for delivering quantitative improvements to biodiversity metrics ('Offset Objectives') at the Offset Site. This includes quantitative measures of erosion throughout the site, with mandated metrics for the reduction of erosion over time. GS LLS should not be responsible for the cost of remediation for any impacts caused by Dewatering by Sydney Water. If Dewatering is undertaken, a *Monitoring and Remediation Plan* should be developed in consultation between Sydney Water and GS LLS to: • provide for the monitoring of dewatering impacts on Offset metrics; and • provide a framework for remediation to a standard meeting Offset metrics in the event that offset metrics are compromised.	Sydney Water notes GS LLS's statutory commitments to improving the Orchard Hills Offset Area. The Delivery Contractor would prepare a Construction Dewatering Monitoring and Remediation Plan in consultation with GS LLS . The project team has flagged GS LLS's comment with • Sydney Water's Natural Assets Team who oversee the environmental management of the Orchard Hills WFP • the Orchard Hills WFP operations team. Additional mitigation measures have been added to Section 6.

5. Legislative requirements

5.1 Strategic context

Table 5-1 below provides a summary of the strategic plans relating to the proposal.

Table 5-1 Summary of relevant strategic plans

Strategic Plan	Summary	Relevance to the proposal
Western Sydney Regional Master Plan (March 2020)	This plan guides Sydney Water's planning and delivery of essential water services in the Western Sydney growth areas.	The proposal ensures future water supplies are resilient to growth and climate change. The proposal also provides essential water services to support housing and economic growth.
Greater Sydney Water Strategy: Water for a thriving, sustainable and resilient Sydney (August 2022)	This strategy outlines the priorities and actions for delivering essential water services to support a sustainable, liveable and productive Greater Sydney.	The proposal services a growing population in Greater Sydney, ensures future water supplies are resilient to growth and climate change, and improves liveability for communities.
Penrith Local Strategic Planning Statement (LSPS)	Penrith LSPS acknowledges the significant role Sydney Water has to ensure that the growth areas within the LGA can be adequately serviced. It also notes that some of the growth areas, such as the Western Sydney Aerotropolis, currently either lack the water-related infrastructure to cater for growth or are limited in their ability to provide additional capacity.	Sydney Water is planning water infrastructure throughout the region and is delivering critical assets to support the wider network that would service areas of growth. The proposal would allow the Orchard Hills WFP to increase its capacity during poor raw water events. This would improve its reliability in providing water supply to customers.

5.2 Environmental legislation

Sydney Water is the proponent and determining authority under the EP&A Act. The proposal does not require development consent and is not classified as State significant infrastructure. We have assessed this proposal under Division 5.1 of the EP&A Act. This REF has concluded that the proposal is unlikely to have a significant impact on the environment.

The following environmental planning instruments (Table 5-2) and legislation (Table 5-3) are relevant to the proposal. Table 5-3 also documents any licences and permits required, and timing and responsibility for obtaining them.

Table 5-2 Environmental planning instruments relevant to the proposal

Environmental Planning Instrument	Relevance to proposal
State Environmental Planning Policy (Precincts—Western Parkland City) 2021 (Western Parkland City SEPP) Penrith Local Environmental Plan 2010 (Penrith LEP)	The proposal is located on land zoned Primary Production Small Lots (RU4) and Infrastructure (SP2). A small portion is in land zoned Environmental Conservation / Environmental Management (C2).
State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP)	Section 2.159 of the TISEPP permits development by or on behalf of a public authority for water supply without consent on any land. The proposal involves development for the purpose of a water supply system and, as Sydney Water is a public authority, the proposal is permissible without consent.
State Environmental Planning Policy (Biodiversity and Conservation) 2021 (BCSEPP)	The BCSEPP consolidates and updates the provisions from seven former SEPPs for protecting and managing our natural environment. **Vegetation in non-rural areas (Chapter 2)** Chapter 2 of this SEPP aims to protect the biodiversity and amenity value of trees and other vegetation in non-rural areas of the State. The proposal is located in Penrith LGA, which is listed in section 2.3(1)(a), and in part, the zones listed in section 2.3.(1)(b). However, section 2.4(1) states: '*This Policy does not affect the provisions of any other SEPP….*', and as the works are permissible under the TISEPP, a council permit to clear vegetation under this SEPP is not required. **Water catchments (Chapter 6)** Chapter 6 of this SEPP applies as the proposal is within the Hawkesbury-Nepean Catchment, a regulated catchment area. Section 6 of this REF assessed potential environmental impacts on water quality, aquatic ecology, flooding, access, cultural heritage, flora and fauna, and scenic quality. The assessment confirmed that potential impacts are minimal and meet the requirements of part 6.2 of the SEPP. **Strategic conservation planning (Chapter 13)** The Cumberland Plain Conservation Plan (CPCP) protects regionally important habitat and provides biodiversity approvals in the Western Parkland Area and Western Sydney Aerotropolis Growth Area. The proposal area is within land mapped under the CPCP, however it is on 'Excluded land'. As such the planning controls of Chapter 13 do not apply.

Table 5-3 Consideration of key environmental legislation

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places which are considered Matters of National Environmental Significance (MNES). The EPBC Act also applies to any actions occurring on Commonwealth land or which may impact the environment on Commonwealth land. Under the EPBC Act, a referral to the Commonwealth DCCEEW is required for actions that have, will have, or are likely to have a significant impact on MNES or the environment on Commonwealth land. The assessments in this REF have been guided by the *Significant Impact Guidelines 1.1 and 1.2*. One threatened ecological community (TEC) listed as 'critically endangered' under the EPBC Act is present within the proposal area. Several threatened species also have the potential to occur or use habitat within the proposal area. Section 6 provides an assessment of potential environmental impacts. The proposal would not result in a 'significant impact' on any MNES or environment within Commonwealth land. As such, a referral to the Commonwealth DCCEEW is not required.	REF, referral not required	Pre-construction, Sydney Water
Biodiversity Conservation Act 2016 (BC Act)	The BC Act seeks to conserve biological diversity and promote ecologically sustainable development, to prevent extinction and promote recovery of threatened species, populations, and ecological communities and to protect Areas of Outstanding Biodiversity Value (AOBV). One TEC listed as 'critically endangered' under the BC Act is present within the proposal area. Several threatened species also have the potential to occur or use habitat within the proposal area. The proposal area is not within any AOBV. Several portions of the proposal area are located within mapped areas on the	REF	Pre-construction, Sydney Water

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
	Biodiversity Values Map, with some vegetation clearing to occur within these areas. Section 6 provides an assessment of potential environmental impacts. The proposal would not result in a significant impact on threatened entities listed under the BC Act.		
National Parks and Wildlife Act 1974 (NPW Act)	The NPW Act provides for the establishment, preservation, and management of areas such as National Parks, State Conservation Areas, nature reserves and Aboriginal areas. The proposal is not within any of the above areas. Under Section 86 of the NPW Act, it is an offence to desecrate an Aboriginal place or object unless authorised by an Aboriginal Heritage Impact Permit (AHIP), or where it is reasonably determined that no Aboriginal object will be harmed. Section 6 provides an assessment of potential Aboriginal heritage impacts. The proposal avoids impacts on areas of identified Aboriginal heritage.	REF	Pre-construction, Sydney Water
Water Act 1912 / Water Management Act 2000 (WM Act)	Section 60A of the WM Act states that it is an offence to take water without a licence. A Water Access Licence (WAL) is required under Section 61 where groundwater extraction will be greater than 3 megalitres (ML). A Water Supply Works Approval (WSWA) is required under Section 90(2) for all activities that involve dewatering groundwater (e.g. dewatering an excavation such as a trench), irrespective of volume. Section 6 provides an assessment of potential groundwater impacts. Groundwater is unlikely to be encountered by the proposal during dry weather conditions. If groundwater dewatering is later identified as being required, relevant approvals will be acquired prior to dewatering.	WSWA (for <3ML) and WAL (for >3ML)	If known during planning, post REF, Sydney Water If unknown, pre-construction, Delivery Contractor

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
Biosecurity Act 2015	The *Biosecurity Act 2015* identifies priority weeds and assigns strategies for their containment, removal, or management. Section 6 provides an assessment of potential environmental impacts. Several priority weeds were recorded within the proposal area. Suitable mitigation measures have been provided to appropriately manage weeds within the proposal area in accordance with the Act.	REF	Pre-construction, Sydney Water

6. Environmental assessment

This section describes the existing environment and assesses direct and indirect impacts of construction and operation of the proposal. It also identifies mitigation measures to minimise impacts. These will be incorporated into contract documents and a Construction Environmental Management Plan (CEMP), or similar, prior to starting work.

6.1 Existing environment

The proposal is located at the Orchard Hills WFP, located at the end of The Chase, Orchard Hills NSW which is within the City of Penrith LGA. The Orchard Hills WFP and the proposal is within land owned by Sydney Water, and land owned by the Department of Defence and leased to Sydney Water.

The proposal is located on land zoned Primary Production Small Lots (RU4) and Infrastructure (SP2). A small portion is located in land zoned Environmental Conservation / Environmental Management (C2). To the east, south and west, the Orchard Hills WFP borders the Orchard Hills Offset Area. This area has been set aside by the Department of Defence to provide biodiversity offsets for development of the Western Sydney International Airport. To the north, the land is predominantly characterised by its rural and residential setting.

The Northern Road (A9) is located to the west of the proposal and the Western Motorway (M4) is located to the north.

The area historically appears to have been used as farmland before the construction of the Orchard Hills WFP. Some remnant vegetation remains within the site, particularly in the northeast. [redacted]

This information has been redacted to protect sensitive Aboriginal heritage information

The existing environment is described further below.

6.2 Environmental aspects, impacts and mitigation measures

6.2.1 Topography, geology and soils

Topography, geology and soil environmental impacts were identified through desktop assessments, on-site investigations, sampling and laboratory testing. Several specialist assessment reports were prepared by Jacobs to support this REF:

- Geotechnical Factual Report (Revision B) (Jacobs 2024b)
- Geotechnical Interpretative Report (Jacobs 2024c)
- Baseline Contamination Assessment (Jacobs 2024d).

The study areas of the above reports do not include the Compound E area or the alternative pipeline alignment area. If any additional impacts beyond those identified in this REF are likely, a REF addendum will be prepared.

6.2.1.1 Existing environment

Topography

The topography of the general area involves large areas of flat ground, interspersed with steep changes in topography. Elevations within the proposal area range between 80 m to 97 m Australian Height Datum (AHD).

Geological landscape

The geological landscape is classed as Bringelly Shale which is characterised by highly plastic clays.

Soil landscape

The soil landscape is classed as the Blacktown Soil Landscape which is characterised by gently undulating rises on Wianamatta Group shales.

Acid sulfate soils

The proposal is not in an area impacted by Acid Sulfate Soils (ASS) (Acid Sulfate Soils Risk dataset, NSW DCCEEW).

Salinity

The Sydney Hydrogeological Landscapes Land Salinity Map indicates that the proposal is located within the Upper South Creek Hydrogeological Landscape. This landscape generally has high levels of land salinity, particularly the Blacktown Soil Landscape. Anecdotally, through consultation with the GS LLS, soils within the proposal area and adjoining Orchard Hills Offset Area are highly sodic.

Mining title

The proposal is not in an area impacted by an existing exploration or mining title (NSW Exploration and Mining Titles dataset, Department of Regional NSW).

6.2.1.2 Potential impacts

Construction phase

During construction, the main potential impacts to topography, geology and soils are erosion and sedimentation.

Construction works will involve ground disturbing activities, temporary stockpiling of excavated materials, and some vegetation removal. An estimated 1,200 m^3 of soil will be excavated. In addition, there may be uncontrolled fill present on site where the pre-treatment structure is proposed. This will be replaced with compacted, engineered fill at an estimated volume of 18,000 m^3. Excavated material will be temporarily stockpiled on site before being used to backfill or disposed of offsite at an appropriate waste handling facility. Excavation works may temporarily alter localised surface topography and drainage conditions. The impacts of surface water drainage and flooding are assessed in Section 6.2.2.

Rainfall or high wind would potentially result in runoff from any stockpiled material or erosion of excavated sections into adjacent land and waterways. Excavated material will be stockpiled as far as practicable from steep slopes to minimise potential erosion and runoff impacts.

Operational phase

The construction of structures and buildings, excavation, filling and levelling will have some permanent changes to the topography and drainage patterns in the area. The impacts of surface water drainage and flooding are assessed in Section 6.2.2.

Higher levels of salinity may increase maintenance requirements and decrease the lifespan of the proposal due to the potential corrosive effects. Salt-resistant materials will be considered during the detail design phase.

Maintenance works will be carried out according to maintenance schedules, the Property Environmental Management Plan (PEMP) or in response to emergencies. These works would generally be minor and be unlikely to have more than a minor impact on topography, geology or soils.

6.2.1.3 Mitigation measures

With the implementation of the mitigation measures below, potential impacts to topography, geology and soils during construction and operation can be adequately managed. Residual impacts are expected to be minor and temporary.

Table 6-1 Environmental mitigation measures — topography, geology and soils

Mitigation measures
Prevent sediment moving offsite in accordance with Managing Urban Stormwater, Soils and Construction, Volume 1 and 2A (Landcom 2004 and DECC 2008), including, but not limited to: • develop a Soil and Water Management Plan (SWMP) as part of the CEMP • divert surface runoff away from disturbed soil and stockpiles • install sediment and erosion controls before construction starts • reuse topsoil where possible and stockpile separately • inspect controls at least weekly and immediately after rainfall • maintain and rectify damaged controls immediately • remove controls once surfaces have been stabilised, including removing trapped sediment in drainage lines.
Include a Stockpile Management Plan (SMP) as part of the SWMP to adequately manage any proposed temporary and permanent stockpiles. This would include detail on: • exact location of stockpiles • minimising stockpile size • height, slopes and batters preventing mixing and cross contamination • consideration of future maintenance • capping • erosion and sediment control

Mitigation measures
• restoration. The SMP will be prepared by the Delivery Contractor and approved by the Sydney Water Project Manager in consultation with the Environmental Representative and the Contamination and Hazardous Materials Team.
Minimise ground disturbance and stabilise disturbed areas progressively.
The Delivery Contractor is to ensure imported material is Virgin Excavated Natural Materials (VENM) or meets a relevant NSW EPA Resource Recovery Order and Resource Recovery Exemption or is a commercially supplied material that is not waste. If using materials that are subject to a NSW EPA Resource Recovery Order / Exemption, the Delivery Contractor must ensure the conditions in that Order / Exemption are strictly adhered to.
Stop work in the immediate vicinity of suspected contamination. Indicators of contamination include discoloured soil, anthropogenic material within fill, asbestos, chemical or petrol odours and leachate. Contain disturbed material on an impermeable surface and cordon areas off. Notify the Sydney Water Project Manager and the Environmental Representative (who would contact Contamination and Hazards Materials Team) to agree on proposed management approach.
Stop work during heavy rainfall or in waterlogged conditions when there is a risk of sediment loss off site.
Sweep up any sediment/soil transferred off site at least daily, or before rainfall.
Eliminate ponding and erosion by restoring natural landforms to the pre-works condition.
Vehicle and machinery movement to be confined to designated tracks, pathways and work areas and keep to sealed areas where possible.
If excavated material or equipment is left on site overnight, ensure it is covered and adequately contained.
Adopt appropriate soil salinity mitigation measures in accordance with the Western Sydney Salinity Code of Practice (Western Sydney Regional Organisation of Councils, 2003). This may include: • treat existing salinity with gypsum • establish salt tolerant species in existing or potential salinity problem areas after construction • stabilise existing areas of erosion • minimise water use on site • avoid rotation and vertical displacement of the original soil profile • backfill excavations deeper than one (1) metre in the same order or treat or use this material as fill at depths more than (one) 1 metre from the finished level.
Use of salt-resistant materials are to be considered during the detail design phase.

6.2.2 Water and drainage

Water and drainage environmental impacts were identified through desktop assessments, on-site investigations, sampling and laboratory testing. Several specialist assessment reports were prepared by Jacobs to support this assessment including:

- Appendix D – Flood assessment report
- Geotechnical Interpretative Report (Jacobs 2024c)
- Water quality of the concrete lined lagoon within the Orchard Hills WFP Reliability Upgrade Project Area (Jacobs 2024e).

The study area of the flood assessment report does not include the Compound E area or the alternative pipeline alignment area. If any additional impacts beyond those identified in this REF are likely, a REF addendum will be prepared.

6.2.2.1 Existing environment

Surface water

There are no creeks or rivers within the proposal area however, there are several existing concrete-lined, artificial sediment lagoons within the Orchard Hills WFP. Three decommissioned sludge lagoons are within the proposal area. A water sample was collected from the surface of one of these lagoons and tested. Results were analysed in accordance with the Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality (2018). There were minimal exceedances of ammonia, total nitrogen and phosphorus, however, overall the water quality was found to comply with the ANZG (2018) criteria.

The Orchard Hills WFP is located at a high point in the landscape and is between 80 m to 97 m AHD. As such, all surface water flows flow downstream into surrounding tributaries. There are no external surface water flows into the proposal area. There are 10 onsite catchments which converge into two main drainage lines:

- Drainage lines from the west of the Orchard Hills WFP boundary flow to Surveyors Creek about 2.5 km northwest of the site. Surveyors Creek flows into Peach Tree Creek about 5 km northwest of the site. Peach Tree Creek flows into the Hawkesbury-Nepean River at Penrith about 7 km northwest of the site.
- Drainage lines from the southeast of the site boundary flows to Blaxland Creek about 3 km east of the site. Blaxland Creek flows into South Creek about 5 km northeast of the site. South Creek flows into the Hawkesbury-Nepean River about 25 km northeast of the site.

No water quality data was available for the drainage lines and creeks, but given the largely pastoral, urban or industrial surroundings downstream of the site, water quality would generally be influenced by stormwater runoff.

Flooding

The proposal is not located within mapped flood prone land.

Groundwater

Historical groundwater boreholes about 2 km north, west and south of the proposal show the presence of groundwater between 3.18 m below ground level (mbgl) to 30 mbgl. Groundwater was monitored in the

proposal area in May and June 2024. Results indicated that groundwater levels were highest near the decommissioned sludge lagoons, around 4 mbgl, and lower in the north of the proposal area, around 9 mbgl.

The nearest Groundwater Dependent Ecosystems (GDEs) are about 500 m to the southwest of the proposal. These are classified as low and medium condition.

6.2.2.2 Potential impacts

Construction phase

As the proposal is located at a high point in the landscape, there are no external sources of water flow. During construction, there may be minor changes in topography and impervious areas however, works are unlikely to significantly obstruct or redirect flows.

Surface water

A dewatering hardstand area to the north of the decommissioned sludge lagoons will be set up (see Figure 3-1). Dewatering of up to three of the decommissioned sludge lagoons may be required and may be discharged into the environment. The sludge will be deposited into a truck to be disposed of offsite. As the decommissioned sludge lagoons are in the western catchment, water being discharged to the receiving environment would likely flow to the west and into Surveyors Creek, following it north to the Hawkesbury-Nepean River. Initial tests show that water from the lagoons generally meets the ANZG (2018) criteria. Water from the decommissioned sludge lagoons would therefore be unlikely to impact downstream water quality and unlikely to impact GDEs and aquatic ecology. Following the implementation of mitigation measures, dewatering the decommissioned sludge lagoons is unlikely to exacerbate erosion or deteriorate downstream water quality through sedimentation.

Additionally, an estimated 9 ML of water will be used for testing and commissioning of the pipelines and concrete structures before they are connected to the Orchard Hills WFP. Water from these activities may be discharged into the environment. Some water may flow to the east, into Blaxland Creek, subject to the final location of water discharge and discharge methodology. Water from testing the pipelines and concrete structures may have high pH due to concrete leaching and will be tested before being discharged. Given the large volume of water, there is potential for erosion, scouring, vegetation smothering and trail closure impacts downstream within the adjoining Orchard Hills Offset Area. Any discharge during construction will be carried out in accordance with the mitigation measures, in consultation with GS LLS and will follow the Sydney Water Discharge Protocol.

There are potential opportunities to reuse water and reduce the volume discharging into the environment. Opportunities include reintroducing the discharged water to the Orchard Hills WFP, into a decommissioned sludge lagoon (if not all are dewatered), into the new detention basin, or discharging water offsite into local dams (in consultation with the landowners). This would minimise potential downstream water quality, scour and sedimentation impacts.

Contamination

Contamination from spillage or inappropriate storage of chemicals and fuels for construction may impact surrounding water quality. In general, small quantities of fuels and other chemicals will be used on site

including diesel generators, plant and machinery. The potential for spills and downstream impacts will be minimised through the implementation of mitigation measures.

Groundwater

Groundwater is not likely to be encountered in the construction phase during dry weather conditions. Groundwater may be encountered when open trenching during periods of wet weather, however large volumes of groundwater are unlikely to be encountered given the elevation of the WFP from the surrounding landscape. Ongoing monitoring of groundwater within the proposal area will occur during the proposal's detail design phase to determine the need for a WSWA and WAL. If required, a WSWA and WAL will be obtained prior to construction and a Dewatering Management Plan prepared in accordance with the mitigation measures.

GDEs

Water movement from the site is likely to flow west and then north into Surveyors Creek and the Hawkesbury-Nepean River. Nearby GDEs are to the southwest of the proposal area and mapped as low and medium condition. Given the water quality and location of the GDEs, potential impacts to GDEs are likely to be negligible.

Operation phase

Surface water modelling predicted an overall minor increase in the volume of stormwater runoff during operation. This is due to the removal of the decommissioned sludge lagoons. This is partially offset by the pre-treatment open-top structures that provide some collection of rainwater.

Modelling shows that during a 50%, 5% and 1% Annual Exceedance Probability (AEP) event, runoff would increase by 11%, 8% and 7% respectively (Appendix D – Flood assessment report). The model shows that a 300 m^3 detention basin would be needed to capture the runoff during 50% and 5% AEP events and a 850 m^3 detention basin for a 1% AEP event. As such, a 850 m^3 detention basin (about 20 m wide by 30 m long by 1.5 m deep) is proposed in approximately the location of the decommissioned sludge lagoons (Figure 3-1). The final size and location of the detention basin will be determined during the detail design phase. Overflows from the basin will be discharged via an existing headwall and culvert which directs flows west to Surveyors Creek and towards the Hawkesbury-Nepean River.

Routine maintenance activities are unlikely to impact flood behaviour, surrounding waterways and water quality.

New scour points on pipelines may be installed which may increase overflows into some areas of the adjoining Orchard Hills Offset Area during emergencies or maintenance activities. This may cause downstream impacts such as erosion and vegetation smothering. As this is likely to occur very infrequently, and given the below mitigation measures are implemented, the potential impacts are unlikely to be significant.

6.2.2.3 Mitigation measures

With the implementation of the mitigation measures below, impacts to water and drainage can be adequately managed, and residual impacts are expected to be minor and temporary.

Table 6-2 Environmental mitigation measures — water and drainage

Mitigation measures
If dewatering is required, a groundwater WSWA would be obtained. No dewatering is to occur until the WSWA is obtained.

The Delivery Contractor is responsible for:
• preparing all application materials prior to construction and supplying these to Sydney Water with appropriate lead time. These application materials include, but are not limited to:
  ○ a Dewatering Management Plan
  ○ dewatering calculations, with appropriate justifications (i.e., groundwater assessment report or memo, expert hydrogeological technical information)
  ○ approval application form/s
• complying with the conditions of the approvals (such as protecting water quality; minimising aquifer extraction volumes, monitoring extraction with flow meters and recording volumes).

Where dewatering is >3ML per water year (from 1 July), a Water Access Licence would be obtained.
If the proposal footprint increases (or reduces) from the study area that is assessed in Appendix D – Flood assessment report, further assessment is required to confirm detention basin sizing.
Bund potential contaminants and store on robust waterproof membrane, away from the decommissioned sludge lagoons and drainage lines. All chemicals and fuels to be labelled, transported and used in accordance with Australian Standards and in line with best practices.
Locate portable site amenities, chemical storage and stockpiles of erodible materials away from the decommissioned sludge lagoons and drainage lines.
If dewatering into the receiving environment is required, establish a water quality monitoring program to monitor water quality of the sludge lagoons and drainage lines including testing of lagoons prior to dewatering to ensure water quality meets ANGZ (2018) criteria.
The Delivery Contractor will be responsible for any erosion that occurs as a direct result of dewatering activities during construction.

Dewater in accordance with the Sydney Water Discharge Protocols. Prepare a Dewatering Management Plan, including consideration of the following:
• explore potential opportunities to minimise the volume of water to be discharged into the environment, including opportunities to reuse water
• location of proposed dewatering release sites
• rates and volumes of dewatering e.g.
  ○ a slow rate of discharge
  ○ short bursts of high volume discharge spaced with rest periods
• dewatering to occur during wet periods to minimise stirring up of sediments downstream

Mitigation measures

- conduct regular checks of the discharge location and downstream areas for possible soil erosion and flooding
- discharge through a geotextile sock or over an energy dissipater.

If dewatering involves discharge into the surrounding Orchard Hills Offset Area, consult with GS LLS regarding proposed mitigation measures in the Dewatering Management Plan.

Prepare a Construction Monitoring and Remediation Plan to:

- assess the conditions of tributaries and waterways prior to dewatering
- monitor construction dewatering impacts on tributaries and waterways to allow new impacts from discharge to be easily identified and avoid any ambiguity
- provide a framework for remediation.

During the detail design phase, consider the following to minimise potential downstream impacts during operation:

- number, type and location of new scour locations, and energy dissipation structures
- directing flows to existing scour points instead of installing a new scour point
- directing flows to the western catchment.

Keep functioning spill kits on site.

No equipment, machinery or work vehicles to be washed or refuelled on site unless within a designated washout area with appropriate controls.

6.2.3 Flora and fauna

Flora and fauna impacts were identified through desktop assessments and on-site investigations. Specialist assessment reports were prepared to support this REF including:

- Appendix E – Biodiversity assessment report
- Cool Burn – Orchard Hills Water Filtration Plant Reliability Upgrade Project – Bushfire Impact and Risk Assessment (Cool Burn 2024).

The study area for the biodiversity assessment report and the bushfire impact and risk assessment does not include the Compound E area or the alternative pipeline alignment area. If any additional impacts beyond those identified in this REF are likely, a REF addendum will be prepared.

6.2.3.1 Existing environment

Vegetation

Existing vegetation was ground-truthed during field surveys and identified two plant community types (PCTs) within the proposal area. Of these, one PCT is associated with a TEC which is protected under the BC Act

and the EPBC Act. The vegetation communities are summarised in Table 6-3 below and shown in Figure 3-2.

Table 6-3 Vegetation communities within the study area*

PCT	Description	Associated TEC	Area within study area*
3320 Cumberland Shale Plains Woodland	There is about 0.36 ha of high quality PCT 3320 vegetation. It has a canopy dominated by *Eucalyptus moluccana*, no mid-storey, and a diverse ground storey. Historical aerial imagery shows that several of the trees are considered remnant. There is about 2.83 ha of moderate quality PCT 3320 vegetation. It has a canopy of *Eucalyptus moluccana*, *E. tereticornis* and *Corymbia maculata*. There is generally no mid-storey however where there is, it is dominated by exotic species. Historical aerial imagery shows that most of the trees were planted in the early 1990s. PCT 3320 provides foraging and sheltering habitat for various woodland birds, mammals, and reptiles. The predominantly eucalyptus canopy provides flowering and fruiting food resources for many fauna species. Much of the open grasslands are managed (e.g. mown). As such, leaf litter and timber are frequently removed.	Cumberland Plain Woodland in the Sydney Basin Bioregion – Critically Endangered (BC Act) Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest – Critically Endangered (EPBC Act)	3.19 ha
4023 Coastal Valleys Riparian Forest	The vegetation around the decommissioned sludge lagoons and a small patch in the southeast of the proposal area is dominated by *Casuarina glauca*. As the ground storey is dominated by exotic species, this PCT in the proposal area is considered low quality.	NA	1.07 ha

* Study area as shown on Figure 1-1 in Appendix E.

Habitat features

Ten hollow bearing trees and (one) 1 stag tree were recorded across the site (Figure 4-1, Appendix E). No nests were observed.

Riparian vegetation and waterways

The decommissioned sludge lagoons within the proposal area are surrounded by PCT 4023. The lagoons are concrete-lined, however the riparian vegetation growing around them are embedded in silt and sediment. The lagoons and riparian vegetation likely provides opportunistic habitat for fauna.

Threatened fauna

Vegetation surrounding the decommissioned sludge lagoons and along the south of the proposal area is mapped within the Swift Parrot NSW important area habitat mapping (Figure 4-1, Appendix E). This was ground-truthed and determined that the vegetation around the lagoons is not consistent with the Swift Parrot's important habitat mapping criteria.

Three Grey-headed Flying-fox (GHFF) camps are located within 10 km of the proposal area. The vegetation within the proposal area is considered opportunistic foraging habitat for the GHFF.

The Cumberland Plain Land Snail (CPLS) was not detected during the ecological survey carried out for the REF, or during previous surveys carried out within the Orchard Hills WFP site.

No threatened fauna species were observed during the field surveys.

Threatened flora

There is a population of *Marsdenia viridiflora* subsp. *viridiflora* in the north-eastern portion of the site. This population occurs within a high quality patch of PCT 3320 and is outside of the proposal area.

No other threatened flora species were recorded during the field surveys and are likely to be absent from the proposal area. However, *Micromyrtus minutiflora* and *Pimelea spicata* have specific survey requirements and their absence cannot be confirmed. As such, they have been assumed present and assessed by a Test of Significance (TOS) under the BC Act and an Assessment of Significance (AOS) under the EPBC Act.

Weeds

Several priority weeds or Weeds of National Significance are within the site. The majority of weeds are located within gullies in the south of the site and outside the proposal boundary. No signs of pathogens or dieback was observed during the field survey. Weeds on site include:

- *Ludwigia pruviana* (Ludwigia)
- *Nasella neesiana* (Chilean Needle Grass)
- *Olea europaea* subsp. *cuspidate* (African Olive)
- *Opuntia* sp. (Prickly Pear)
- *Rubus fructicosus* subsp. *fructicosis* (Blackberry)
- *Senecio madagascariensis* (Fireweed).

Biodiversity Offset sites

To the south, east and west, the site borders areas owned by the Department of Defence for the purposes of biodiversity offsetting. The Orchard Hills Offset Area provides biodiversity offsets for significant impacts from the development of the Western Sydney International Airport.

Biodiversity Values Map

Vegetation surrounding the decommissioned sludge lagoons (validated as PCT 4023) and along the southwestern border of the proposal area (validated as PCT 3320) are mapped on the Biodiversity Values (BV) Map. They are listed as "Threatened species of communities with potential for serious and irreversible impacts."

Bushfire prone land

The southern portion of the proposal area is mapped as bushfire prone land. The southwest boundary is within Vegetation Category 1 land, the eastern boundary is within Vegetation Category 2 and a 100 m buffer around these two areas is mapped as Vegetation Buffer.

According to the Bushfire Impact and Risk Assessment (Cool Burn 2024), Penrith LGA has a Fire Danger Index of 100 in Forest and 130 in Grassland. The main sources of bushfire ignition are illegal burning, arson and lightning.

Key Fish Habitat

There are no Key Fish Habitat (KFH) within the proposal area or immediate surrounds. The nearest mapped KFH is Claremont Creek about 1.2 km to the north.

6.2.3.2 Potential impacts

Construction phase

Vegetation

During construction, vegetation clearing is required in the proposal area including:

- compound areas
- around the decommissioned sludge lagoons where the pre-treatment structure is proposed
- the detention basin location
- the new maintenance building location.

The clearing of vegetation would permanently remove localised patches of vegetation. These impacts are on the edge of the larger (>100 ha) connected patch of the adjoining Orchard Hills Offset Area. As such, the vegetation within the site and proposal are likely to be opportunistic habitat, food resource and breeding sites on the edge of this larger adjacent patch.

About 1.79 ha of native vegetation will require removal, occurring within moderate condition PCT 3320 and low condition PCT 4023. About 0.81 ha of TEC will be impacted. Minor trimming of adjacent vegetation may also be required to manage overhanging branches where present. The estimated amount of vegetation removal is summarised in Table 6-4 below.

Table 6-4 Vegetation removal within the proposal area

PCT	Vegetation condition	Associated TEC	Vegetation removal
3320 Cumberland Shale Plains Woodland	Moderate	Cumberland Plain Woodland in the Sydney Basin Bioregion – Critically Endangered (BC Act) Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest – Critically Endangered (EPBC Act)	0.81 ha

PCT	Vegetation condition	Associated TEC	Vegetation removal
4023 Coastal Valleys Riparian Forest	Low	NA	0.97 ha
Non-native vegetation ('urban natives and exotics' in Figure 3-2)	Planted urban natives, planted exotics, weeds, open grasslands / mown lawns.	NA	2.23 ha

In accordance with the BC Act, the impacts to TEC were assessed in a TOS. Similarly, in accordance with the EPBC Act *Significant Impact Guidelines 1.1,* the impacts to TEC were assessed in an AOS. The assessments concluded that the removal of TEC would not result in fragmentation and loss of connectivity with the wider locality and would not be significantly impacted by the proposal (refer Appendix E – Biodiversity assessment report).

About 2.23 ha of 'urban native and exotic' vegetation within the proposal area may be removed (Table 6-4). Compound E was not assessed, however based on aerial imagery and site photographs, it is assumed to be disturbed grassland under the 'urban natives and exotics' category. During construction, most of the disturbance will be a temporary impact to grassed areas due to their use as temporary construction compound sites.

An additional area behind the existing maintenance building has been identified as a potential alternative location for the new pipeline. A construction corridor, about 15 m wide may be required and may result in the removal of additional vegetation. The area mapped here is moderate quality PCT 3320 and is also a TEC. The proposal footprint will be refined during the detail design phase and additional assessment, including updated TOS, AOS and offset calculations, will be carried out if the impact footprint extends to this area.

The proposal area will be restored at the end of construction and vegetation will be replanted in accordance with Sydney Water's voluntary Biodiversity Offset Guideline (SWEMS0019.13). Revegetation will be prioritised on site where possible and will be carried out in consultation with landowners and stakeholders. Restoration would provide an overall positive impact to native vegetation. As outlined in Appendix E – Biodiversity assessment report:

- 3:1 offset ratio is to be applied for PCT 3320, resulting in 2.44 ha of offset required
- 2:1 offset ratio is to be applied for PCT 4023, resulting in 1.95 ha of offset required
- 1:1 offset ratio / 1:1 replacement of any trees removed in 'urban natives and exotics' mapped areas
- 2:1 offset ratio is to be applied for the removal of any tree hollows, resulting in the installation of 2 nest boxes or salvaged hollows for each hollow removed. Hollows are to be salvaged where possible.

Given the above, and the implementation of mitigation measures, the overall native vegetation impact would not be significant.

Habitat features

One hollow bearing tree is located within the proposal area (Figure 3-2). Several others are immediately adjacent to the proposal boundary and may be indirectly impacted. As the site is located adjacent to the Orchard Hills Offset Area, the habitat features within the proposal area are considered opportunistic. Sydney Water's voluntary Biodiversity Offset Guideline will be implemented which would result in the reinstatement of two hollows per hollow removed. Hollows will be salvaged and reused over nest boxes where possible. All other identified hollow bearing trees and the stag tree will be avoided where possible. As such, the removal of habitat features would have a minimal impact on fauna and will be restored following construction.

Riparian vegetation and waterways

Up to three decommissioned sludge lagoons will be infilled which would result in the removal of opportunistic foraging vegetation (classified as low condition PCT 4023) and a water source for fauna. The decommissioned lagoons are isolated from waterbodies in the surrounding area and are unlikely to provide valuable habitat for the endangered Green and Golden Bell Frog (GGBF) or other amphibians, birds or reptiles. A detention basin will be constructed likely within the proposed Compound A area, near the existing decommissioned sludge lagoons (Figure 3-1). This would provide an ongoing, opportunistic water source for any fauna on site. Some riparian vegetation removal around the decommissioned sludge lagoons is unlikely to result in a significant impact due to the lack of connectivity with other waterways and riparian vegetation. The dewatering of the lagoons and removal of PCT 4023 is therefore unlikely to impact threatened and native fauna.

It is possible that fauna use the decommissioned sludge lagoons as opportunistic habitat and a water source. As such, fauna may be present during dewatering and vegetation clearing. An ecologist will be required to be on site during vegetation clearing and dewatering to relocate any fauna.

Clearing of vegetation in and around the decommissioned sludge lagoons may stir up sediments that have settled. The potential contamination impacts are assessed in Section 6.2.8 below.

Threatened flora and fauna

CPLS were not identified within the site during survey efforts in 2024 and 2022. While some suitable habitat is present, they are isolated patches across the site and are fragmented from larger suitable habitat patches in the adjacent Orchard Hills Offset Area. Therefore impacts to the CPLS are unlikely.

The vegetation surrounding the decommissioned sludge lagoons is mapped as important habitat for the Swift Parrot. However, it has been ground-truthed and validated as low condition PCT 4023 (Appendix E – Biodiversity assessment report, see Figure 4-1). As documented in the National Recovery Plan for the Swift Parrot, suitable habitat includes eucalypt woodlands with large mature flowering eucalypt trees. The vegetation around the decommissioned sludge lagoons is dominated by *Casaurina glauca* and does not contain any keystone eucalypt species or other foraging species likely to provide suitable habitat for the Swift Parrot. Despite being mapped as important habitat for the Swift Parrot, the BAR determined that the vegetation surrounding the decommissioned sludge lagoons is not considered suitable habitat. Removal of the low condition PCT 4023 vegetation around the lagoons is therefore unlikely to impact the Swift Parrot.

The moderate condition PCT 3320 in the southern part of the proposal area is also mapped as important habitat areas for the Swift Parrot (Appendix E – Biodiversity assessment report, see Figure 4-1). PCT 3320 conforms to the preferred habitat of Swift Parrot. Construction activities in the southern part of the proposal

area include demolishing the old maintenance building, constructing the new maintenance building and constructing new pipelines. These activities may involve some clearing of PCT 3320 and mapped habitat for Swift Parrots. This vegetation provides suitable foraging habitat for the Swift Parrot however, it is adjacent to high quality habitat in the Orchard Hills Offset Area. Clearing of this vegetation is restricted to the edge of the WFP boundary and is at the periphery of the high quality vegetation within the larger landscape. Vegetation removal would not result in the fragmentation of habitat throughout the wider area. A TOS and an AOS were conducted for the Swift Parrot and concluded that given the above and that vegetation will be rehabilitated after construction, the proposal is unlikely to significantly impact the Swift Parrot.

The alternate pipeline location is also within mapped Swift Parrot habitat. The proposal footprint will be refined during the detail design phase and additional assessment, including updated TOS, AOS and offset calculations, will be carried out if the impact footprint extends to this area.

During construction, noise, vibration, and emissions associated with vegetation clearing, excavations and personnel movements may temporarily disturb local fauna. There is also the potential for direct strikes to fauna if encountering machinery and vehicles. Local fauna are likely to be mobile species such as kangaroos, birds and snakes. An ecologist will be on site during vegetation clearing to relocate any fauna. As these indirect impacts are localised and within an existing operational facility, overall, the proposal is likely to have a minimal impact on local fauna.

There is a population of *Marsdenia viridiflora* subsp. *viridiflora* in the north-eastern portion of the site. However, this population is located over 200 m from the proposal area and would not be impacted by the works.

In Appendix E – Biodiversity assessment report, in accordance with the BC Act, TOS's were carried out for the Swift Parrot, GGBF, microbats and woodland flora. The TOS's concluded that the proposal would not be likely to have a significant impact. Similarly, in accordance with the EPBC Act and the *Significant Impact Guidelines 1.1*, AOS's were carried out for the Swift Parrot, GGBF, *Micromyrtus minutiflora* and *Pimelea spicata*. The AOS's concluded that the proposal would not be likely to have a significant impact and referral to the federal Minister for the Environment would not be required.

In addition, with the implementation of mitigation measures, the proposal is unlikely to impact threatened species.

Overall, due to the localised nature of vegetation impacts and the extensive presence of higher quality habitat in the adjacent Orchard Hills Offset Area, impacts to threatened flora are likely to be minor. The works are unlikely to result in a significant impact on any threatened species or populations.

Weeds

Two weed infestations, containing several priority weeds are located adjacent to the proposal area (see Figure 3-2). Identified weeds include Chilean Needle Grass (*Nassella neesiana*), Prickly Pear (*Opuntia* sp.), Blackberry (*Rubus fruticosus* subsp. *fruticosis*) and Fireweed (*Senecio madagascariensis*). The identified weed infestation areas would not be directly disturbed by the proposal as they are outside of the proposal area. Mitigation measures would be implemented to minimise potential indirect impacts to the weed infestations.

A Property Environmental Management Plan (PEMP) for the site will be developed and implemented by Sydney Water, likely in 2026, with the priority action being weed removal and management.

It is understood that Sydney Water (existing operation teams at Orchard Hills WFP) has been working with the GS LLS to remove and manage Chilean Needle Grass. During construction, the movement of soil, plant and machinery and surface water run off may cause the movement and spread of weeds within the WFP and into the adjoining Orchard Hills Offset Area.

Following implementation of mitigation measures, the potential spread of weeds within the site or to the adjoining Orchard Hills Offset Area will be adequately minimised and managed during construction.

Biodiversity Offset sites

The proposed works would not clear native vegetation beyond the boundaries of the Orchard Hills WFP. Given the localised nature of vegetation removal and implementation of mitigation measures, the proposed works are not likely to impact the adjoining Orchard Hills Offset Area.

Biodiversity Values Map

Vegetation around the decommissioned sludge lagoons and southern portion of the proposal area were mapped on the Biodiversity Values Map for its Cumberland Shale Plains Woodland biodiversity value and important habitat for the Swift Parrot biodiversity value.

As assessed above, vegetation removal around the decommissioned sludge lagoons (validated as PCT 4023) would not result in removal of Cumberland Shale Plains Woodland or important habitat for the Swift Parrot.

Minimal vegetation removal is proposed in the southern portion of the proposal area, within the mapped Biodiversity Values area. The impact on the vegetation in this area has been assessed as part of the TOS and AOS. The assessments concluded that a significant impact is unlikely.

Bushfire prone land

Given the peri-urban landscape with grassland and woodland surrounding the proposal, there is potential for bushfire to occur. During construction, some hot works will be required and will be conducted away from vegetation or other flammable sources. Works would not occur during TOBAN days in accordance with the mitigation measures. Temporary construction and laydown areas do not require an APZ and the proposed compound areas will generally be buffered from nearby vegetation by existing cleared areas, tracks, roads and vegetation clearing during site establishment. Given the implementation of mitigation measures, the impact of bushfire on the construction of the proposal will be minor. Similarly, the impact of the construction of the proposal on bushfire risk will be minor.

Key Fish Habitat

During construction, vegetation clearing, and excavations would increase the risk of localised erosion, sedimentation, and pollution runoff into small drainage lines and sediment ponds. However, with the implementation of mitigation measures, potential impacts to these adjacent habitats is unlikely. This is further assessed in Sections 6.2.1 and 6.2.2. As such, the works are not expected to result in any impacts to downstream environments or KFH.

Operation phase

During the operational phase, regular site maintenance such as weed management and lawn mowing would occur in accordance with maintenance schedules or the PEMP. Weed management activities would occur under the PEMP and bring a positive impact to the site.

The clearing of vegetation would permanently increase edge effects to vegetation within the proposal area. This would increase light and noise penetration to a minor degree. After construction, revegetation would occur in accordance with the mitigation measures and Sydney Water's voluntary Biodiversity Offset Guideline (SWEMS0019.13). This would increase vegetation overall and bring a positive impact to biodiversity within the site.

As part of the detail design, a 20 m APZ will be implemented where possible which allows the proposal to avoid flame contact and exposure to excessive radiant heat. Where the proposal is unable to maintain appropriate APZ distances, alternate design solutions would be considered. The location of buildings and assets would be finalised during the detail design phase. Given the distances are met or design solutions implemented, the proposal will therefore be unlikely to impact on bushfire.

As the Orchard Hills WFP is already an operational facility, and given the implementation of mitigation measures, impacts to flora and fauna during operation are unlikely.

6.2.3.3 Mitigation measures

With the implementation of the mitigation measures below, potential construction and operation impacts to flora and fauna can be adequately managed, and residual impacts are expected to be minor and temporary.

Table 6-5 Environmental mitigation measures — flora and fauna

Mitigation measures
If the proposal footprint changes from the study area that is assessed in Appendix E – Biodiversity assessment report, further assessment would be required. This may include recalculating TOS, AOS and offset ratios.

Provided it is essential for delivering the project, Sydney Water's Project Manager can approve the following vegetation removal and tree trimming, without additional environmental assessment (but only after consultation with the Environmental and Community Engagement Representatives and affected landowners). Sydney Water considers vegetation removal in these circumstances has minimal environmental impact.
• Any minor:
  ○ vegetation trimming or
  ○ removal of exotic vegetation or
  ○ removal of planted native vegetation
  ○ where the vegetation is not a threatened species (including a characteristic species of a threatened community or population), heritage listed, in declared critical habitat or in a declared area of outstanding biodiversity value.

Mitigation measures

- Any removal of remnant vegetation where there is no net change to environmental impact (e.g. a different area of vegetation is removed but the total area is the same or less than assessed in the REF).

Written explanation of the application of this clause (including justification of the need for trimming or removal and any proposed revegetation) should be provided by the Delivery Contractor when seeking Sydney Water's Project Manager approval. Any impacts to native vegetation and trees must be offset in accordance with Sydney Water's Biodiversity Offset Guideline (SWEMS0019.13).

Include the location and presence of TEC, *Marsdenia viridiflora* subsp. *viridiflora* population, stag tree and hollow bearing trees in Delivery Contractor site induction and toolbox talk.

Site laydown areas are to be within open grassed mapped as 'urban natives and exotics' or on areas with hard stand surfaces where possible.

Where possible, site laydown areas are to be located:

- at least 20 m from waterways
- at least 15 m away from protected trees, in accordance with the requirements of AS 4970-2009
- away from or upstream from weed infestation areas.

If vegetation is highly sensitive, including TECs, hollow bearing trees and the stag tree, trimming or clearance cannot proceed without written authorisation from the Sydney Water Project Manager (in consultation with the Environmental Representative).

Map and report native vegetation clearing greater than 0.01 ha in extent (and any associated rehabilitation) to the Sydney Water Environmental Representative. Track vegetation clearing as per SWEMS0015.26 Contractor Native Vegetation Clearing and Rehabilitation template.

Minimise vegetation clearance and disturbance, including impacts to the stag tree and riparian zones. Where possible, limit clearing to trimming rather than the removal of whole plants.

Physically delineate vegetation to be cleared and/or protected on site using flagging tape or similar, and install appropriate signage prior to works commencing.

Protect trees in accordance with the requirements of AS 4970-2009 for the Protection of Trees on Development Sites. This includes the habitat trees adjacent to the proposal area. Tree Protection Zones to be established on retained vegetation or large trees adjacent to work areas. Do not damage tree roots unless absolutely necessary, and engage a qualified arborist where roots >50mm are impacted within the Tree Protection Zone.

Protect trees in accordance with the Program Delivery Guidance Standard 9.3 Biodiversity Management (ENV-GS-003).

Retain dead tree trunks, bush rock or logs in-situ unless they are in the proposal area and moving is unavoidable. Reposition material elsewhere on the site or approved adjacent sites.

Mitigation measures

Inspect vegetation for potential fauna prior to clearing or trimming. If fauna is present, allow it to move away unharassed. If nests or dreys (i.e. a small round nest made from a thicket of sticks) engage WIRES or a licenced ecologist to inspect and relocate fauna before works.

If native fauna is encountered on site, stop work and allow the fauna to move away unharassed. Engage WIRES or a licenced ecologist if assistance is required to move fauna.

During dewatering of the decommissioned sludge lagoons, engage a licensed ecologist to inspect the area and undertake fauna relocation (e.g. turtles, frogs) into an appropriate nearby habitat.

A suitably qualified ecologist will conduct a pre-clearance survey for the presence of flora and fauna, and will supervise the clearing of all hollow bearing trees.

If any threatened species (flora or fauna) is discovered during the works, stop work immediately and notify the Sydney Water Project Manager. Work will only recommence once the impact on the species has been assessed and appropriate control measures implemented. The Delivery Contractor would adopt the Sydney Water Unexpected Finds procedure.

Where practical, open trenches will be covered at the end of each work day to avoid potential for native fauna to become trapped in open trenches.

If any damage occurs to vegetation outside of the proposal area, notify the Sydney Water Project Manager and Environmental Representative so that appropriate remediation strategies can be developed.

Manage biosecurity in accordance with:

- *Biosecurity Act 2015* (see NSW Weedwise), including reporting new weed infestations or invasive pests
- contemporary bush regeneration practices, including disposal of sealed bagged weeds to a licenced waste disposal facility.

If herbicide is to be used, this must be applied by a person trained to do so and that has a certificate of competency, or a statement of attainment issued by a registered training organisation. Herbicide will only be used in accordance with the label/permit. Record Pesticides and Herbicides use in accordance with SWEMS0017.

Prepare a Weed Management Plan in consultation with the Orchard Hills WFP site manager to ensure it is aligned with the existing site Chilean Needle Grass management plans. The plan should incorporate any advice and learnings provided by GS LLS as part of previous weed management.

Prior to works commencing on site, the Delivery Contractor should identify Chilean Needle Grass within the proposal area and follow relevant guidelines to remove it from the proposal area and control its spread.

The Delivery Contractor will, in consultation with the Sydney Water Natural Assets Team who are developing the PEMP for the Orchard Hills WFP, ensure site reestablishment and revegetation management plans are aligned.

Mitigation measures

To prevent the spread of weeds:

- conduct toolbox talks to identify high risk priority weeds to onsite staff
- ensure all equipment including personal protective equipment (PPE) is visibly clean of plant and soil material prior to entering and leaving site
- designate a washdown location within the construction compound
- consider no go zones for the movement of plant and equipment within the proposal area in relation to areas of known Chilean Needle Grass
- the identified weed infestation areas are to be delineated as no go zones
- when clearing and trimming, separate all plant parts that may be infested with weeds and weed propagules and dispose at a licensed waste disposal facility.

Do not reuse topsoil where at risk of spreading Chilean Needle Grass. If not used, topsoil is to be bagged, covered or otherwise contained to avoid potential spread of Chilean Needle Grass, before being transported and disposed of offsite.

In TOBAN period:

For maintenance and construction activities that are not essential/emergency works, the use of fire in the open, including for general purpose hot works must not proceed without an exemption being approved. Staff and contractors should not contact local RFS directly to seek their own exemption, instead contact BusinessResilience@sydneywater.com.au for details of the Sydney Water TOBAN exemption process.

An APZ of 20 m from temporary and permanent structures is to be considered where possible.

If replanting near Sydney Water pipelines refer to ‘Which trees can damage wastewater pipes?’ from Sydney Water website.

Offset residual impacts to native vegetation and trees in accordance with the Biodiversity Offset Guideline (SWEMS0019.13). As outlined in Appendix E – Biodiversity assessment report:

- 3:1 offset ratio for PCT 3320, resulting in 2.44ha of offset required
- 2:1 offset ratio for PCT 4023, resulting in 1.95ha of offset required
- 1:1 offset ratio for non-locally native or exotic trees, resulting in a 1:1 replacement of any trees removed in ‘urban natives and exotics’ mapped areas
- 2:1 offset ratio of removal of any tree hollows, resulting in the installation of 2 nest boxes or salvaged hollows for each hollow removed. Hollows to be salvaged where possible.

The final location of replanting is to be determined in consultation with the Sydney Water Natural Assets Team and Orchard Hills WFP site manager.

In consultation with the Sydney Water Natural Assets Team, the Delivery Contractor is to engage a suitably qualified bush regenerator to rehabilitate and revegetate areas disturbed by construction. Species and planting densities should be consistent with PCT 3320, and actions should be guided by

Mitigation measures
'Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland' (Department of Environment and Conservation, NSW, 2005).

6.2.4 Aboriginal heritage

Potential Aboriginal heritage impacts were identified through desktop assessments and on-site investigations. A specialist assessment report was prepared to support this REF and is attached as:

- Appendix F – Aboriginal objects due diligence assessment

The study area for the Aboriginal objects due diligence assessment does not include the Compound E area or the alternative pipeline alignment area, located behind the existing maintenance building (Figure 3-1).

An Aboriginal Cultural Heritage Assessment Report (ACHAR) is being prepared to assess the potential impacts to the alternative pipeline area. If any additional impacts beyond those identified in this REF are likely, a REF addendum will be prepared.

6.2.4.1 Existing environment

A search of the AHIMS database indicates that:

- there are no previous records of Aboriginal heritage items or non-Aboriginal heritage sites within 200 m of the proposal
- four Aboriginal heritage sites, all artefacts, were identified within the wider area (between 700 m and 1,000 m to the west of the proposal, along The Northern Road).

One new Aboriginal site was identified during field surveys and subsequently registered in AHIMS as site [redacted].

This information has been redacted to protect sensitive Aboriginal heritage information

Additionally, an Aboriginal cultural heritage area of sensitivity was identified on site and is shown on Figure 3-2. Overall, the proposal area is within a highly significant cultural landscape with moderate to high potential for surface and subsurface archaeological potential.

6.2.4.2 Potential impacts

Construction phase

Works will largely be occurring in areas with historic evidence of widespread clearing, agricultural use, and ground disturbance. Vegetation removal and ground disturbance in previously undisturbed areas will be avoided where possible.

Despite widespread clearing, agricultural use and earthworks, an Aboriginal cultural heritage area of sensitivity (see Figure 3-2) has been identified. This is due to the location of the proposal being close to several waterways which flow in all directions into first order creeks, as well as being on a hillcrest. These landscapes have the potential for archaeological material in the subsurface of undisturbed areas.

The proposal is outside of the area of sensitivity, with the exception of the alternative pipeline location (Figure 3-2). A construction corridor, about 15 m wide, may be required if the alternative pipeline location is chosen for the final design. This would result in the removal of vegetation and trenching within the sensitivity

area. The proposal footprint will be refined during the detail design phase. Additional assessment, including an ACHAR and test pits, will be carried out to inform the detail design phase. The ACHAR will assess the potential impacts to this area. If required, an REF addendum would be prepared and an AHIP obtained prior to construction.

Compound E (Figure 3-1) was not assessed during the specialist site survey. A review of historical aerial images (Appendix G – Historic Aerial Imagery) shows that the site was likely cleared and used for grazing purposes until the construction of the Orchard Hills WFP. The images show that the proposed Compound E area was previously disturbed during construction of the new sludge lagoons, with the area cleared and likely used as a construction compound. The proposal would likely also require grass trimming for use of the area as a compound. As tree clearing, excavation and earth movements are not required, and as the site has been historically disturbed, impacts to Aboriginal heritage are not expected. Works to use this area as a compound can proceed with caution.

As recommended in Appendix F – Aboriginal objects due diligence assessment, no further archaeological assessment is required if the areas of Aboriginal cultural sensitivity can be avoided.

Operation phase

During operation, potential impacts to Aboriginal heritage are unlikely to occur. Maintenance works will be carried out according to maintenance schedules, the PEMP or in response to emergencies. Maintenance works would generally be minor and are unlikely to involve major ground disturbing works or tree removal. The operation of the proposal would not impact any Aboriginal heritage values within the proposal area or wider site boundary. The potential for impacts to Aboriginal heritage during operation is minimal.

6.2.4.3 Mitigation measures

With the implementation of the mitigation measures below, potential impacts to Aboriginal heritage can be adequately managed, and residual impacts are not anticipated.

Table 6-6 Environmental mitigation measures — Aboriginal heritage

Mitigation measures
If the proposal footprint changes from the study area that is assessed in Appendix F – Aboriginal objects due diligence assessment, further assessment would be required, such as an ACHAR. If a significant impact is identified, referral to the Minister would be required under the Commonwealth DCCEEW *Significant Impact Guidelines 1.2*.
Establish a minimum 5 m hard-fenced no-go zone [redacted] during construction.
All site personnel must be inducted by a heritage specialist (or delegate) before starting work on site. The induction should include clear explanation of heritage constraints, go and no-go areas, processes and measures to avoid impacts, stop work procedures, and contact details to obtain further heritage guidance if needed. This is to include but is not limited to: • [redacted] it's no-go zone and legal obligations and consequences • the Aboriginal cultural sensitive area

This information has been redacted to protect sensitive Aboriginal heritage information

Mitigation measures
• all on-site personnel view as part of site induction the Aboriginal objects video by Heritage NSW: https://youtu.be/kShPePNwADw
Do not make publicly available or publish, in any form, Aboriginal heritage information on sites / potential archaeological deposits, particularly regarding location.
Repeat the basic AHIMS search if it is older than 12 months. Conduct additional assessment if new sites are registered and could be impacted by the works.
Harm to any Aboriginal objects and declared Aboriginal places is only permitted once an AHIP has been granted. Include Aboriginal Heritage Management Plan (AHMP) in CEMP to address AHIP conditions. All site personnel must be inducted to the protection measures required by the AHIP.
If any Aboriginal object is found, cease all excavation or disturbance in the area and notify Sydney Water's Project Manager in accordance with SWEMS0009.
All human remains in, on or under the land must not be harmed.
If suspected human remains are discovered: • cease all excavation or disturbance in the area (a buffer for at least 20 m) • notify the Sydney Water Project Manager in accordance with SWEMS0009 • notify the local police and NSW Environment line on 131 555, as soon as practicable • work is not to recommence in that location unless authorised in writing by Heritage NSW.

6.2.5 Non-Aboriginal heritage

Heritage impacts were identified through desktop assessments and on-site investigations. A specialist assessment report was prepared to support this REF and is attached as:

- Appendix H – Statement of heritage impact

The study area for the statement of heritage impact does not include the Compound E area or the alternative pipeline alignment area. If any additional impacts beyond those identified in this REF are likely, a REF addendum will be prepared.

6.2.5.1 Existing environment

The Commonwealth Heritage List (CHL) is a list of properties owned by the Commonwealth that have significant heritage value. The proposal intersects with the Commonwealth Heritage Listed Orchard Hills Cumberland Plain Woodland (CHL ID 105317) (Figure 3-2). At about 1,370 ha in size, this place represents the least disturbed and largest remaining remnant of Cumberland Plain Woodland.

A site inspection confirmed that apart from the CHL listed site, no other historical heritage was identified, nor was any non-Aboriginal archaeological potential identified within the WFP and proposal area.

As the proposal area appears to have been used for grazing until the construction of the Orchard Hills WFP, it is unlikely that any historical heritage is present.

6.2.5.2 Potential impacts

Construction phase

Upgrades to a lime dosing unit in the southeast of the proposal area would occur. While this intersects with the CHL curtilage, no vegetation clearing is required and the area is already disturbed by the historical construction of the existing lime dosing unit.

In accordance with the Commonwealth DCCEEW *Significant Impact Guidelines 1.2* impact scale, the proposal is considered to be low intensity, short-term, and localised, thus having a minor impact on the heritage values of the CHL place. Therefore, a significant impact is not likely.

As the detail design progresses, any additional impacts that are outside the original Statement of Heritage Impact study area and within the CHL place may need to be reassessed. This may include the alternative pipeline location in the southwest of the proposal area at the rear of the maintenance building. This would require trenching and a 15 m wide construction corridor. This may result in the removal of vegetation on the border of the CHL mapped area. Impacts to biodiversity are assessed in Section 6.2.3 above and are not likely to be significant. The proposal footprint will be refined during the detail design phase and additional assessment carried out if the impact footprint extends to this area.

Operation phase

During operation, potential impacts to heritage are unlikely to occur. Maintenance works will be carried out according to maintenance schedules, the PEMP or in response to emergencies. Maintenance works would generally be minor and are unlikely to involve major ground disturbing works or tree removal. The potential impact to heritage is minimal.

6.2.5.3 Mitigation measures

With the implementation of the mitigation measures below, potential impacts to non-Aboriginal heritage can be adequately managed, and residual impacts are not anticipated.

Table 6-7 Environmental mitigation measures — non-Aboriginal heritage

Mitigation measures
If the proposal footprint changes from the study area that is assessed in Appendix H – Statement of heritage impact, review the need for further assessment. If a significant impact is identified, referral to the Minister would be required under the Commonwealth DCCEEW *Significant Impact Guidelines 1.2*.
All site personnel must be inducted by a heritage specialist (or delegate) before starting work on site. The induction should include clear explanation of heritage constraints, go and no-go areas, processes and measures to avoid impacts, stop work procedures, and contact details to obtain further heritage guidance if needed.
If any non-Aboriginal relic is found, cease all excavation or disturbance in the area and notify Sydney Water's Project Manager in accordance with SWEMS0009.

Mitigation measures
The Delivery Contractor must retain an appropriate photographic record of pre-construction site conditions and throughout the construction process. Changes must be appropriately documented and the photographic record must be forwarded to Sydney Water's Project Manager and Heritage Advisor.

6.2.6 Noise and vibration

Noise and vibration impacts were identified through desktop assessments and on-site investigations. A specialist assessment report was prepared to support this REF and is attached as:

- Appendix I – Construction noise and vibration impact assessment

The study area for the construction noise and vibration report does not include the Compound E area or the alternative pipeline alignment area. If any additional impacts beyond those identified in this REF are likely, a REF addendum will be prepared.

6.2.6.1 Existing environment

Noise sensitive receivers are defined by the type of occupancy, land use and associated activities performed on that land. The sensitive receivers in the vicinity of the proposal are:

- residences along The Chase, 400 m to the northeast
- residences along Wentworth Road, 400 m to the north
- residences along Carolyn Chase, 250 m to the northwest
- Penrith Anglican College, 200 m to the northwest.

The existing noise environment is predominantly comprised of road traffic noise. The proposal is in a peri-urban, rural residential setting.

In accordance with the EPA NSW Noise Policy for Industry (2017), the background noise levels used for the noise assessment modelling are outlined in Table 6-8 below.

Table 6-8 Rated background noise levels

Logger	Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
Logger 1 – 44 Carolyn Chase	36	41	36
Logger 2 – 47 The Chase	34	49	39

In accordance with the EPA NSW Interim Construction Noise Guideline (2009), the noise management levels (NMLs) are outlined in Table 6-9 below.

Table 6-9 Noise management levels

Logger	Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
Logger 1 – 44 Carolyn Chase	46	46	41
Logger 2 – 47 The Chase	44	54	44

6.2.6.2 Potential impacts

Construction phase

Noise

The proposal would generate noise and vibration during construction from vegetation clearing, demolition, excavation and construction which will occur during standard daytime hours. However, at times there may be works and activities that will be outside of standard daytime hours as outlined in Section 3.1.8.

Construction noise impact modelling was conducted for an average case scenario and a worst case scenario. The average case and worst case construction noise impacts are all likely to be below the 'Highly Noise Affected' (75 dB) criterion. NMLs however may be exceeded during construction.

Minor exceedances of up to 3 dB may occur at sensitive receivers to the northeast of the proposal (on The Chase and Wentworth Road) during demolition works and structural construction works. There may be up to 8 dB noise exceedance for residents at The Chase and Wentworth Road during dewatering of the decommissioned sludge lagoons and rehabilitation. However, this is modelled under the scenario where multiple noisy equipment is used simultaneously (e.g. petrol chain saw, mulcher, piling rig and compactor) at the edge of the proposal area. As these are unlikely to be used simultaneously at the edge of the proposal area, there is unlikely to be prolonged noise impacts to sensitive receivers.

No exceedances are predicted during excavation works.

Additional traffic generated by the proposal includes movement of material, equipment and staff to and from the site. There will be up to 24 light vehicle movements and 4 heavy vehicle movements during standard working hours with the exception of oversized vehicle movements. Some material deliveries and oversized vehicle movements are likely to occur at night to meet Transport for NSW guidelines and minimise local traffic impacts. Due to the relatively low traffic movements the proposal would be unlikely to exceed noise level targets.

The works have the potential to temporarily impact on sensitive receivers. All reasonable and feasible measures will be implemented to reduce noise impacts during construction.

Vibration

Safe working distances for vibration intensive equipment are outlined in Table 6-10 below.

The nearest structures would potentially be electricity poles, existing WFP buildings and fences. No vibration sensitive structures, such as heritage structures, are located nearby. Apart from demolition works, plant and equipment are unlikely to work within 5 m of structures. As such, vibrations are unlikely to impact structures.

As there are no residential receivers within 10 m of the proposal, vibration from the proposal is unlikely to cause discomfort to nearby residents.

Table 6-10 Safe working distances for vibration-intensive equipment

Equipment	Safe working distance (metres)			
	Cosmetic Damage – BS7385-2: 1993		Cosmetic Damage – DIN 4150-3	Human response – DEC AVATG, 2006
	Reinforced structures	Unreinforced structures	Vibration sensitive structures	
15t excavator with bucket	5	5	5	10
Jack hammer	1	1	10	Avoid contact with structure
Bored piling	5	5	10	N/A

Operation Phase

During operation, changes to background noise levels are likely to be minimal, given the existing use of the site. Noise generated during operation will be related to routine maintenance works such as worker vehicles and handheld equipment or due to maintenance activities. Noise generated during operation is unlikely to exceed the noise criteria in the Noise Policy for Industry (EPA 2017).

6.2.6.3 Mitigation measures

With the implementation of the mitigation measures below, impacts to noise and vibration can be adequately managed during construction and operation, and residual impacts are expected to be minor and temporary.

Table 6-11 Environmental mitigation measures — noise and vibration

Mitigation measures
Works must comply with the Construction Noise Guideline (Draft, 2021), including scheduling work and deliveries during standard daytime working hours of 7am to 6pm Monday to Friday and 8am to 1pm Saturday. No work to be scheduled on Sunday nights or public holidays. Any proposed work outside of these hours must be justified. The proposal would also be carried out in accordance with Sydney Water's *Noise Management Procedure* SWEMS0056.
All reasonable and feasible noise mitigation measures should be justified, documented and implemented on-site to mitigate noise impacts.
Incorporate standard daytime hours noise management safeguards into the CEMP, including but not limited to:

Mitigation measures

- identifying and consulting with the potentially affected residents prior to the commencement of works:
    - Describe the nature of works, the expected noise impacts, approved hours of work, duration, complaints handling and contact details.
    - Determine need for, and appropriate timing of respite periods (e.g. times identified by the community that are less sensitive to noise such as mid-morning or mid-afternoon for works near residences).
- implementing a noise complaint handling procedure
- not permitting plant or machinery to warm-up near residential dwellings before the nominated working hours
- selecting appropriate plant for each task, to minimise the noise impact (e.g. all stationary and mobile plant would be fitted with residential type silencers)
- not using engine brakes when entering or leaving the work site(s) or within work areas
- regularly inspecting and maintaining equipment in good working order
- arranging work sites where possible to minimise noise (e.g. generators away from sensitive receivers, site set up to minimise use of vehicle reversing alarms, site amenities and/or entrances away from noise sensitive receivers)
- using natural landforms or mounds or site sheds as noise barriers
- scheduling noisy activities around times of surrounding high background noise (local road traffic or when other noise sources are active).

If works beyond standard daytime hours are needed, the Delivery Contractor would:

- justify the need for out of hours work (OOHW) and why it is not possible to carry out the works during standard daytime hours
- consider potential noise impacts and implement the relevant standard daytime hours safeguards, Sydney Water's *Noise Management Code of Behaviour* (SWEMS0056.01) and document all reasonable and feasible management measures to be implemented
- identify additional community notification requirements and outcomes of targeted community consultation
- seek approval from Sydney Water's Project Manager in consultation with the Environment and Community Engagement Representatives.

If night works are needed, the Delivery Contractor would:

- justify the need for night works
- consider potential noise impacts and implement the relevant standard daytime and out of hours
- safeguards and document consideration of all reasonable and feasible management measures

Mitigation measures

- identify community notification requirements (i.e. for scheduled night work (not emergency works))
- notify all potentially impacted residents and sensitive noise receivers not less than one week prior to commencing night work
- seek approval from Sydney Water's Project Manager in consultation with the Environment and Community Engagement Representatives
- complete a Sydney Water out of hours work request form.

If works on Sundays or public holidays are required, the Delivery Contractor would:

- justify why all other times are not feasible
- consider potential noise impacts and implement relevant standard daytime, out of hours and night time safeguards and other reasonable and feasible management measures
- identify community notification requirements
- seek approval from Sydney Water's Project Manager in consultation with the Environment and Community Engagement Representatives.

Consider less vibration intensive methodologies where practicable and use only the necessary sized and powered equipment.

Noisy plant to be positioned and orientated to minimise noise impacts on noise sensitive receivers.

If night works are required, limit night-time construction noise to four consecutive nights. Implement a minimum respite period of three nights between periods of consecutive night works.

Schedule works bearing in mind the activities and sensitivity of adjacent land uses (e.g. Penrith Anglican College).

6.2.7 Air and energy

6.2.7.1 Existing environment

The sensitive receivers in the vicinity of the proposal consist primarily of low density rural-residential properties.

Potential sensitive receivers include:

- existing Orchard Hills WFP
- Penrith Anglican College, about 350 m north
- nearby residents on The Chase, Carolyn Chase and Wentworth Road.

The key sources of pollutants that may impact ambient air quality within the proposal area include:

- emissions from motor vehicles along The Northern Road, about 800 m west, and the surrounding road network

- major infrastructure projects within the vicinity of the proposal that are currently under construction (refer to cumulative impacts in Section 6.2.11).

The existing air quality in the region is expected to be relatively good given the surrounding land use and low density of development.

6.2.7.2 Potential impacts

Construction phase

During construction, the proposal has the potential to generate dust and odour for nearby sensitive receivers from:

- dust generated during vegetation clearing, excavation, concrete cutting and demolition of buildings and disused concrete structures, and stockpiling of exposed soils
- dust generated by construction vehicles travelling on disturbed or unsealed access routes
- dust from hazardous materials, such as asbestos, due to encountering unexpected hazardous waste during construction
- emissions from construction machinery, equipment and vehicles
- odour from construction work including vehicle exhaust and fuel intensive machinery.

Construction activities would be temporary and would not significantly increase Sydney Water's greenhouse gas (GHG) emissions.

With the implementation of the proposed safeguards, a material or noticeable effect on air quality would not be likely to occur.

Operation phase

During operation, air quality is expected to be good and unlikely to be significantly different from existing operations. Changes to background odour at nearby receivers are unlikely.

6.2.7.3 Mitigation measures

With the implementation of the mitigation measures below, impacts from air and energy can be adequately managed, and residual impacts are expected to be minor.

Table 6-12 Environmental mitigation measures — air and energy

Mitigation measures
Maintain equipment in good working order, comply with the clean air regulations of the *Protection of the Environment Operations Act 1997*, have appropriate exhaust pollution controls, and meet Australian Standards for exhaust emissions.
Track energy use as per SWEMS0015.28 Contractor NGER template.
Switch off vehicles/machinery when not in use.
Implement measures to prevent offsite dust impacts, for example: • modify or cease work in windy conditions

Mitigation measures

- modify site layout (place stockpiles away from sensitive receivers)
- vegetate exposed areas using appropriate seeding.

Activities with the potential to generate dust to be monitored and use dust suppression (water spraying or install dust barriers) where appropriate.

Cover all transported waste.

During detailed design, carry out the following:

- estimate the proposal's carbon footprint and GHG emissions
- consider low carbon alternatives and construction materials
- consider opportunities to reduce GHG emissions.

6.2.8 Waste and hazardous materials

Waste and hazardous materials environmental impacts were identified through desktop assessments, on-site investigations, sampling and laboratory testing. A preliminary sludge testing investigation was conducted to support the planning of the proposal (Dredging Solutions 2024).

Sydney Water's corporate objectives include to be a resource recovery business with an increasing portfolio of circular economy products and services. This includes reducing waste through recycling and re-use and encouraging suppliers to minimise wastes. The Delivery Contractor will seek opportunities to reduce, recycle and reuse materials in accordance with the waste hierarchy (see Figure 6-1). This will be documented in the Waste Management Plan or CEMP.

Additionally, Sydney Water maintains a Material Stockpile and Material Receiver Dashboard and Register. This provides a centralised location for Sydney Water and its contractors to share real-time information regarding excess or wanted bulk civil material to increase reuse and reduce the disposal of otherwise suitable material for use by projects.

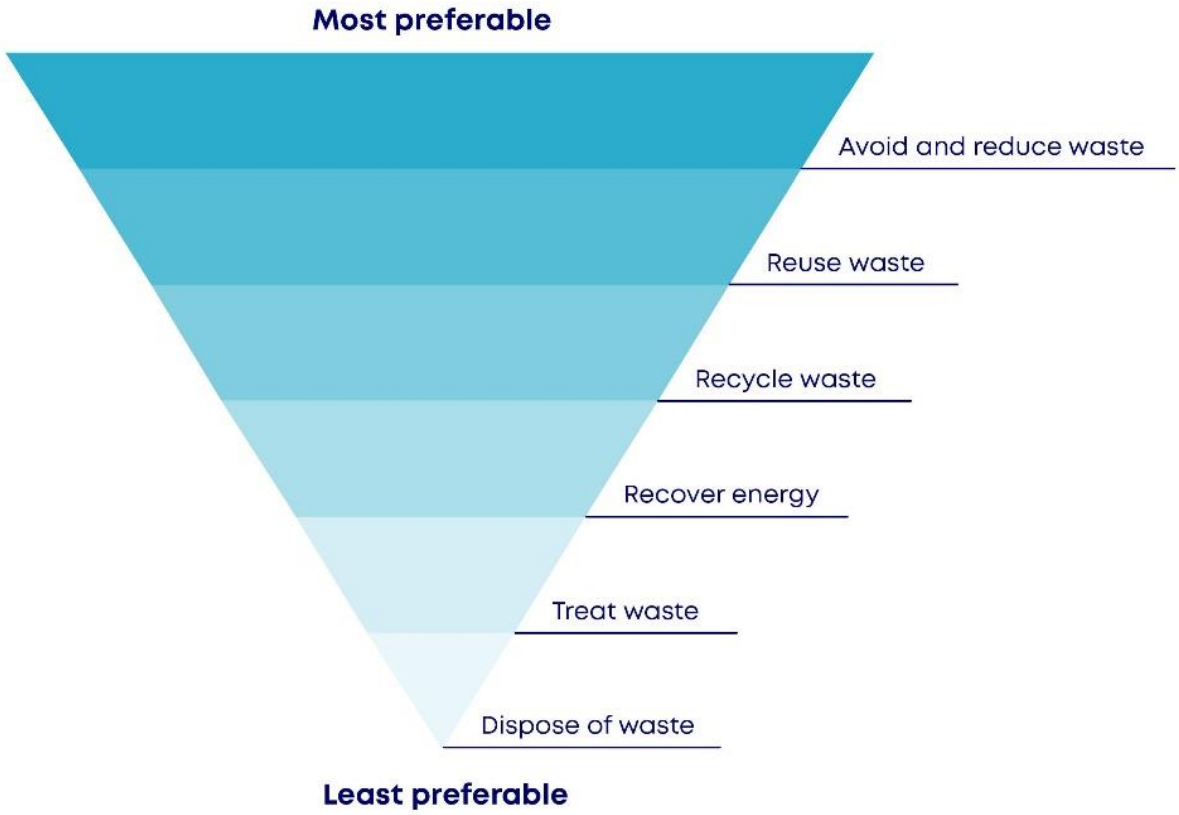

Figure 6-1 Waste hierarchy (Source: NSW EPA)

6.2.8.1 Existing environment

Historic and current land uses such as farming and construction activities have occurred in the proposal area and surrounding area. As part of the Baseline Contamination Assessment (Jacobs 2024d), contamination sampling and a preliminary waste classification under the Waste Classification Guidelines (NSW EPA) was conducted. The report indicates that excavated fill soils would be classified as 'General Solid Waste (non-putrescible)' and underlying natural soils would likely be virgin excavated natural material (VENM). There is the potential to encounter contaminated and/or hazardous materials below investigation depths or in areas where investigations were not conducted. The Baseline Contamination Assessment (Jacobs 2024d) did not assess materials within the decommissioned sludge lagoons.

As part of the Sludge Survey Report (Dredging Solutions 2024), the volume of sludge was estimated and sludge samples were collected for testing. Results of sludge volume calculations are:

- Northern lagoon – 289 m^3
- Western lagoon – 1,298 m^3
- Eastern lagoon – could not be surveyed (as was not accessible).

Preliminary sludge testing results indicate that the material is generally below the adopted health investigation level and may be suitable for reuse within the site or composting. Testing results also indicated that the sludge may not be suitable for reuse as an alternative to agricultural lime, gypsum for land application or organics processing.

EPA contaminated land record of notices

A search of the EPA contaminated land record of notices database (August 2024) identified eight (8) sites within the Penrith LGA. These are summarised below and detailed in Appendix J – EPA contaminated land record of notices database:

- 7-Eleven Service Station, 4.5 km northwest
- Penrith Waste Services, 5 km southwest
- Elura Liquid Waste Disposal Site, between 5-10 km south
- Crane Enfield Metals, 7 km northwest
- Drum Recycler, 8 km northeast
- Coles Express (former Ampol) Service Station, 8.5 km northeast
- Solveco, 9 km northeast
- Castlereagh State Forest (now Castlereagh Nature Reserve), 15 km north.

POEO public register

A search of the POEO public register (August 2024) identified six (6) sites within the suburb of Orchard Hills that have an environment protection licence:

- Acciona Infrastructure Projects Australia Pty Ltd, 900 m northwest
- CPB Contractors Pty Ltd, 800 m west
- Mulgoa Quarries Pty Ltd, 1 km west
- Orchard Holdings (NSW) Pty Ltd, 3 km southeast
- SRC Operations Pty Ltd, 3 km southeast
- Snackbrands Australia Pty Ltd, 6 km southeast.

Department of Defence Unexploded Ordnance (UXO)

The proposal is within the curtilage of the Orchard Hills Defence Establishment. While considered unlikely, as Sydney Water has occupied the site since the 1960s, there is potential to encounter UXO during construction of the proposal. UXO is unlikely to pose a risk if it remains in-situ and no attempts are made to touch or disturb it in any way. If an item suspected of being an UXO or potential UXO is discovered during construction, works are to stop immediately, and the process described in the safeguards below followed. Removal and disposal of the item, if determined to be a UXO, would be carried out by the appropriate Department of Defence personnel.

Hazardous Building Materials (HMB)

A review of Sydney Water's HMB register for the Orchard Hills WFP identified the likely presence of several HBMs. The majority of registered HBMs are considered low or moderate risk and include lead paint, lead contaminated dust, polychlorinated biphenyls and asbestos containing material (ACM). Lead paint along the rails of the treatment plant is classified as high risk and there are no very high risk HBMs.

6.2.8.2 Potential impacts

Construction phase

Construction activities of the proposal would generate the following waste streams:

- general construction and demolition waste (e.g. concrete, road material, timber, plastic, soils and metal)
- green waste, including potential weed waste, from vegetation clearing
- domestic waste (e.g. food packaging generated by workforce)
- excess spoil from excavations and earthworks including the new detention basin
- sediment from the decommissioned sludge lagoons
- wastewater and solids from existing septic tanks on site to be decommissioned
- contaminated materials, if encountered
- wastewater from temporary/portable amenities.

During construction, soil will temporarily be stockpiled within the proposal area boundary. Inappropriate management of soil stockpiles has the potential to impact surrounding land and waterways from dust generation, off-site leaching of contaminants, and exposure of contaminated soil, including asbestos (if present).

Excavated fill materials have preliminarily been classified as ‘General Solid Waste (non-putrescible)’ and natural soils would likely be VENM (Jacobs 2024d). Sediments will be removed from the decommissioned sludge lagoons and a detention basin will be excavated in the northwest of the proposal area. Additionally, some grading and levelling earthworks may also occur. The total volumes of excavation would be calculated during the detail design phase.

Preliminary sludge testing (Dredging Solutions 2024) and soil testing (Jacobs 2024d) indicate that excavated materials may be suitable to be reused on site. Provided additional sampling and analysis of excavated material during construction occurs and the mitigation measures in this REF are implemented, potential environmental impacts from excavated material are unlikely.

If ACM materials are encountered at the surface or within soils during construction, soils excavated within the area would be classified as ‘Special Waste – Asbestos Waste’.

Potential residual contamination, including potentially contaminated groundwater, may be present surrounding the site. They are unlikely to be transported to the proposal area due to it being located at a high point in the landscape. Groundwater flow is expected to flow away from the proposal area to the west, to the Hawkesbury-Nepean River. However there remains the potential for contamination to be encountered during construction.

Section 6.2.3 assesses the impacts of native vegetation clearing. It is likely that a portion of this green waste material will be reused or mulched. Some of the waste would likely be classified as weed waste and would be appropriately managed to avoid propagation of weed species around the proposal area and disposed of offsite.

Wastewater would classify as liquid waste and be contained to temporary amenities and disposed offsite.

Given the above and the implementation of the mitigation measures below, waste and hazardous materials are unlikely to be significantly impacted during construction.

Operation phase

During operation, no hazardous materials are expected to be encountered. Waste generation at the WFP is unlikely to significantly increase compared to current operational waste levels.

6.2.8.3 Mitigation measures

With the implementation of the mitigation measures below, impacts from waste and hazardous materials can be adequately managed, and residual impacts are expected to be minor.

Table 6-13 Environmental mitigation measures — waste and hazardous materials

Mitigation measures
If any UXO is discovered: • stop works immediately and do not touch or disturb the item • if safe to do so from a distance, take photos and note the location using paint, flagging tape or similar • inform the WFP operations manager and Sydney Water's Project Manager • call the police who will instigate a request of Department of Defence personnel to investigate and dispose of the item.
A Waste and Resource Recovery Plan (WRRP) must be prepared to appropriately manage and classify any materials including soils, construction/demolition wastes and associated stockpiles. The plan would be prepared by the Delivery Contractor and approved by the Sydney Water Project Manager in consultation with the Environmental Representative and Contamination and Hazardous Materials Team.
The Delivery Contractor will utilise the Sydney Water Material Stockpile and Material Receiver Dashboard and Register to identify potential opportunities for spoil reuse between projects. The Material Receiver Dashboard can also be utilised to identify suitable waste facilities for material that cannot be reused. It can be accessed via the Sydney Water Delivery Portal.
Manage waste in accordance with relevant legislation and maintain records to show compliance e.g. waste register, transport and disposal records. Record and submit SWEMS0015.27 *Contractor Waste Report*.
The Delivery Contractor will seek opportunities to reduce, recycle and reuse materials. This will be documented in the CEMP.
Cover all transported waste.
Prevent pollutants from escaping including covering skip bins.
Provide adequate bins for general waste, hazardous waste and recyclable materials.
Minimise stockpile size and ensure delineation between different stockpiled materials

Mitigation measures
Minimise the generation of waste, sort waste streams to maximise reuse/recycling in accordance with the *Waste Avoidance and Resource Recovery Act 2001*.
Manage waste and excess spoil in accordance with the NSW EPA Resource Recovery Orders and Exemptions (if applicable) and/or Waste Classification Guidelines. Where materials are not suitable or cannot be reused onsite or offsite, recycle soils at a licensed soil recycling facility or dispose at an appropriately licensed landfill facility.
Dispose excess vegetation (non-weed) that cannot be used for site establishment at an appropriate green waste disposal facility.
If fibro or other asbestos containing material is identified, restrict access and follow Sydney Water's Asbestos Management – Minor Works procedure, Document Number 746607 and SafeWork NSW requirements. Contact Sydney Water's Project Manager (who will consult with the Contamination and Hazardous Materials Team propertyenvironmental@sydneywater.com.au).
Before construction commences, complete a detailed site investigation and/or in-situ waste classification for the proposal. The sampling procedures and density must meet NEPM 2013 guidelines. Any site-specific management measures specified must be adhered to.

6.2.9 Traffic and access

Traffic impacts were identified through desktop assessments and on-site investigations. A specialist assessment report was prepared to support this REF and is attached as:

- Appendix K – Traffic impact assessment

6.2.9.1 Existing environment

Road

The existing environment surrounding the proposal is generally comprised of local roads for which local council is the roads authority. Orchard Hills is connected to the wider locality via The Northern Road (a state road) and Western Motorway (M4). Table 6-14 provides a summary of the key roads and intersections surrounding the proposal.

Table 6-14 Roads and intersections surrounding the proposal

Road / intersection	Description	Signposted speed limit
The Chase	A sealed local access road which provides access to the WFP and a few residential properties.	50 km/h
Wentworth Road	One of the main roads in and out of Orchard Hills. Wentworth Road is a two direction, single lane road, which provides access to several residential properties and the Penrith Anglican School.	70 km/h

Road / intersection	Description	Signposted speed limit
The Northern Road	A major state road which connects Richmond to Narellan. It typically has 4 lanes of traffic (including a bus lane) in each direction.	70 km/h
Wentworth Road and The Northern Road intersection	This intersection was upgraded as part of the Transport for NSW The Northern Road Upgrade project. This has increased traffic capacity and vehicle flow at the intersection by providing dedicated left turn, right turn and through lanes in all directions.	N/A

A capacity assessment was conducted for Wentworth Road which indicated that the road was operating at level of service (LoS) A in both directions during peak hour.

Based on publicly available crash data between 2018 to 2022, there were multiple crashes along The Northern Road, including several at the Wentworth Road and The Northern Road intersection.

Public transport and active transport

There are bus stops on The Northern Road and Wentworth Road which service the following bus routes:

- 794 from Glenmore Park to Penrith
- 789 from Luddenham to Penrith
- 781 from St Marys to Penrith.

Orchard Hills Public School and Penrith Christian School buses operate along the proposed construction access route from The Northern Road to Wentworth Road. In the morning, buses would be using this route between 7:30am to 9am, and between 2:30pm to 3:30pm in the afternoon.

There are no formal pedestrian footpaths or cycling lanes in the surrounding road network.

6.2.9.2 Potential impacts

Construction phase

Road

During construction, there will be up to 80 personnel during the peak construction period. This will generate a slight increase in light vehicle movements for workforce transport. Heavy vehicle movements would also be required for transport of material and equipment.

Road capacity and intersection modelling was conducted to assess the potential impacts of the traffic generated by the proposal on the surrounding roads. Modelling involved predicting a future scenario (2026) as the traffic baseline. Additional traffic generated by the proposal includes movement of material, equipment and staff to and from the site. There will be up to 24 light vehicle movements and 4 heavy vehicle movements during the morning peak. These additional vehicles generated by the proposal's construction was modelled against the 2026 scenario. The results are summarised in Table 6-15 below.

Table 6-15 Road capacity and network modelling results

Road	LoS during peak construction (not including proposal traffic)		LoS during peak construction (including proposal traffic)		Difference
	AM peak	PM peak	AM peak	PM peak	
Wentworth Road, between The Northern Road and The Chase	A	A	A	A	None
Northern Road / Wentworth Road intersection	C	B	C	B	None
Wentworth Road / The Chase intersection	A	B	A	B	None

The modelling results show that during construction there will be a negligible impact on overall road function, LoS or capacity of the existing road network. Additionally, due to overall low construction traffic volumes and the upgraded The Northern Road/Wentworth Road intersection, the proposal is unlikely to increase road safety risks and crash frequency.

Some material deliveries and oversized vehicle movements are likely to occur at night to meet Transport for NSW guidelines and minimise local traffic impacts. Due to the relatively low traffic movements and the temporary nature of vehicle movements, the proposal would therefore be unlikely to impact local road capacity.

Construction and worker vehicles will be parked within the proposal area in designated parking or compound areas. Plant, such as excavators, will be moving within the proposal area. Vehicles and equipment would use existing paved roads to access the proposal area. Vehicle and plant movements will be managed in accordance with the proposed mitigation measures and are unlikely to impact local parking, property access and emergency services.

Increase in heavy vehicle traffic during construction could potentially damage road infrastructure, in particular, local roads. The proposed mitigation measures would minimise and manage local road damage

Public transport and active transport

There is the potential for minor impacts to public transport services and school bus services during overlapping operating times along Wentworth Road and The Northern Road. Oversized vehicles and deliveries will be required during the construction phase and will be delivered outside of school start and finish times e.g. during out of hours. Access to bus services and operation of bus routes are unlikely to be impacted by the proposal.

As there are no formal pedestrian footpaths or cycling lanes in the surrounding road network, potential impacts to pedestrians and cyclists is limited. Any impacts would likely be negligible.

Operation phase

During operation, traffic movements may be generated from:

- site staff and contractors travelling to and from work each day
- training sessions, inductions, school tours visiting the Orchard Hills WFP once a month via bus
- occasional meetings throughout the year
- heavy vehicle movements such as for chemical deliveries or lagoon de-sludging.

Traffic generation during operation is likely to be significantly lower than traffic generated during construction and no change to existing vehicle movements. Given the low volume of traffic on the surrounding road network, the low volume of traffic generated by operational activities, and the capacity of the surrounding road network, there will be minimal traffic impacts during operation.

6.2.9.3 Mitigation measures

With the implementation of the mitigation measures below, impacts to traffic and access can be adequately managed, and residual impacts are expected to be minimal.

Table 6-16 Environmental mitigation measures — traffic and access

Mitigation measures
Prepare a Traffic Management Plan (TMP) as part of the CEMP in consultation with the relevant traffic authority. This will include: • confirmation of haulage routes • access arrangements to the proposal area, including entry and exit locations • management of vehicle movement including measures to encourage rideshare, management of oversized vehicles, materials transport • traffic control and safety measures • consultation and notification requirements • a response plan for any construction-related traffic incident • monitoring, review and amendment plans for traffic management measures • coordination with nearby developments if construction periods and routes overlap • an oversize and/or over mass transport management plan.
Heavy vehicle access permits would be acquired and any permit conditions to be implemented.
A dilapidation survey and report of local (The Chase) and internal roads is to be undertaken in accordance with Austroads guidelines and standards.
Meet NSW Roads and Maritime Service's Traffic Control at Worksites Manual v5 requirements for Transport for NSW roads.
Minimise traffic impacts near Penrith Anglican College and the local road network for example:

Mitigation measures
• scheduling major materials deliveries outside of school drop off or pick up times • scheduling heavy vehicle movements to outside of peak periods • staggering heavy vehicle deliveries to minimise queuing outside the proposal area and on the road network.
Erect signs to inform road users of the proposed works, trucks turning and any temporary road closures.
Ensure work vehicles do not obstruct vehicular or pedestrian traffic, or private driveway, public facility or business access unless necessary and only if appropriate notification has been provided.
Construction vehicles, plant and machinery are to be parked within the proposal area.
Construction vehicles, plant and machinery are not to obstruct existing traffic for the operation of the Orchard Hills WFP and access to be maintained at all times (24/7).

6.2.10 Social and visual

6.2.10.1 Existing environment

The proposal is located in the suburb of Orchard Hills within Penrith LGA. Surrounding receivers include low density rural properties and Penrith Anglican College. Penrith Anglican College teaches children from pre-kindergarten to Year 12, enrolling around 1,000 students each year. Other potential receivers include users of The Northern Road and Department of Defence personnel.

The Orchard Hills WFP is partially shielded by vegetation and topography. To the east, south and west, the site is surrounded by vegetation and the Orchard Hills Defence Establishment. There is a high voltage transmission line that runs adjacent to the northern boundary of the Orchard Hills WFP.

The proposal is located within the Orchard Hills WFP where the most prominent structures are the existing buildings and facilities. Two water storage reservoirs are on the northeastern side of the site. Google Streetview images show that the buildings and reservoirs are not visible from The Northern Road to the west or Wentworth Road and Carolyn Chase to the north. The water storage reservoirs are partially visible from The Chase to the east.

6.2.10.2 Potential impacts

Construction phase

During construction, there may be temporary impacts to visual amenity for surrounding receivers through the increased presence of heavy equipment, machinery and vehicles. However, the Orchard Hills WFP is surrounded by vegetation to the east, south and west which provide a visual screen from potential receivers in those directions.

There will be potential visual and social impacts to the Penrith Anglican College as it borders the Orchard Hills WFP. Potential impacts would occur if the potential construction compound adjacent to the school is used (Compound E area, see Figure 3-1). However, students are unlikely to approach the boundary due to the presence of high voltage transmission lines along the southern boundary of the school. This provides a

buffer between the receivers and the potential construction compound. Additionally, if the compound is used, it would be temporary and the area would be restored following completion of the proposal.

The majority of the Orchard Hills WFP is shielded from Wentworth Road and Carolyn Chase by topography and some vegetation. The potential construction compound may be visible from some residential receivers, however due to their distance, the impact will be minimal.

Additionally, as works would generally be within standard day time construction hours, visual and social impacts to residents are likely to be minimal. Some out of hours work would occur at times to minimise disruptions to the local community. This includes material deliveries and oversized vehicle movements which would minimise traffic impacts during the day. Connection of the proposal to the existing WFP would also likely occur outside of standard hours when water demand is low to minimise water supply impacts to the community.

Residential receivers may be temporarily impacted from noise, dust and traffic, including out of hours work and vehicle movements. Impacts of these have been discussed in Section 6.2.6, Section 6.2.7 and Section 6.2.9 respectively.

Any residual visual and social impacts will be managed in accordance with the mitigation measures below.

Operation phase

The proposal would not be prominent in the landscape as the proposed facilities and buildings would not exceed the height of the existing water storage reservoirs. While some vegetation clearing will be required to construct the proposal, this would occur mostly along the western boundaries of the site. Receivers to the west would continue to be visually shielded by topography and vegetation. Thus the potential visual impact of the proposal is negligible.

In the long-term, the proposal would increase the reliability of drinking water supplied to customers in the area, particularly during poor quality raw water events. Therefore, once operational, the proposal would have a positive social impact to the area.

6.2.10.3 Mitigation measures

With the implementation of the mitigation measures below, impacts to social and visual impacts can be adequately managed during construction and operation, and residual impacts are expected to be minor and temporary.

Table 6-17 Environmental mitigation measures — social and visual

Mitigation measures
Undertake works in accordance with Sydney Water communications policies and requirements including: • notify impacted residents and businesses • erect signs to inform the public on nature of work • treat community enquiries appropriately • prepare a CSEP in accordance with Sydney Water community requirements.

Mitigation measures
If the potential compound (Compound E area) to the north of the Orchard Hills WFP is required, clear and early consultation with Penrith Anglican College will be done to minimise visual and social impacts to their operations and students.
Minimise visual impacts (e.g. retain existing vegetation where possible).
Direct artificial light away from sensitive receivers where possible (i.e. residents, fauna or roadways).
Maintain work areas in a clean and tidy condition.
On completion of works, restore work sites to pre-existing condition or better and all vehicles, material and items relating to the works will be removed.

6.2.11 Cumulative and future trends

6.2.11.1 Potential cumulative impacts

Due to the changing nature of Western Sydney, the proposal has the potential to contribute to cumulative impacts.

There are several developments in the vicinity of the proposal which may result in cumulative impacts with the proposal. Table 6-18 provides a summary of the nearby projects and how they might interact with the proposal.

Table 6-18 Projects near the proposal

Project	Description	Cumulative impact
Orchard Hills WFP Stage 2	This Sydney Water project is in the planning phase and would be located within the WFP. Should raw water continue to deteriorate, or increased WFP capacity be required to service growth, this project would move to delivery.	The construction of Stage 2, immediately following the proposal (Stage 1) may cause construction fatigue for nearby receivers. Consideration of construction staging and cumulative impacts would be assessed during the planning of the Stage 2 project.
Orchard Hills WFP Solar Program	This Sydney Water project is in the planning phase. It would be located within the WFP or directly adjacent to it. The project would involve installing solar panels northeast of the Orchard Hills WFP.	The construction of this project would likely start and finish in 2025. It may cause a small amount of additional noise and traffic impacts which, coupled with the proposal's delivery phase, would cause construction fatigue for nearby receivers.
Orchard Hills WFP Administration Refurbishment	This Sydney Water project is in the planning phase. It would involve the refurbishment and upgrade of the existing administration buildings and office area.	The construction of this project would likely start in mid-2025 and finish in 2026. It may cause a small amount of additional noise and traffic impacts which, coupled with the proposal's delivery phase, would cause construction fatigue for nearby receivers.

Project	Description	Cumulative impact
Water Filtration Plant Renewals Program	Under Sydney Water's renewals program, there are several upgrades and maintenance projects located at the Orchard Hills WFP.	These projects are at various stages of planning and construction. Some of them would be constructed between 2025 and 2027, overlapping with the proposal. This could cause construction fatigue for nearby receivers.
Explosive Ordnance Facilities Northern NSW Redevelopment	The Department of Defence is planning to upgrade infrastructure in the Orchard Hills Defence Establishment. Works would involve: • new administration, accommodation, training and wellbeing facilities • demolition of obsolete facilities • upgrading utilities and security infrastructure.	The works would likely be located over 800 m south of the proposal, within the main area of the Orchard Hills Defence Establishment. Given the distance from the proposal, and access to the Orchard Hills Defence Establishment is via The Northern Rd, there are unlikely to be overlapping receivers. Therefore any potential cumulative impacts would be negligible.
Penrith Anglican College Masterplan	There is no publicly available information regarding development plans at Penrith Anglican College. It is understood that facilities would be upgraded and new buildings would be constructed. A drive by on 10 September 2024 noted construction works occurring onsite.	If further construction occurs between 2025 and 2027, there is the potential for cumulative impacts. Nearby residents on Carolyn Chase and Wentworth Road may be impacted by cumulative noise and visual impacts. The surrounding road network and intersections are modelled to operate at a good LoS. Additional minor vehicle movements are unlikely to significantly impact traffic.
Orchard Hills Metro Station	The Orchard Hills metro station is expected to open in 2026. It would be located about 4 km northeast of the proposal.	The project's construction traffic routes are likely the M4 Motorway, Kent Road and Gipps Street. Traffic generated by the proposal is unlikely to coincide along the same roads. Given the distance, potential cumulative impacts would be negligible.
Orchard Hills Precinct Rezoning project	The final development stages of the Orchard Hills Precinct Rezoning project is likely to be centred around the new Sydney Metro station, to support the opening of the station in 2026.	Based on the Orchard Hills Stage 1 rezoning proposal and structure plan currently on exhibition (reviewed 20 January 2025), development around the new metro station (4 km northeast of the proposal) would occur first as Stage 1A, 1B and 1C. Stage 2 appears to be the area between the Western Motorway M4 and Caddens Road. The areas north of the proposal, including Wentworth Road and Kingswood Road would be developed during Stage 3 and 4. Given this staging plan, potential construction periods may overlap with Stage 1 and 2 development. However, traffic

Project	Description	Cumulative impact
		generated by the proposal is unlikely to coincide along the same local roads and potential cumulative impacts would be negligible.
Major projects	The planning portal identified several major projects occurring within the surrounding suburbs.	Several projects were identified however due to their distance from the proposal, there is unlikely to be overlapping receivers.

Sydney Water recognises the large volume of construction activity that has occurred or is planned to occur within the locality due to the changing nature of the area. This prolonged exposure to disruptive activities can lead to fatigue, increased stress and other negative effects. Sydney Water and the Delivery Contractor would consult with the proponents (including other Sydney Water delivery teams) and their contractors to minimise the potential for cumulative impacts where practicable through construction planning.

Future trends

Sydney Water has adopted a position to ensure service levels can be maintained by managing climate risks. The proposal has a direct link to climate change adaptation by increasing the resilience and reliability of the Orchard Hills WFP to provide clean drinking water during poor quality raw water events. Table 6-19 provides a summary of the future trends that might interact with the proposal.

Table 6-19 Potential climate risks

Climate risk	Potential Impact	Assessment and mitigation
Bushfire	The WFP is bounded to the east, south and west by the Orchard Hills Offset Area which contains dense vegetation. This vegetation is mapped as Bushfire Category 1 land. There is potential for bushfire to spread from the Orchard Hills Offset Area to the WFP and vice versa.	Cool Burn (2024) recommends an APZ of minimum 20 m which allows the proposal to avoid flame contact and exposure to excessive radiant heat. Most of the proposed new infrastructure are located at least 20 m from the boundary of the WFP. The maintenance building would not be able to meet the 20 m APZ buffer (final location subject to detail design) however the report finds that the vegetation near it is less dense and the existing access track also provides additional fire buffer. Where the proposal is unable to maintain appropriate APZ distances, design solutions would be considered. Additional fire hydrants would be added around the new structures. The locations of buildings and assets would be finalised during the detail design phase. Given the distances are met or alternate design solutions implemented, the proposal will therefore be unlikely to impact on bushfire.
Extreme rain	Extreme rain events may lead to an increase in poor quality raw water in Warragamba Dam	The proposal would enhance the ability of the WFP to treat poor quality raw water ensuring the drinking water supplied meets customer demand and the ADWG.

Climate risk	Potential Impact	Assessment and mitigation
	to be treated by the WFP and localised flooding.	As the WFP is on a high point in the landscape, localised flooding would likely be temporary and would not significantly impact infrastructure.
Drought	Extreme drought followed by rain may lead to an increase in poor quality raw water in Warragamba Dam to be treated by the WFP.	The proposal would enhance the ability of the WFP to treat poor quality raw water ensuring the drinking water supplied meets customer demand and the ADWG.

As summarised above, the proposal is unlikely to exacerbate future trends.

Construction of the proposal would result in the consumption of fossil fuels for transport, plant and machinery, but this will be reduced as far as practicable.

Optimisation of the reference design (Jacobs 2024a) included adjustments to avoid existing trees. Over 4 ha of native vegetation will be revegetated. Additionally, adjacent vegetation in the Orchard Hills Offset Area will be protected long term, providing refuge for fauna in the locality. Thus, biodiversity will be protected and expected to improve in the long term.

One of the primary drivers of the proposal is the forecasted population growth in the area. Sydney Water is expanding its network throughout Western Sydney to support growth. The proposal would improve the reliability and resilience of the drinking water supplied to current and future customers.

6.2.11.2 Mitigation measures

With the implementation of the mitigation measures below, impacts to and/or from cumulative and future trends can be adequately managed during construction and operation, and residual impacts are expected to be minor.

Table 6-20 Environmental mitigation measures — cumulative and future trends

Mitigation measures
Consult with key stakeholders and local developments, including Penrith Anglican College and other Sydney Water delivery teams, to coordinate works were practical.
Works to occur during standard daytime construction hours, with some oversized vehicles and deliveries occurring out of hours to reduce potential cumulative noise impacts during construction.
Deliveries and parking to occur within the Orchard Hills WFP to reduce potential cumulative road impacts to the local road network.
Conduct a climate change risk assessment as part of the detail design phase.

6.2.12 General environmental management

Table 6-21 Environmental mitigation measures — general environmental management

Mitigation measures
Prepare a Construction Environmental Management Plan (CEMP) addressing the requirements of this environmental assessment. The CEMP should identify licence, approval and notification requirements. Prior to the start of work, all project staff and contractors will be inducted in the CEMP. The CEMP must be readily available on site and include a site plan which shows: • go/no go areas and boundaries of the work area • location of environmental controls (including erosion and sediment controls, any fences or other measures to protect vegetation or fauna, spill kits, stockpile areas) • location and full extent of any vegetation disturbance.
Sydney Water's Project Manager (after consultation with the Environment and Community Engagement Representatives and affected landowners) can approve temporary ancillary construction facilities (such as compounds and access tracks), without additional environmental assessment or approval if the facilities meet the following principles: • limit proximity to sensitive receivers • no disruption to property access • no impact to known items of non-Aboriginal and Aboriginal heritage • outside high-risk areas for Aboriginal heritage • use existing cleared areas and existing access tracks • no impacts to remnant native vegetation or key habitat features • no disturbance to waterways • potential environmental impacts can be managed using the mitigation measures in this REF • no disturbance of contaminated land or acid sulphate soils • would be rehabilitated at the end of construction. The Delivery Contractor must demonstrate in writing how the proposed ancillary facilities meet these principles. Any facilities that do not meet these principles would require additional environmental impact assessment. The agreed location of these facilities must be shown on the CEMP site plan and appropriate environmental controls installed.
Prepare an Incident Management Plan (IMP) outlining actions and responsibilities during: • predicted/ onset of heavy rain during works • spills • unexpected finds (e.g. heritage and contamination) • other potential incidents relevant to the scope of works.

Mitigation measures

To ensure compliance with legislative requirements for incident notification (e.g. *Protection of the Environment Operations Act 1997*), Sydney Water's employees and contractors would follow SWEMS0009 *Responding to incidents with an environmental impact procedure*.

All site personnel to be inducted into the IMP.

If any additional impacts to the Compound E area or the alternative pipeline alignment area beyond those identified in this REF are likely, a REF addendum is to be prepared and associated specialist studies to be conducted.

7. Conclusion

Sydney Water has prepared this REF to assess the potential environmental impacts of the proposal and in accordance with the Commonwealth DCCEEW *Significant Impact Guidelines 1.1 and 1.2.* The proposal is required to:

- improve the reliability and resilience of the Orchard Hills WFP during poor quality raw water events to meet customer demands
- ensure drinking water quality meets the ADWG during poor quality raw water events.

The main potential construction environmental impacts of the proposal are impacts to biodiversity, water and drainage and impacts from noise and cumulative development. During operation, the proposal would bring positive impacts through improving drinking water supply for customers.

Given the nature, scale and extent of impacts and implementation of the mitigation measures outlined in this REF, the proposal is unlikely to have a significant impact on the environment. Therefore, an environmental impact statement is not required under Division 5.1 of the EP&A Act and a referral to the Commonwealth DCCEEW is not required under the *Significant Impact Guidelines 1.2 and 1.2*.

The REF considers how the proposal aligns with the principles of ESD. The proposal will result in positive long-term environmental improvements. The proposal will not result in the degradation of the quality of the environment and will not pose a risk to the safety of the environment.

References

Department of Defence 2022, Orchard Hills Offset Area Offset Plan

Department of Regional NSW 2019, NSW Exploration and Mining Titles, State Government of NSW

Dredging Solutions 2024, Sludge Survey Report

Cool Burn 2024, Orchard Hills Water Filtration Plant Reliability Upgrade Project – Bushfire Impact and Risk Assessment

Jacobs 2024a, Orchard Hills WFP Reliability Upgrade (Pre-treatment) – Design Report

Jacobs 2024b, Orchard Hills WFP Reliability Upgrade (Pre-treatment) – Geotechnical Factual Report

Jacobs 2024c, Orchard Hills WFP Reliability Upgrade (Pre-treatment) – Geotechnical Interpretative Report

Jacobs 2024d, Orchard Hills WFP Reliability Upgrade (Pre-treatment) – Baseline Contamination Assessment

Jacobs 2024e, Water quality of the concrete lined lagoon within the Orchard Hills WFP Reliability Upgrade Project Area

NSW Environmental Protection Authority (EPA) 2021, Draft Construction Noise Guideline, State Government of NSW

NSW EPA 2017, NSW Noise Policy for Industry, State Government of NSW

NSW EPA 2009, Interim Construction Noise Guideline, State Government of NSW

NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) 2024, Acid Sulfate Soils Risk, State Government of NSW

NSW DCCEEW 2005, Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland, State Government of NSW

Sydney Water Corporation 2023, Orchard Hills WFP Upgrade – Options Assessment

Water Quality Australia 2018, Australian and New Zealand Guidelines for Fresh and Marine Water Quality

Western Sydney Regional Organisation of Councils 2004, Western Sydney Salinity Code of Practice

Appendices

Appendix A – Section 171 checklist

Section 171 checklist	REF finding
Any environmental impact on a community	There may be short-term impacts on the community from construction traffic, activities and equipment. Temporary visual, noise, dust and cumulative development impacts to the local community may occur. These impacts will be minimised and managed by the mitigation measures in this REF. Temporary impacts to visual amenity through vegetation clearing may occur however the proposal is visually shielded from most sensitive receivers. Local impacts to biodiversity may also occur however this would be temporary as vegetation would be would be revegetated after construction. The proposal would not significantly impact sensitive receivers. Once operational, there will be long term environmental improvements through providing a reliable and resilient drinking water network, particularly during poor quality raw water events.
Any transformation of a locality	The proposal will not result in the transformation of a locality. Works sites will be restored to their pre-construction conditions or better after the completion of works. A detention basin would be constructed to capture additional surface water flows, minimising potential downstream impacts. Given the works are limited to within the existing WFP, no permanent transformation of the locality is expected.
Any environmental impact on the ecosystems of the locality	The proposal has been designed to minimise ecological impacts where possible. Some vegetation clearing will be required and would be offset in line with Sydney Water's voluntary Biodiversity Offset Guideline as outlined in the mitigation measures of this REF. A PEMP is being prepared for the Orchard Hills WFP and is expected to be implemented in 2026 with weed management a priority. Through ongoing consultation with GS LLS on construction management plans, the construction of the proposal would not exacerbate ecological impacts to the surrounding Orchard Hills Offset Area. Any potential environmental impacts on vegetation and ecosystems of the locality will be minimised and managed by the mitigation measures in this REF.
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	The proposal will be located in the existing Orchard Hills WFP which is already disturbed from historical construction and existing operations. During construction, there may be temporary aesthetic impacts to nearby receivers due to the presence of machinery and compounds however the majority of the site is shielded from surrounding receivers by vegetation and topography. There would also be a temporary reduction of vegetation due to vegetation clearing. However, the site will be restored to pre-construction conditions or better at the completion of works and vegetation would be replanted in accordance with Sydney Water's Biodiversity Offset Guideline. No recreational or public areas would be impacted by the proposal. Thus, the proposal will not reduce the aesthetic, recreational, scientific or other environmental quality or value of the locality.
Any effect upon a locality, place or building having	The proposal will not have any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical,

Section 171 checklist	REF finding
aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations	scientific or social significance or any other special value for present or future generations. The proposal has been designed to avoid and protect the identified [redacted] within the Orchard Hills WFP. *This information has been redacted to protect sensitive Aboriginal heritage information*
Any impact on the habitat of any protected animals (within the meaning of the *Biodiversity Conservation Act 2016*)	The proposal would have a minor impact to flora and fauna as discussed in Section 6.2.3. Impacted vegetation will be offset in accordance with the Sydney Water Biodiversity Offset Guide and as calculated in Section 6.2.3 above. The proposal would not have a significant impact on the habitat of protected animals.
Any endangering of any species of animal or plant or other form of life, whether living on land, in water or in the air	The proposal would have a minor impact to flora and fauna as discussed in Section 6.2.3. Impacted vegetation will be offset in accordance with the Sydney Water's Biodiversity Offset Guideline and as calculated in Section 6.2.3 above. Given the mitigation measures are implemented, the proposal would not be endangering any species.
Any long-term effects on the environment	The proposal would not have any long-term impacts on the environment but will have a long-term benefit by providing a reliable and modern drinking water service for the area.
Any degradation of the quality of the environment	The proposal would not cause the degradation of the quality of the environment. The proposal has been designed to avoid the identified [redacted] and minimise the spread of weeds to surrounding sensitive vegetation. A detention basin would be constructed to capture additional surface water flows, minimising potential downstream impacts. Soil and sediment erosion mitigation measures will be implemented and impacts to water quality are not expected. *This information has been redacted to protect sensitive Aboriginal heritage information*
Any risk to the safety of the environment	The proposal will not increase risk to the safety of the environment. Climate change hazards have been assessed in Section 6.2.11. The proposal would not exacerbate climate change risks.
Any reduction in the range of beneficial uses of the environment	The proposal will not reduce the range of beneficial uses of the environment.
Any pollution of the environment	The proposal would involve earthworks, which potentially contribute to temporary impacts on local soils, waterways and air quality. Construction compound sites will be restored to pre-construction or better conditions at the completion of construction.

Section 171 checklist	REF finding
	Environmental mitigation measures will mitigate the potential for the proposal to pollute the environment. No pollution of the environment is expected.
Any environmental problems associated with the disposal of waste	Waste disposal will be in accordance with the environmental mitigation measures, and no environmental problems associated with the disposal of waste are expected.
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	The proposal will not increase demand on resources, that are, or are likely to become, in short supply. Instead, the proposal would improve the reliability and resilience of drinking water supply to customers during poor quality raw water events.
Any cumulative environmental effect with other existing or likely future activities	The proposal may contribute to cumulative impacts to local traffic and noise during concurrent construction periods with nearby local developments. Impacts are unlikely to be significant as most major construction projects are located at a distance from the proposal and do not share overlapping receivers.
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	Due to the distance from the coast, the proposal is unlikely have any impact on coastal processes or hazards, and coastal processes and coastal hazards will not have any impact on the proposal.
Any applicable local strategic planning statements, regional strategic plans or district strategic plans made under the EP&A Act, Division 3.1	Section 5.1 discusses the strategic context of the proposal. The proposal would support local and regional plans by providing a more reliable and resilient drinking water service.
Any other relevant environmental factors.	The proposal has been assessed against the factors listed above, and there are no other relevant environmental factors to consider.

Appendix B – Consideration of TISEPP consultation

TISEPP section	Yes	No
Section 2.10, council related infrastructure or services – consultation with council		
Will the work:		
Potentially have a substantial impact on stormwater management services provided by council?		X
Be likely to generate traffic that will strain the capacity of the road system in the LGA?		X
Connect to, and have a substantial impact on, the capacity of a council owned sewerage system?		X
Connect to, and use a substantial volume of water from a council owned water supply system?		X
Require temporary structures on, or enclose, a public space under council's control that will disrupt pedestrian or vehicular traffic that is not minor or inconsequential?		X
Excavate a road, or a footpath adjacent to a road, for which the council is the roads authority, that is not minor or inconsequential?		X
Section 2.11, local heritage – consultation with council		
Is the work likely to affect the heritage significance of a local heritage item, or of a heritage conservation area (not also a State heritage item) more than a minor or inconsequential amount?		X
Section 2.12, flood liable land – consultation with council		
Will the work be on flood liable land (land that is susceptible to flooding by the probable maximum flood event) and will works alter flood patterns other than to a minor extent?		X
Section 2.13, flood liable land – consultation with State Emergency Services		
Will the work be on flood liable land (land that is susceptible to flooding by the probable maximum flood event) and undertaken under a relevant provision*, but not the carrying out of minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? * (e) Div.14 (Public admin buildings), (g) Div.16 (Research/ monitoring stations), (i) Div.20 (Stormwater systems)?		X
Section 2.14, development with impacts on certain land within the coastal zone– council consultation		

TISEPP section	Yes	No
Is the work on land mapped as coastal vulnerability area and inconsistent with a certified coastal management program?		X
Section 2.15, consultation with public authorities other than councils		
Will the proposal be on land adjacent to land reserved under the *National Parks and Wildlife Act 1974* or land acquired under Part 11 of that Act*? If so, consult with DPE (NPWS).*		X
Will the proposal be on land in Zone C1 National Parks and Nature Reserves or on a land use zone that is equivalent to that zone? *If so, consult with DPE (NPWS).*		X
Will the proposal include a fixed or floating structure in or over navigable waters? *If so, consult TfNSW.*		X
Will the proposal be on land in a mine subsidence district within the meaning of the *Coal Mine Subsidence Compensation Act 2017*? *If so, consult with Subsidence Advisory NSW.*		X
Will the proposal be on land in a Western City operational area specified in *the Western Parkland City Authority Act 2018,* Schedule 2 and have a capital investment value of $30 million or more? *If so, consult the Western Parkland City Authority*.		X
Will the proposal clear native vegetation on land that is not subject land (ie non-certified land)? *If so, notify DPE at least 21 days prior to work commencing. (Requirement under s3.24 Chapter 3 Sydney Region Growth Centres - of the SEPP (Precincts – Central River City) 2021).*		X

Appendix C – Design drawings

Appendix D – Flood assessment report

Appendix E – Biodiversity assessment report

Appendix F – Aboriginal objects due diligence assessment

Aboriginal heritage information must not be made publicly available or be published in any form or by any means by Sydney Water or our contractors / joint ventures, unless written approval has been provided to Sydney Water from DPE's AHIMS Registrar .

For publicly displayed REFs, all Aboriginal heritage information that identifies individual sites must be removed.

Appendix G – Historic Aerial Imagery

Historical Imagery Viewer photo 1911_14_096 (1969), NSW Department of Customer Service

Historical Imagery Viewer photo 4038_08_102 (1990), NSW Department of Customer Service

Appendix H – Statement of heritage impact

Appendix I – Construction noise and vibration impact assessment

Appendix J – EPA contaminated land record of notices database

Name	Address	Distance	Comment	Impact on proposal
7-Eleven Service Station	92 Mulgoa Road, Jamisontown	4.5 km northwest	In 2012 the site was declared significantly contaminated land due to contamination from total petroleum hydrocarbons and BTEX. Offsite migration of contaminated groundwater may have occurred. Management actions have been implemented however residual hydrocarbons remain in the groundwater. In July 2024, the EPA issued an ongoing groundwater monitoring order.	The 7-Eleven service station is 1.5 km east of Nepean River. Any groundwater movement is presumed to be towards the west, to the Nepean River. The proposal is located to the east of this site. Any potential contaminated groundwater from this site is unlikely to impact the proposal.
Penrith Waste Services	Mulgoa Road, Mulgoa	5 km southwest	Current location of Penrith Landfill Depot. In 1992, an initial notice for potential contamination by chemical waste was made. In 1993 it was revoked. No comment is provided and it is assumed that no contamination was found on site.	The EPA's repeal notice does not provide commentary on the reason for appeal. It is assumed that investigations were carried out and contamination was not found or that management of contamination is satisfactory. It is assumed that groundwater would flow to the west towards Mulgoa Creek (600 m from centre of site). As such, potential contaminated groundwater from this site is unlikely to impact the proposal.
Elura Liquid Waste Disposal Site	Lot 4, The Northern Road, Luddenham	Not known. Possibly between 5 and 10 km south	In 1993, the EPA issued a notice on the basis of the site being potentially contaminated by chemical waste. However, "this notice has ceased to have legal effect as the company issued with the notice has been deregistered and no longer exists. The terms of the notice are no longer in force. It is not known if the notice was complied with. Information regarding any potential contamination has been provided to the current land owner so that any potential risks can be handled appropriately." The Australian Business Registered shows that the company (Alltypes Liquid Haulage Pty Ltd) cancelled its ABN in 2006.	There is potential soil and groundwater contamination. As the EPA has not provided a new notice to the new landowner, it is assumed that the risk of contamination is low. Depending on the direction of groundwater flow, any potential contamination may impact the proposal.

Name	Address	Distance	Comment	Impact on proposal
Crane Enfield Metals	2115-2131 Castlereagh Road, Penrith	7 km northwest	The site was contaminated with a range of volatile chlorinated hydrocarbons in the soil and groundwater. Contaminated groundwater had migrated onto the neighbouring property and was ultimately discharging into the Nepean River. The site was declared a remediation site in 2006 and an ongoing maintenance order in 2020 and 2021 was issued. Management actions were carried out including yearly monitoring of groundwater. The EPA has repealed all notices and orders relating to this site as contamination has been satisfactorily managed.	The site is about 1 km from the Nepean River. Any potential contamination would likely flow towards the river and is unlikely to impact the proposal.
Drum Recycler	Vallance Street, St Marys	8 km northeast	In 1994, a notice for potential contamination by chemical waste was issued. Sampling and investigations were carried out and a Remedial Action Plan was implemented. The site was deemed fit for use for industrial purposes and the EPA repealed the notice in 1998.	The site is 600 m and 1 km from Ropes Creek and South Creek, respectfully. Residual contamination may be present however given the distance from the proposal, potential impacts are unlikely.
Coles Express (former Ampol) Service Station	86-88 Great Western Highway, Colyton	8.5 km northeast	Groundwater samples showed significant exceedances in petroleum hydrocarbons, including benzene, toluene, ethylbenzene and xylene (BTEX). Offsite migration may have occurred. Management actions were carried out and the EPA repealed the notice in 2020.	As management actions were carried out satisfactorily, the EPA notice was repealed. Therefore, the presence of ongoing and residual contamination is unlikely. Any potential contamination from this site is unlikely to impact the proposal.
Solveco	38 Links Road, St Marys	9 km northeast	The land is declared significantly contaminated land due to soil, groundwater and soil vapour contamination. Contaminated groundwater is not delineated and has the potential to migrate off-site, particularly posing environmental risk to Ropes Creek and South Creek.	The site is 400 m and 1 km from Ropes Creek and South Creek, respectfully. Given the distance from the proposal and the proximity to the creeks, it is unlikely that potential contamination from the site would impact the proposal.

Name	Address	Distance	Comment	Impact on proposal
Castlereagh State Forest (now Castlereagh Nature Reserve)	Northern end of Compartment 5, The Northern Road, Berkshire Park	15 km north	EPA notices from 1992, 1995 and 1996 highlight the disposal of chemical wastes leading to environmental degradation. Investigations were carried out. The land is considered suitable for continuing low sensitivity land use. Notices were revoked in 1998.	Due to the distance and EPA's revocation of notices, presence of ongoing and residual contamination is unlikely. Any potential contamination from this site is unlikely to impact the proposal.

Appendix K – Traffic impact assessment

SW27 12/24