Review of Environmental Factors

Glenfield Water Resource Recovery Facility Upgrades (September 2024)

Sydney WATER

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Determination

This Review of Environmental Factors (REF) assesses potential environmental impacts of Glenfield Water Resource Recovery Facility (WRRF) Upgrades (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. Additional environmental impact assessment may be required if the scope of work or work methods described in this REF change significantly following determination.

Decision Statement

The main potential construction environmental impacts of the proposal include impacts to flora and fauna and asbestos management. During operation, the benefits are associated with improved air quality by minimising odour generation. 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 (SIS) and/or Biodiversity Development Assessment Report (BDAR) 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, we do not require an Environmental Impact Statement (EIS) and the proposal may proceed.

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 by:	Endorsed by:	Approved by:
[redacted]			

1 Introduction

1.1 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.

We are a statutory State-owned corporation and are 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 Glenfield WRRF upgrades and identifies mitigation measures that avoid or minimise potential impacts.

1.2 Proposal background and need

The Malabar wastewater system services a large area. The system contains four Water Resource Recovery Facilities (WRRF) at Liverpool, Glenfield, Fairfield and Malabar. It also has over 7000 kilometres (km) of sewer reticulation, including the Northern Georges River Submain (NGRS), and 150 sewer pumping stations (SPS). An assessment of the system identified key issues related to current performance and ability to service forecasted population growth.

The Glenfield WRRF is one of three plants in the Georges River Treatment Hub (Liverpool, Glenfield, and Fairfield). Treatment performance of the Glenfield WRRF is declining due to aging of the infrastructure.

Table 1-1summarises the proposal need, objectives and consideration of alternatives.

Table 1-1 Proposal need, objectives and consideration of alternatives

Aspect	Relevance to proposal
Proposal need	Glenfield WRRF is a secondary treatment plant that services the Glenfield catchment and the temporary Greater Macarthur (GMAC) catchment. The Glenfield catchment is forecasted to grow by 29% by 2046, from 210,000 to 270,000 . However, a peak growth of 335,000 (50%) is expected in 2031 due to servicing of the GMAC temporary catchment. The WRRF, in its current state, cannot service this growth nor any temporary catchments without further deterioration in treatment performance. In the past 5 years, the plant has been operating at above 20% design hydraulic and load capacity. This has led to an unacceptable frequency and volume of untreated bypasses, culminating in extensive community complaints regarding odour, and an EPA Pollution Reduction Program (PRP) in 2021/22. Network modeling has shown that there will be dry weather overflows in the system if this situation continues beyond 2026. The preferred solution at Glenfield WRRF is an upgrade to both hydraulic and load treatment capacity

Aspect	Relevance to proposal
	across the plant. This upgrade enables the WRRF to service growth up to 2046 and restore the ability to discharge to the Liverpool Ashfield Pipeline – which is the preferred system solution. The capacity upgrade also provides an opportunity to mitigate the odour issue in the long term by providing capacity to treat and manage flows more effectively.
Proposal objectives	The proposal objectives are to: • ensure the WRRF can service current and future growth • address the EPA Pollution Reduction Program regarding odour issues and subsequent community complaints • provide treatment capacity to enable increased network capacity in the Northern Georges River Submain (NGRS) via utilising the Liverpool to Ashfield Pipeline (LAP) and Western Branch Submain • develop solution to align with the long-term Malabar system plan, meaning that transition to future system pathways will be possible without demolition or reconfiguration of assets built under this project.
Consideration of alternatives/options	<u>Do nothing scenario</u> If the proposal is deferred, wastewater flows in the NGRS will be too high to undertake required maintenance. This will also lead to increased operation of the Glenfield WRRF and will worsen compliance issues such as uncontrolled discharges to the environment and odour. The risks of deferring the project are provided in Table 1-2. <u>Options assessment</u> Sydney Water's options assessment process determined the preferred option. A long list of options was developed which addressed key objectives. These options were refined and costed. Options were then considered using a Multi Criteria Analysis. Criteria considered included cost, social impact, environmental impact, operational flexibility, maintainability, wet weather overflow abatement and circular economy contribution. The preferred option is to upgrade Glenfield WRRF to service growth up to 2046 flows, including inlet works and primary treatment. Upgrade of odour control and containment.

Table 1-2 Consequences of deferral

Project Deferral Risk Rating	Risk Area	Short Description	Post Project Completion Rating
Very High 1 Major, very likely	Compliance	Growth and interim catchments cannot be serviced by the current WRRF leading to worsening compliance and reputational risks. Regulatory sanction, multiple statutory fines, enforceable undertaking, low level prosecution	Low 6 Minor, very unlikely
Very High 1 Major, very likely	Reputation	Increased customer/community complaints due to odours emitted from WRRF including negative impact to reputation due to odour complaints. Widespread complaints or multiple escalated complaints to Minister or ombudsman	Low 6 Minor, very unlikely
Very High 1 Major, very likely	Performance	Poor effluent quality means continuation of discharge to the NGRS, and inability to divert flows from the NGRS for safe access and maintenance. Majority of project objectives not achieved which are important to the program outcomes	Low 6 Minor, very unlikely
Very High 1 Major, very likely	Compliance	Ministerial and/or EPA inquiries or legal action due to odour requirements in the *Protection of the Environment Operations Act 1997* (POEO Act). Regulatory sanction, multiple statutory fines, enforceable undertaking, low level prosecution	Low 6 Minor, very unlikely
Very High 1 Major, very likely	Environment	Higher frequency and volume of discharge to local environment (Georges River) and at poorer discharge quality.	Low 6 Minor, very unlikely
High 2 Moderate, very likely	Public health	Increase in wastewater overflows upstream of WRRF (in network) due to capacity bottlenecks at the inlet works. Exposure to unsafe product.	Low 6 Minor, very unlikely
High 2 Moderate, very likely	Performance	Delay in achieving long-term Malabar System strategy where the improved treatment at the WRRF forms part of strategy. Majority of proposal objectives not achieved which are important to the program outcomes	Low 6 Minor, very unlikely

1.3 Consideration of Ecologically Sustainable Development

Table 1-3 considers how the proposal aligns with the principles of ecologically sustainable development(ESD).

Table 1-3 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 driver for the proposal is to ensure that threats to the surrounding environment from wastewater operations are reduced (e.g. minimising odour and reducing wet weather discharges to the environment). Therefore, the proposal will not result in serious or irreversible damage. Mitigation measures will be implemented during construction to further reduce any risk of environmental damage.
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 continuing to provide a reliable wastewater service and reducing the potential environmental impacts from odours and wet weather discharges.
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 has been designed to use previously disturbed areas and will not significantly impact on biological diversity or impact ecological integrity.
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*	Cost was a key input to the MCA process and decision-making. The proposal will provide cost efficient use of resources and provide optimum outcomes for the community and environment.

2 Proposal description

2.1 Proposal details

Table 2-1 describes the proposal and Figure 2-1 shows the location and key environmental constraints.

Table 2-1 Description of proposal

Aspect	Detailed description
Proposal description	The proposal would reduce odour issues, increase the WWRF capacity for anticipated population growth, and provide a resilient wastewater system through: • provision of full secondary treatment at Glenfield WRRF through new membrane bioreactor (MBR) full secondary treatment • upgrades to primary treatment, biosolids treatment, and effluent flow management systems to match full secondary capacity and reduce the plant odour potential • upgrades to odour control systems to enhance odour capture and treatment • site and general ancillary services for the new assets.
Location and land ownership	The proposal is located at the Glenfield WRRF Victoria Road, Macquarie Fields which is owned by Sydney Water.
Site establishment and access tracks	The proposal will use existing roads and internal Sydney Water roads, where possible. New internal roads (within the WRRF) will be constructed as part of the proposal to access new infrastructure.
Ancillary facilities (compounds)	A construction compound will be required to house site sheds, construction amenities and materials laydown. An indicative location for the compound is shown on Figure 2-1
Methodology (pre-construction works)	During pre-construction we will: • prepare management plans, procedures and site inductions • undertake required investigations (e.g. service locating, testing of lagoon water quality and geotechnical boreholes) • establish and mark out designated construction areas and areas for material and equipment storage • install environmental controls

Aspect	Detailed description
	• clear vegetation within the construction area • set up temporary site sheds, amenities and associated infrastructure.
Scope of work	The proposal involves the following scope of works and shown on Figure 2-2 to Figure 2-4. The proposal includes the following activities within Glenfield WRRF: • site establishment including vegetation removal, pour concrete slabs, install utilities and pipework, construction compound set up and installation of access tracks. **Inlet works** • decommission of existing inlet works • new inlet works including screening and grit removal • connect SPS353 to the new inlet works. **Electrical/ Supervisory Control and data acquisition (SCADA) works** • relocation of existing HV • construct new HV switching and switch-room • new Endeavour Energy HV point of connections • HV unit with embedded generator protection and tariff metering facilities • modification to the existing HV switchboard • decommissioning of redundant HV RMUs and augmentation of the existing HV network • new LV switchrooms including new LV switchboards for new processing areas and load centres • renew existing transformers and associated remedial • programmable logic controller electrical SCADA upgrades • removal of existing HV overhead line. **Primary treatment** • construct a temporary odour control unit (OCU) • refurbish the existing primary sedimentation tanks (PSTs) including new scum removal, odour covers, ventilation • construct new conventional PSTs • construct new effluent channels and flow control.

Aspect	Detailed description
	Secondary and tertiary treatment • construct new membrane bioreactor (MBR) and associated equipment • construct new chemical dosing unit • construct new chemical MBR cleaning system • construct one new digester and associated mechanical and electrical works • install a new odour control treatment unit, ducting and ventilation system • install new biogas piping for new digester and integration with existing digester and existing cogen. Extension of biogas piping to new location of waste gas burner. **Ancillary works** • relocate the existing waste gas burners • relocate the LPG storage • demolition of existing scour headwall structure and suitable backfill and compaction (engineered) to enable location for new inlet works • undertake utilities & general works including process water, compressed air, roads, drainage etc • Construct new access roads and hardstand areas for new inlet works, secondary treatment assets, odour control, primary treatment, and duplicate reclaimed effluent.
Commissioning	Commissioning involves testing and running the new equipment to ensure it works correctly and is integrated with existing plant operations. The exact commissioning steps depend on the type of the equipment, but typically include: • factory testing • pre-commissioning checks • dry and wet testing of installed equipment • process commissioning including trialing and process proving of new and affected existing processes • training and providing operation and maintenance manuals • process performance testing.

Aspect	Detailed description
Restoration	Work areas will be restored to a pre-construction condition or better, in consultation with the landowners. In accordance with Sydney Water's Biodiversity Offset Guide, cleared native vegetation will be offset in an adjacent or alternative location. This will require the planting of like for like vegetation species.
Materials/ equipment	Plant: • excavators (various sizes) • haulage trucks (various sizes) • compactors • roadsaws • vacuum trucks • concrete trucks and pumps • water cart and pump • horizontal borer • hydraulic pipe jackers • vibratory rollers • truck mounted crane • semi-trailers and large delivery trucks • light commercial and passenger vehicles. Equipment: • pumps (various sizes) • pipe welding equipment • air compressors • compaction equipment • generators • jackhammers • davit systems • fall arrest equipment • temporary fencing • hand tools • skip bins • jersey kerbs • water-filled barriers • portable amenities. Materials: • stabilised sand

Aspect	Detailed description
	• asphalt • select fill (granular backfill material) • excavated spoil • formwork timber • concrete and reinforcement • pipework and appurtenances • diesel and petrol.
Work hours	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. The proposal is not expected to require work outside these hours. However, Sydney Water's Project Manager can approve work outside of standard daytime hours. The approval process is described in the mitigation measures in Section 6.
Proposal timing	Construction is expected to start April 2026 and take about 36 months.
Operational requirements	We will operate Glenfield WRRF with upgraded components to meet EPL compliance and reduce community impacts.

2.2 Proposal area and changes to the scope of work

The proposal shown in this REF is indicative and based on the latest concept design at the time of REF preparation. The final proposal may change based on detailed design or construction planning. The general mitigation measures outline when changes to the proposal trigger supplementary environmental impact assessment. If required, further assessment must be prepared in accordance with SWEMS0019.

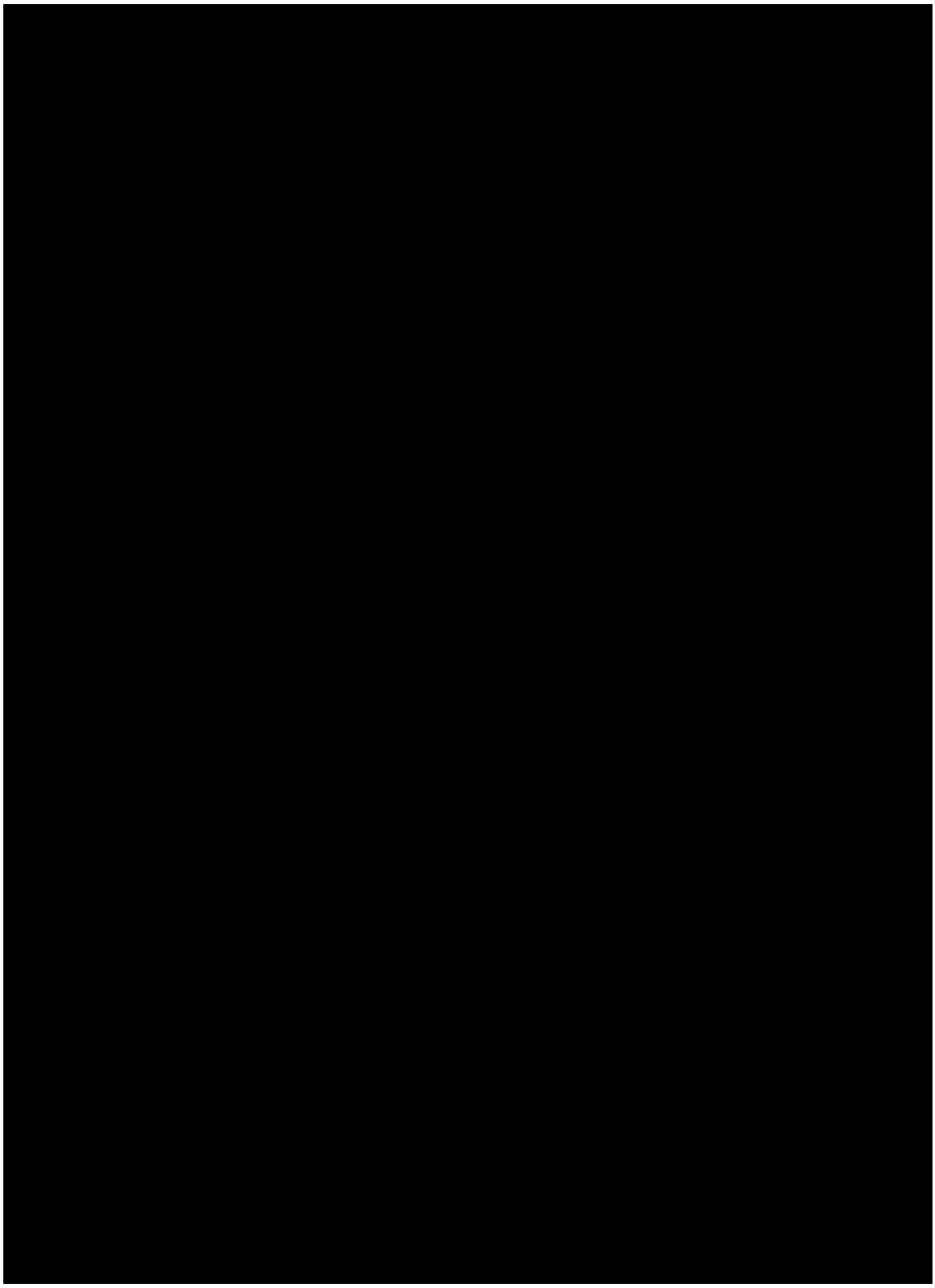


Figure 2-1 Location of proposal and key environmental constraints

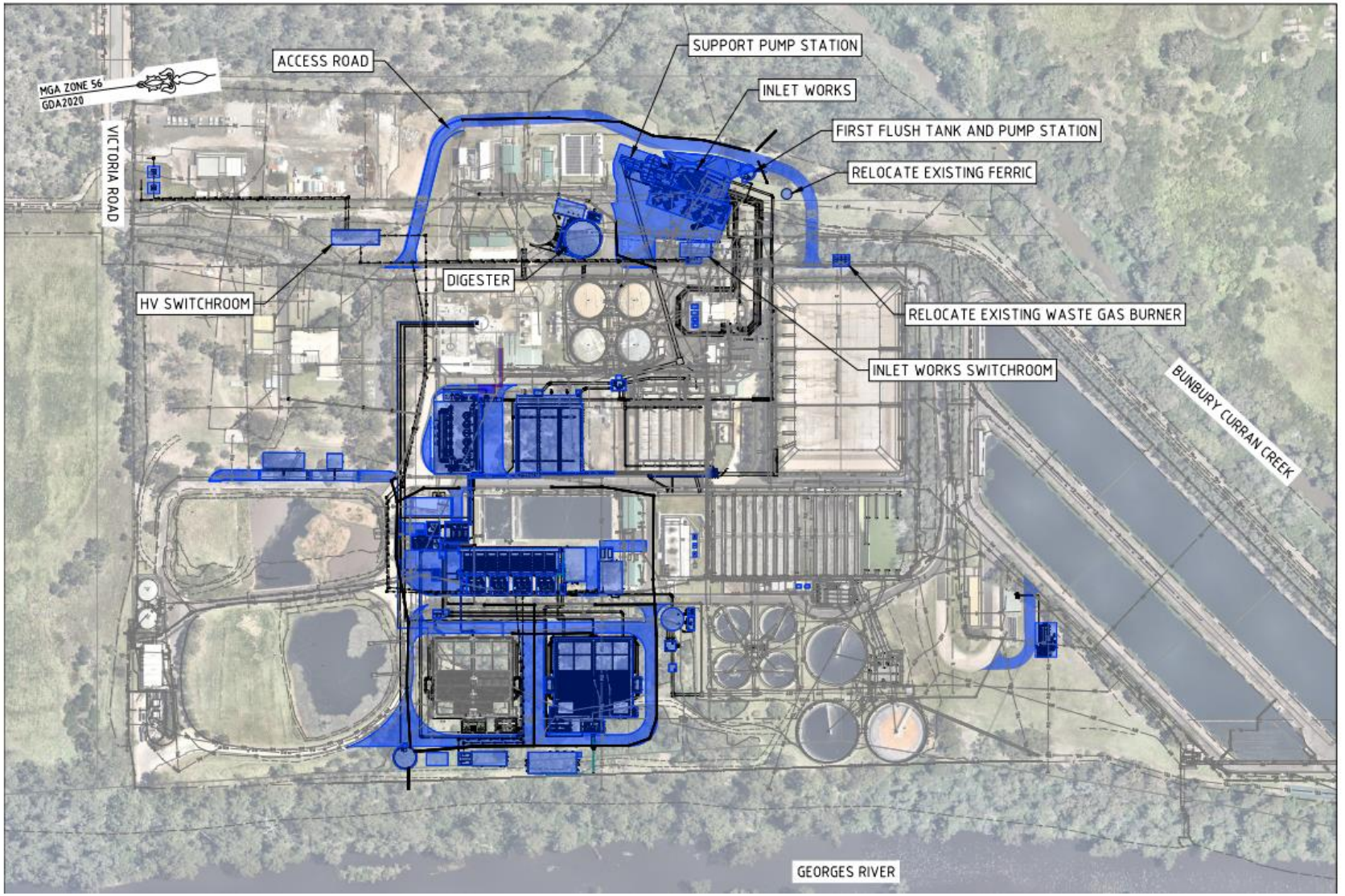


Figure 2-2 Proposal design - north works

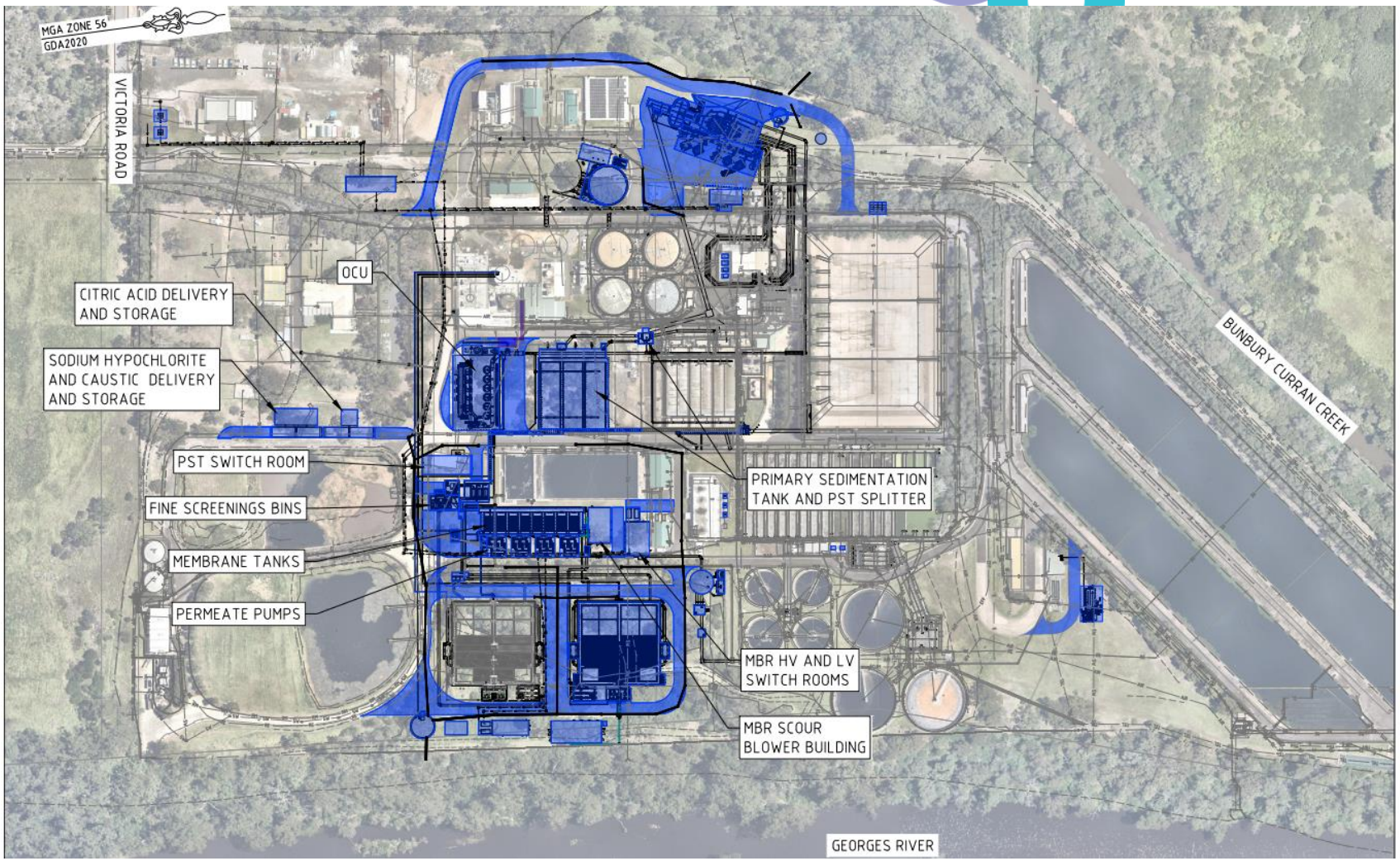


Figure 2-3 Proposal design - central works

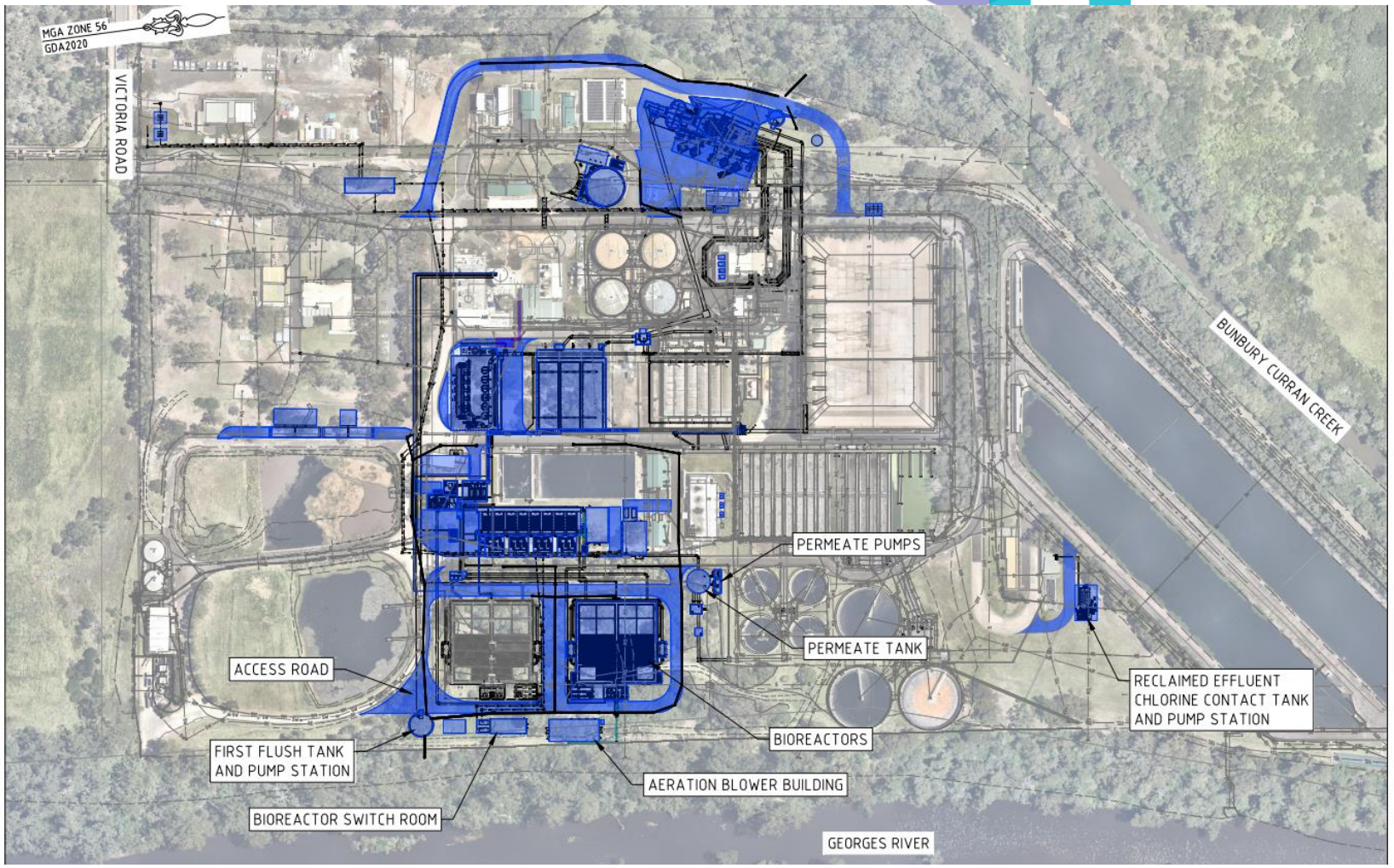


Figure 2-4 Proposal design - south works

3 Consultation

3.1 Community and stakeholder consultation

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 plan or strategy development or before making key decisions.

3.2 Consultation required under State Environmental Planning Policies and other legislation

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. This is specified in the State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP).

We have also consulted with the Western Parkland City Authority (WPCA) as the proposal has a capital investment value of over $30 million and is in the Western City operational area (section 2.15 of the TISEPP). WPCA provided their written support on 8 August 2024. WPCA consider the proposal aligns with their Blueprint to provide a connected city and will improve the livability of the Western Parkland City and the safety of residents within it.

4 Legislative requirements

4.1 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 4-1) and legislation (Table 4-2) are relevant to the proposal. Table 4-2 also documents any licences and permits required, and timing and responsibility for obtaining them.

Table 4-1 Environmental planning instruments relevant to the proposal

Environmental Planning Instrument	Relevance to proposal
Campbelltown Local Environmental Plan 2015 (Campbelltown LEP)	The proposal is on land zoned Sewerage System (SP2).
State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP)	Section 2.126 permits development for the purpose of sewerage treatment plants without consent on land in a prescribed zone. Glenfield WRRF upgrades are in land zoned SP2, which is listed as a prescribed zone. As Sydney Water is a public authority, the proposal will be carried out in the prescribed circumstances and may proceed without consent. We have consulted with Western Parkland City Authority as required in section 2.15 of the TISEPP.
State Environmental Planning Policy (Biodiversity and Conservation) 2021 (BCSEPP)	**Water catchments (Chapter 6)** Chapter 6 of the BCSEPP applies as the proposal is within the Georges River Catchment, a regulated catchment area. Section 5 of this REF assesses potential environmental impacts on water quality and quantity, 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. **Koala habitat protection (2020 and 2021) (Chapters 3 & 4)** These chapters aim to encourage the proper conservation and management of areas of natural vegetation that

Environmental Planning Instrument	Relevance to proposal
	provide koala habitat. This is to ensure that permanent free-living populations are protected in their present range, and to reverse the current trend of population decline. The SEPP contains prescriptions for the consideration of "potential koala habitat" and "core koala habitat" for developments within local government areas listed in Schedule 2 of the SEPP, including Campbelltown City Council. Campbelltown City Council have developed a Koala Plan of Management (KPoM). Objectives of the plan have been considered when assessing potential impacts on koalas and koala habitat. Compliance with the Campbelltown KPoM is necessary for proposals where development consent is required. Although the proposal is Part 5 and does not require development consent, the objectives have been considered in Section 5.2.3 and Appendix C.

Table 4-2 Consideration of key environmental legislation

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
Protection of the Environment Operations Act 1997 (POEO Act)	The works are on the Malabar wastewater system which is covered by EPL 372. These works are required, in part, to ensure Glenfield WRRF operates in accordance with the EPL discharge requirements, and to meet the EPL PRP requirements for odour reduction. Temporary relaxation of EPL limits is not required during construction/ commissioning. A variation to EPL 372 is not required for operation.	NA	NA
Biodiversity Conservation Act 2016 (BC Act)	A Biodiversity Assessment was prepared to assess vegetation trimming and clearing (Section 5.2.4 and Appendix C). Tests of Significance (ToS) were prepared in accordance with the BC Act to assess the impact of this proposal on threatened species, communities, and their habitats. The assessment concluded that the works are unlikely to result in a significant impact.	REF	Pre-construction, Sydney Water

Legislation	Relevance to proposal	Permit or approval	Timing and responsibility
Water Act 1912/ Water Management Act 2000 (WM Act)	The proposal has potential to encounter groundwater during construction. A Water Supply Works Approvals (WSWA) or Water Access Licence >3ML will be required for any groundwater dewatering activities.	WSWA/WAL Pre-construction, Sydney Water	WSWA Pre-construction, Sydney Water
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Under the EPBC Act, actions that have, or are likely to have, a significant impact on Matters of National Environmental Significance (MNES) require Commonwealth approval. Significant Impact Criteria (SIC) assessments were performed to determine whether the project is likely to significantly impact any threatened entities (Appendix C, Arcadis, 2024). The proposal is not anticipated to have a significant impact on listed threatened species, ecological communities, or migratory species (Section 6.1.3 of the REF).	*NA*	NA

5 Environmental assessment

Section 5.2 describes the existing environment and assesses direct and indirect impacts of construction and operation**.** It also identifies mitigation measures to minimise impacts. These will be incorporated into contract documents and a Construction Environmental Management Plan (or similar) prior to starting work.

5.1 Existing environment

The proposal is located at Glenfield WRRF within an existing Sydney Water owned site. The proposal has been subject to previous disturbance from the construction, operation and maintenance of the WRRF. The proposal is located between Georges River to the east and Bunburry Curran Creek to the North.

The proposal area is generally cleared of vegetation. Some pockets of dense vegetation are present along the eastern boundary and western boundary of the Glenfield WRRF.

There are some nearby sensitive residential located about 250 m north west of the proposal.

The proposal will be accessed via an existing access road from Victoria Road which is a two-way divided road, which connects to Canterbury Road (State Road managed by Transport for NSW (TfNSW)).

5.2 Environmental aspects, impacts and mitigation measures

5.2.1 Topography, geology and soils

Existing environment and potential impacts

The proposal is in an area impacted by soil contamination, mainly asbestos fibre cement fragments. These fragments are present in the subsurface soil throughout various areas of the site. This is discussed further in Section 5.2.7. Further investigations and/or removal works may be required if fragments are encountered during future works onsite.

During construction, we will disturb ground, remove vegetation, excavate, and stockpile soil including imported clean fill, which could result in potential offsite erosion and sedimentation of surrounding land and waterways.

A review of information available (NSW OEH eSPADE 2.0) indicates an unknown risk of acid sulfate soils (ASS) to the east of the site along the Georges River. Inappropriate management of ASS, saline soils and contaminated soils have potential to impact surrounding land and waterways from off-site leaching of contaminants or acid/ saline soils.

The proposal will not permanently change the surface topography and drainage patterns of the area. The area will be returned to its original topography and drainage pattern following construction.

We do not anticipate any impacts on geology, soils and topography during operation of the proposal.

Mitigation measures

With the implementation of the mitigation measures below, impacts to topography, geology and soils can be adequately managed, and residual impacts are expected to be minor.

Table 5-1 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: • 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 • rectify damaged controls immediately • remove controls once surfaces have been stabilised, including removing trapped sediment in drainage lines.
Minimise ground disturbance and stabilise disturbed areas progressively.
Delivery Contractor 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.
The Contractor will ensure an Asbestos Management Plan (AMP) is prepared by a suitably qualified person as part of the CEMP. The AMP is to be reviewed by Sydney Water's Environmental Representative in consultation with Contamination and Hazardous Materials team. The plan must identify the type and location of known/potential contamination, management requirements (waste minimisation, waste segregation and classification) and reuse, offsite recycling and/or disposal measures. The AMP should also consider findings of the Sydney Water Hazardous Building Materials Management Plan (Nov 2020).
Manage acid sulfate soils in accordance with the Acid Sulfate Soils Management Advisory Committee: Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998).
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, and before rainfall.
Adopt appropriate soil salinity mitigation measures in accordance with Western Sydney Salinity Code of Practice (Western Sydney Regional Organisation of Councils, 2003). This may include: • stabilising existing areas of erosion • minimising water use on site • avoiding rotation and vertical displacement of the original soil profile

Mitigation measures
• backfilling excavations deeper than one metre in the same order or treating or using this material as fill at depths more than one metre from the finished level.

5.2.2 Water and drainage

Existing environment and potential impacts

The proposal is located 50 m west of Georges River and 50 m south of Bunbury Curran Creek which are both listed as Key Fish Habitat (KFH). Bunbury Curran Creek has been noted as a potential floodplain from which effluent can migrate away from waterways into nearby recreational, residential, or commercial areas during heavy rainfall. Flooding has the potential to impact construction and cause movement of spoil offsite.

Construction works include excavation, stockpiling of soils and storage of fuels and chemicals. If not managed properly these activities could impact water quality increasing the risk of sediment or contaminants entering the stormwater system and waterways.

The proposal will not alter existing topography or drainage patterns of the area. All excavations will be backfilled and any excess spoil will be disposed of in accordance with the mitigations measures listed in Table 5-2.

Geotechnical investigations will be undertaken as part of the pre works to determine groundwater levels. If it is determined that groundwater would be encountered Sydney Water will obtain a groundwater Water Supply Work Approval or a Water Access Licence, prior to any dewatering taking place. Dewatering would be managed with appropriate mitigation measures, and in accordance with the approvals and licenses from the Natural Resources Access Regulator.

In addition, stockpiles will be managed carefully for proposal sites in flood-risk areas. Bunding potential contaminants, including contaminated wastes, will mitigate impacts from waste runoff and spills.

Mitigation measures

With the implementation of the mitigation measures below, impacts to surface and ground water can be adequately managed, and residual impacts are expected to be low.

Table 5-2 Environmental mitigation measures — water and drainage

Mitigation measures
Bund potential contaminants and store on robust waterproof membrane, away from drainage lines
Keep functioning spill kit on site for clean-up of accidental chemical/fuel spills, and an aquatic spill kit on site for clean-up of accidental chemical/fuel spills. Keep the spill kits stocked and located for easy access.
Locate portable site amenities, chemical storage and stockpiles of erodible materials away from watercourses, drainage lines and flood prone areas.

Mitigation measures
Keep stockpiles to a minimum and ensure adequate contingency measures are in place to prevent sedimentation of waterways in the event of a large flood event.
If possible, groundwater removed from excavations should be used for dust suppression (via a pump or water tanker) in accordance with Exemption 38 of the *Water Management (General) Regulation 2018*.
If the potential for intercepting more groundwater than identified in the REF (following its determination), Sydney Water will obtain a groundwater Water Supply Works Approval. Where dewatering is >3ML per water year (from 1 July), Sydney Water will also obtain a Water Access Licence from NRAR. The Delivery Contractor is responsible for: • providing expert hydrogeological technical information to obtain the approvals • preparing a Dewatering Management Plan complying with the conditions of the approvals (such as protecting water quality; minimising aquifer extraction volumes, monitoring extraction with flow meters and recording volumes).
Dewater excavations in accordance with the Program Delivery Guidance Standard 9.1 Excavation Dewatering (ENV-GS-001).
Store all chemicals and fuels in accordance with relevant Australian Standards and Safety Data Sheets. Record stored chemicals on site register. Ensure bunded areas have 110% capacity of the largest chemical container, or an additional 25% capacity of the total volume stored within (whichever is greater). Tightly secure chemicals and fuels in vehicles. Clearly label all chemicals.
Conduct refuelling, fuel decanting and vehicle maintenance in compounds where possible. If field refuelling is necessary, designate an area away from waterways and drainage lines with functioning spill kits close by.
Conduct any equipment wash down within a designated washout area.
Ensure equipment is leak free. Repair oil/fuel leaks immediately or remove from site and replace with a leak-free item.

5.2.3 Flora and fauna

A specialist flora and fauna assessment was carried out by Arcadis and is summarised here. The flora and fauna assessment included:

- a desktop review including database searches for flora and fauna previously recorded
- a flora and fauna field survey
- likelihood of occurrence assessment for the identified and predicted flora and fauna
- assessments of significance for those species that were found to be likely to occur
- considering the relevant biodiversity certification orders in force for the field survey area
- discussion of the potential impacts of the proposal
- identification of site-specific mitigation measures to minimise and mitigate potential impacts of the proposal.

The complete assessment report is provided as Appendix C.

Vegetation communities

Two different plant community types (PCTs) were confirmed to be present within the field survey area during site inspection as shown in Table 5-3, Figure 5-1 and Figure 5-2 . PCT 3321 and PCT 4024 have associated Threatened Ecological Communities listed under the BC Act and EPBC Act (TECs). Although both TECs are listed under the EPBC Act they did not meet the key diagnostic characteristics or meet the minimum thresholds for the moderate condition.

Table 5-3 Threatened ecological communities within the Study Area

PCT	BC Act	Extent within the Study Area (ha)
PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest	Shale Sandstone Transition Forest in the Sydney Basin Bioregion – Critically Endangered	1.48
PCT 4024 – Cumberland Blue Box Riverflat Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. - Endangered	0.50

Threatened flora

A database search of BioNet Atlas of NSW Wildlife identified a total of 38 threatened flora species as being recorded or predicted to occur within a 10-kilometre radius of the Study Area. Of these 36 are listed under the BC Act and 28 are listed under the EPBC Act.

During field surveys, ecologists did not find any threatened flora species. The quality of habitat present for threatened flora was considered low due to the degraded understorey dominated by exotic perennial grasses and evidence of a recent herbicide spraying. As such, the number of threatened flora species with a moderate or higher likelihood to occur was downgraded from 20 to zero following field surveys. Based on the observations made during the field survey, the Study Area is considered unlikely to support threatened flora species known from the locality.

Threatened fauna

Database searches identified a total of 55 threatened and migratory fauna species as being recorded or predicted to occur within a 10-kilometre radius of the Study Area. Of these 29 are listed under the BC Act and 38 are listed under the EPBC Act.

During field surveys, ecologists did not find any threatened fauna species or migratory fauna species listed under the EPBC Act or BC Act. Based on the observations made during the field survey, the Study Area is considered to have a moderate likelihood of supporting threatened fauna species known from the locality. Despite the remnant vegetation across the Study Area, the overall quality of habitat present was degraded, with strong evidence of edge effects evident in the understorey dominated by weeds.

Koalas *(Phascolarctos cinereus)* have previously been identified in the Study Area (Arup, 2024). Arcadis ecologists corroborated this finding with observations of Koala scratching's on *Eucalyptus punctata* (Grey gums) identified during the field survey.

Up to 12 hollow bearing trees were identified with varying sizes. This vegetation is likely to support hollow dependent microbats, woodland birds with the larger hollows potentially supporting lorikeets, cockatoos or owls.

Exotic Grassland

There is dispersed exotic grassland across the Glenfield WRRF. Exotic grasslands cover approximately 0.63 hectares and is not considered priority habitat for the threatened fauna likely to occur on site.



Figure 4-1 Biodiversity values within the Study Area at Site 1.

Figure 5-1 Ground-truthed Plant Community Types and hollow bearing trees (Arcadis, 2024)



Figure 4-2 Biodiversity values within the Study Area at Site 2. Grey gums included as Koala habitat trees.

Figure 5-2 Ground-truthed Plant Community Types, koala habitat trees and hollow bearing trees (Arcadis, 2024)

Potential impacts

Vegetation communities

Under a worst-case scenario the proposed works would remove a total of 1.60 hectare of vegetation in the Study Area comprising native, planted and exotic vegetation as shown in Figure 5-1 and Figure 5-2.

A total of 0.91 hectare of vegetation associated with Shale Sandstone Transition Forest in the Sydney Basin Bioregion occurs within the Impact Area and may be removed by the Proposal.

In accordance with Section 7.3 of the BC Act, a Test of Significance assessment has been undertaken to determine the significance of impacts to Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC. No Test of Significance was undertaken for River-Flat Eucalypt Forest considering no vegetation constituting this TEC will be removed by the Proposal.

It was determined that the proposal is unlikely to have a significant impact upon Shale Sandstone Transition Forest in the Sydney Basin Bioregion for the following reasons:

- the proposal will not result in or increase the likelihood of extinction of the local occurrence of these communities
- the proposal will remove a minor fraction of the total extent of these communities
- the proposal would not fragment an existing patch of these communities
- the proposal is unlikely to impact adjoining patches of these communities or suitable habitat such that they substantially reduce in quality or integrity.

Threatened flora

Up to 20 threatened flora species were identified as having a moderate to high likelihood of occurrence in the site. Following the field survey these were downgraded to a low likelihood of being impacted by the proposal. As none were found during the field survey and the vegetation quality of the site is unlikely to support the threatened flora species, no Tests of Significance or Significant Impact Criteria assessments for threatened flora were conducted.

Threatened fauna

Vegetation disturbance will impact potential foraging, shelter, and/or breeding habitat for multiple threatened fauna species with a moderate or higher likelihood of occurring within the construction footprint. Under a worst-case scenario a total of 0.91 hectares of potential habitat (excluding exotic lawns) would be removed by the proposal which would impact foraging resources for threatened fauna species that inhabit woodlands. The proposal would require the removal of up to nine hollow bearing trees (HBTs) and a further three identified preferred Koala trees with an average DBH (diameter at breast heigh) of 50cm. Of these three trees, none were observed to have koala scratchings.

Potential impacts of the proposal on threatened species have been assessed using tests of significance (Section 7.3 of the *Biodiversity Conservation Act 2016*) and are presented in Table 7-6 of Appendix C. Areas of habitat loss for each species have been calculated based on associated

PCTs. Consequentially of the species listed, no species were determined likely to be significantly impacted by the proposed work.

Koalas have potential to occur within the field survey area. They are less mobile and more likely to be impacted by vegetation clearing activities and work vehicle strikes than other animals. Specific pre-clearing surveys for koalas will be required before and during construction.

The proposal would require the removal of up to 0.91 hectares of habitat including several feed trees. The removal of this vegetation is unlikely to significantly impact the species as it would not fragment the local population, affect critical habitat, or interfere with the recovery of the species.

The 0.91 hectares of potential foraging habitat to be cleared is not considered to be a significant area of habitat or of importance to the long-term survival of the Koala in the locality. As a result, it is considered unlikely that the proposal represents a significant impact to this vulnerable species.

Potential impacts – aquatic habitat

Georges River and Bunbury Curran Creek are adjacent to the Study Area and are mapped as Key Fish Habitat. These aquatic habitats are unlikely to be affected by the proposed works, about 15 metres east of the impact area. Therefore, impacts to the KFH are considered unlikely.

Georges River and Bunbury Curran Creek have moderate to high potential for GDEs, however they fall outside the Study Area. There is a low potential for GDEs to occur within the Study Area and as such are unlikely to be impacted by the proposed works.

Potential indirect impacts

Fauna injury or mortality may occur during vegetation clearing activities or may result from collisions with work vehicles or plant, or accidental entrapment in plant or equipment.

Indirect impacts to suitable habitat in adjacent buildings and retained vegetation beyond the construction footprint are possible from noise and vibration during construction. However, with mitigation measures, impacts are likely to be negligible and unlikely to have a significant impact on locally occurring fauna.

It is likely that the vegetation within the site already experiences some invasion by exotic species which represent a threat to native vegetation. An increase in the movement of people, vehicles, machinery, vegetation waste and soil during the proposed works may facilitate the introduction or spread of exotic grasses and other weeds.

Operation

No impacts to flora and fauna are anticipated during operation.

Mitigation measures

With the implementation of the mitigation measures below, impacts to flora and fauna can be adequately managed, and residual impacts are expected to be moderate.

Table 5-4 Environmental mitigation measures — flora and fauna

Mitigation measures
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 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. • Any removal of remnant vegetation where there is no net change to environmental impact (eg a different area of vegetation is removed but the total area is the same or less than assessed in the EIA). Written explanation of the application of this clause (including justification of the need for trimming or removal and any proposed revegetation) should be provided when seeking Project Manager approval. Any impacts to native vegetation and trees must be offset in accordance with the Biodiversity Offset Guideline (SWEMS0019.13).
Physically delineate vegetation to be cleared and/or protected on site and install appropriate signage prior to works commencing.
Minimise vegetation clearance and disturbance, including impacts to standing dead trees. Where possible, limit clearing to trimming rather than the removal of whole plants.
Offset residual impacts to native vegetation and trees in accordance with the Biodiversity Offset Guideline (SWEMS0019.13). The total area of a threatened ecological community cleared is to be offset onsite at a ratio of 3:1.
Ecologist will undertake a count for all planted trees, exotic and native, that will be removed by the development. These counts will be used to calculate the required offsets as per the Sydney Water's Biodiversity Offset Guide
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.
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.
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.
If any damage occurs to vegetation outside of the disturbance corridor (as shown in the CEMP), 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

Mitigation measures

- contemporary bush regeneration practices, including disposal of sealed bagged weeds to a licenced waste disposal facility.

Record Pesticides and Herbicides use in accordance with SWEMS0017

To prevent spread of weeds:

- All equipment and plant machinery should be cleaned prior to the start of works.
- Wrap straw bales in geofabric to prevent seed spread.

Bag all plant parts and excavated topsoil that may be infested with weed propagules and dispose at a licensed waste disposal facility.

In TOBAN period:

- check specific TOBAN notice to confirm whether the work can be carried out under standard exemptions (Govt Gazette No18 Feb 2018) if the work is not covered by a standard exemption, apply to RFS for specific exemption.

During the pre-clearance surveys, any hollow-bearing trees not previously identified in or near the proposed Study Area would be marked by an ecologist so that they are retained and avoided by contractors.

Cover open trenches overnight to avoid fauna becoming trapped. Additionally, trenches should be checked each morning for possible trapped fauna.

Construction should occur during standard daylight hours to avoid potential indirect impacts on nocturnal fauna such as owls, amphibians, and mammals. If construction is to occur at night, then light mitigation measures outlined in the National Light Pollution Guidelines for Wildlife should be applied to mitigate impacts to native fauna (DEE 2020). Any permanent lighting proposed as part of the development should adopt directional fittings and lighting posts to minimise light spill into adjacent areas of native vegetation.

Road design standards and/or approved vehicle calming devices (e.g. speed humps, chicanes and wildlife activated signage) must be incorporated on new roads created with a maximum speed of 40km/hr.

Approved wildlife exclusion fencing must be installed along the WRRF, the lower half of which must be clad with galvansied tin sheeting on the outside face.

Round pipe koala-grids or other approved devices must be installed at fence-ends and driveways and other access points to prevent koala access to the WRP.

Clearing of native vegetation and/or earthworks must be temporarily suspended within a range of 25 m from any tree which is concurrently occupied by a koala and must not resume until the koala has moved from the tree of its own volition.

Any clearing of land must not commence until the area proposed for clearing has been inspected for the presence of koalas by a suitably qualified person. The individual, or a nominated representative, must remain on site during any approved clearing of vegetation. If clearing operations are being undertaken concurrently in different sections of a property, a suitably qualified person must be present in each section.

Retained Preferred Koala Food Trees and shelter trees that occur outside of the Impact Area of the Proposal must be protected.

5.2.4 Heritage

Existing environment and potential impacts

Aboriginal heritage

The proposal would be constructed predominantly on land previously disturbed by WRRF activities.

Searches of the Aboriginal Heritage Information Management System (AHIMS) database on [redacted] The proposal is unlikely to impact any object or place of Aboriginal cultural heritage significance during construction or operation, however, to minimise residual risk an unexpected finds procedure identified in this REF will be implemented during works.

Non-Aboriginal heritage

One Commonwealth listed heritage property (Cubbitch Barta National Estate) is located within 200 m of the proposed works at Glenfield WRRF. This heritage item is on the opposite side of Georges River and not proposed to be accessed during construction works. It is unlikely that the works (both construction and operation) would impact on any heritage items.

Mitigation measures

With the implementation of the mitigation measures below, impacts to Aboriginal heritage and non-Aboriginal heritage can be adequately managed, and residual impacts are expected to be low. It is unlikely that the works (both construction and operation) would impact on any heritage items.

Table 5-5 Environmental mitigation measures — heritage

Mitigation measures
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.
If any Aboriginal object or non-Aboriginal relic is found, cease all excavation or disturbance in the area and notify Sydney Water Project Manager in accordance with SWEMS0009.

5.2.5 Noise and vibration

Existing environment and potential impacts

The proposal is predominantly within a bushland environment. The works would occur entirely within the operational Glenfield WRRF which is buffered from sensitive receivers by dense vegetation. Due to the distance of sensitive receivers from the works (over 250 m), minimal noise impacts from the construction of the proposal area anticipated.

During operation, there will be a minor increase to background noise due to the operation of new infrastructure such as new OCU. However noise generated during operation will not exceed the noise criteria in the Noise Policy for Industry (EPA 2017).

The proposal will not generate vibration impacts during construction and operation. The works do not require equipment that generates vibration. No vibration impacts are anticipated during operation.

Mitigation measures

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

Table 5-6 Environmental mitigation measures — noise and vibration

Mitigation measures
Works must comply with the EPA 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 will also be carried out in accordance with: • Sydney Water's Noise Management Procedure SWEMS0056 • Noise Policy for Industry (EPA, 2017). 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:
• Identify and consult with the potentially affected residents prior to commencement of works. This should:
  ○ 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 (eg times identified by the community that are less sensitive to noise such as mid-morning or mid-afternoon for works near residences).
• Implement a noise complaints handling procedure.
• Do not warm-up plant or machinery near residential dwellings before the nominated working hours.
• Select appropriate plant for each task, to minimise the noise impact (eg all stationary and mobile plant will be fitted with residential type silencers).
• Do not use engine brakes when entering or leaving the work site(s) or within work areas.
• Regularly inspect and maintain equipment in good working order.
• Arrange work sites where possible to minimise noise (eg 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).
• Use natural landforms/ mounds or site sheds as noise barriers.
Schedule noisy activities around times of surrounding high background noise (local road traffic or when other noise sources are active).

Mitigation measures
If works beyond standard daytime hours are needed, the Delivery Contractor would: • consider potential noise impacts and implement the relevant standard daytime hours safeguards, follow 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 the Sydney Water Project Manager in consultation with the environment and communications representatives.
If night works are needed, the Delivery Contractor would: • 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 • identify community notification requirements (ie 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 the Sydney Water Project Manager in consultation with the environment and communications representatives.
If works on Sundays or public holidays are required, the Delivery Contractor would: • 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 the Sydney Water Project Manager in consultation with the environment and communications representatives.

5.2.6 Air and energy

Existing environment and potential impacts

The proposal is located wholly within Glenfield WRRF. Potential sensitive receivers include residential receivers located 250 m north west of the proposal. Currently, receivers surrounding the Glenfield WRRF experience odour issues. These have led to odour complaints with the Georges River Hub (Glenfield, Liverpool and Fairfield WRRF's).

The proposal could result in impacts to air associated with:

- emissions from construction machinery, equipment, and vehicles
- odour from construction work including decommissioning the OCU, construction and decommissioning of the temporary OCU and operation of the new OCU.

The proposal has the potential to generate dust from ground disturbance and spoil storage. However, potential dust impacts would be short term and managed through appropriate timing of the works (i.e. excavation works minimised during windy conditions) and mitigation measures.

Fuels are required for vehicles and plant during construction. We expect this to be a minor impact to energy use given the scale of the work and short duration of construction.

Although the Glenfield WRRF operates within the EPL, an objective of the proposal is to address odour issues. As part of the options assessment for the design, odour modelling was conducted to assess the effectiveness of each option at reducing offsite odour impacts. Development of the odour model followed the procedures outlined in the "Approved Methods for the Modelling and Assessment of Pollutants in NSW" (EPA, 2016), the "Technical Framework - Assessment and Management of Odour from Stationary Sources in NSW" (DEC, 2006), and the Sydney Water "Procedure for Odour Dispersion Modelling for SW Projects" (AA, 2015).

The model (CALPUFF) was used to simulate odour levels near Glenfield WRRF using representative emissions and meteorological data. Odour criteria from the EPA were used to define the extent of odour impact. The results from odour modelling have been used to inform measures for minimising odour complaints in the local community. The design considered the maximum wastewater flows and ensured that the proposed odour management system included recommendations from the EPA's PRP.

Mitigation measures

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

Table 5-7 Environmental mitigation measures — air and energy

Mitigation measures
Use alternatives to fossil fuels where practical and cost-effective.
Track energy use as per SWEMS0015.28 Contractor NGER template.
Minimise the potential for odours (eg cover open connection points during OCU upgrades).
Ensure odour control measures are available and ready to use during the works.
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.
Identify methods to minimise potential odours (eg. sequencing of odorous works, isolating and covering odour emitting sources).
Switch off vehicles/machinery when not in use.
Implement measures to prevent offsite dust impacts, for example: • Water exposed areas (using non-potable water source where possible such as water from excavation pits). • Cover exposed areas with tarpaulins or geotextile fabric. • Modify or cease work in windy conditions. • Modify site layout (place stockpiles away from sensitive receivers).

Mitigation measures
• Vegetate exposed areas using appropriate seeding.
Cover all transported waste.

5.2.7 Waste and hazardous materials

Existing environment and potential environmental impacts

Our corporate objectives include being 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 our suppliers to minimise waste.

Preliminary site investigations identified asbestos in fill material across the Glenfield WRRF site. Efforts were made during design to avoid this known contaminated fill area to minimise waste and impacts to the surrounding receivers. However, there is potential for asbestos to be present in fill material across other areas of the site.

The proposal will generate:

- excavated material (potentially including Asbestos Containing Materials)
- drilling fluids
- green waste
- demolition waste (from buildings and hardstand areas)
- decommissioned mechanical equipment
- general waste.

The proposal may involve the transportation of asbestos waste (associated with soil containing asbestos and the removal of recycled building aggregate). Requirements to track waste via the EPA's Waste Locate online tracking System will be confirmed by the contractor. A contamination assessment is required to rule out the asbestos risk in the soil prior to excavation.

An Asbestos Management Plan will be prepared as part of the CEMP as detailed in Table 5-1. The plan will provide management requirements (waste minimisation, waste segregation, classification and tracking requirements) and reuse, offsite recycling and/or disposal measures.

The contractor will seek opportunities to reduce, recycle and reuse materials. This will be documented in the Waste Management Plan or CEMP.

During operation we do not expect changes to the types or volumes of waste produced.

Mitigation measures

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

Table 5-8 Environmental mitigation measures — waste and hazardous materials

Mitigation measures
A contamination assessment is required to rule out the asbestos risk in the soil prior to excavation
Prepare a Waste and Resource Recovery Plan (WRRP) to appropriately manage and classify any materials including soils, construction/demolition wastes and associated stockpiles The plan will be prepared by the Delivery Contractor (or nominated environmental consultant) and approved by the Sydney Water Project Manager in consultation with the Environmental Representative and Contamination and Hazardous Materials team. The WRRP should include: • expected waste types and their location • delineation of waste /resource types including identification of likely vertical and lateral extents (where warranted) • visual monitoring of materials during excavation and measures to be undertaken to prevent co-mingling / cross-contamination of waste / resource types • ex-situ waste and resource recovery classification program, including timing relative to project / excavation phases as well as proposed hold points • waste minimisation and resource recovery methodologies (including consideration of onsite reuse or management if contaminated) • roles and responsibilities in relation to stockpile and material management and monitoring program • proposed onsite reuse locations and reuse methodology (if applicable) • proposed offsite reuse, offsite recycling and / or offsite disposal locations / facilities • legislative compliance requirements • consideration of future maintenance • restoration.
Manage waste in accordance with relevant legislation and maintain records to show compliance eg waste register, transport and disposal records. Record and submit SWEMS0015.27 Contractor Waste Report.
Provide adequate bins for general waste, hazardous waste and recyclable materials.
Minimise stockpile size and ensure delineation between different stockpiled materials.
Minimise the generation of waste and sort waste streams to maximise reuse/recycling in accordance with the legislative requirements.
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 where appropriate. Recycle soils at a licensed soil recycling facility or dispose at an appropriately licenced landfill facility.
Prevent pollutants from escaping including by covering skip bins.
Dispose excess vegetation (non-weed) that cannot be used for site stabilisation at an appropriate green waste disposal facility.

5.2.8 Traffic and access

Existing environment and potential impacts

The proposal is located entirely within the Glenfield WRRF, where public access is restricted. Access to the WRRF will be via Victoria Road which is a two-way divided road. Construction will generate light and heavy vehicle movements across the Glenfield WRRF. The proposal will require varied traffic movement over the construction period with an average of about 10 heavy vehicle and 25 light vehicle movements a day during construction. The proposal will not impact access to private properties.

The proposal has the potential to affect traffic and access from construction traffic on local roads. The anticipated traffic load would include cranes arriving at the site, workers travelling to site daily, spoil removal and a few material deliveries. The traffic generated for the proposal is expected to be minor and temporary. No public road closures are required.

During operation, traffic movements, street parking availability or access to private properties will not change.

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 minor.

Table 5-9 Environmental mitigation measures — traffic and access

Mitigation measures
Develop management measure to minimise traffic impacts near residential properties, schools and businesses by consulting with them (eg no major materials deliveries at school drop off or pick up times etc).
Manage sites to allow people to move safely past the works, including alternative pedestrian, bicycle, pram and wheelchair access.
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.

5.2.9 Social and visual

Existing environment and potential impacts

The proposal is predominantly screened from public view by vegetation. Whilst the proposal will result in a permanent visual change to the Glenfield WRRF, it will not be readily visible to the public. Construction activities would have visual impacts to workers and visitors to the Glenfield WRRF, however these will be temporary.

The proposal will provide a positive social benefit by adding resilience to the wastewater service in the area. The increased workforce on site may result in a minor increase in customers for businesses in the local area providing economic benefit.

Mitigation measures

With the implementation of the mitigation measures below, social and visual impacts can be adequately managed, and residual impacts are expected to be low.

Table 5-10 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.
Minimise visual impacts (eg retain existing vegetation where possible).
Direct artificial light away from sensitive receivers where possible (ie residents, fauna or roadways).
Maintain work areas in a clean and tidy condition.

5.2.10 Cumulative and future trends

Potential environmental impacts

Sydney Water will coordinate the works with the operations at Glenfield WRRF to ensure cumulative impacts to the community and plant operations are low. Sydney Water is not aware of any other works such as Major Projects or local developments occurring in the area.

Future trends that could impact the proposal were considered, such as bushfires, flooding, extreme heat and extreme storm events related to climate change. The proposal has considered future trends and is unlikely to further exacerbate them. The upgrades are generally within existing hardstand areas so it is unlikely to create additional stormflow that would contribute to local flooding.

Mitigation measures

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

Table 5-11 Environmental mitigation measures — cumulative and future trends

Mitigation measures
Sydney Water to coordinate works within the Glenfield WRRF to minimise impacts to the surrounding area.

5.2.11 General environmental management

Table 5-12 Environmental mitigation measures — general environmental management

Mitigation measures
Sydney Water's Project Manager (after consultation with the environmental and community 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: • limit proximity to sensitive receivers • do not disrupt property access • have no impact to known items of non-Aboriginal and Aboriginal heritage • are outside high risk areas for Aboriginal heritage • use existing cleared areas and existing access tracks • have no impacts to remnant native vegetation or key habitat features • have no disturbance to waterways • do not require additional safeguards beyond those included in the EIA • do not disturb contaminated land or acid sulfate soils • will 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 will require additional environmental impact assessment. The agreed location of these facilities must be shown on the CEMP site plan and appropriate environmental controls installed.
Should the proposal change from the EIA, no further environmental assessment is required provided the change: • remains within the assessment area for the EIA and has no net additional environmental impact or • is outside the assessment area for the EIA but: - reduces impacts to biodiversity, heritage or human amenity or - avoids engineering (for example, geological, topographical) constraints and - after consultation with any potentially affected landowners and relevant agencies. The Delivery Contractor must demonstrate in writing how the changes meet these requirements, for approval by Sydney Water's Project Manager in consultation with the environmental and community representatives.
Prepare a Construction Environmental Management Plan (CEMP) addressing the requirements of this environmental assessment. The CEMP should specify 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 areas, including locations of lay-down and storage areas for materials and equipment • location of environmental controls (such as erosion and sediment controls, fences or other measures to protect vegetation or fauna, spill kits) • location and full extent of any vegetation disturbance. The CEMP will identify appropriate delineation with (eg metal fencing for heritage items, white flagging for construction corridor, red flagging for no go zones etc). Delineate approved work areas before construction.

Mitigation measures

Prepare an Incident Management Plan (IMP) outlining actions and responsibilities for:

- predicted/onset of heavy rain during works
- spills
- unexpected finds (eg heritage and contamination)
- other potential incidents relevant to the scope of works.

All site personnel must be inducted into the IMP.

To ensure compliance with legislative requirements for incident management (eg *Protection of the Environment Operations Act 1997)*, Follow SWEMS0009 and attach SWEMS0009 to the CEMP.

Complaints to be managed in accordance with Sydney Water's Complaints Procedure and relevant Community Engagement Plan.

6 Conclusion

Sydney Water has prepared this REF to assess the potential environmental impacts of the Glenfield WRRF Upgrades. The proposal is required to improve environmental performance of the Glenfield WRRF and ensure compliance with EPL 372.

The main potential construction environmental impacts of the proposal include impacts to flora and fauna and asbestos management. During operation, the benefits are associated with improved air quality by minimising odour generation. 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.

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

Arup, Glenfield Biodiversity Memo 2.0, February 2024

Environment Protection Authority 2016, Approved Methods for the Modelling and Assessment of Air Pollutants in NSW

NSW Environmental Protection Authority (EPA) 2017, NSW Noise Policy for Industry, NSW Government Sydney

NSW Environment Protection Authority (EPA) 2020, Draft Construction Noise Guideline, NSW Government Sydney

Sydney Water 2023, Glenfield Wastewater Treatment Plant Upgrade – Preliminary Site Investigation

Sydney Water 2015, Corrosion and Odour Program - Procedure for Odour Dispersion Modelling for SW Projects

Appendices

Appendix A – Section 171 checklist

Section 171 checklist	REF finding
Any environmental impact on a community	There will be environmental improvements by implementing EPA's requirements to minimise odour and provide a more efficient and reliable wastewater service.
Any transformation of a locality	The proposal will occur on Sydney Water land and will not result in the transformation of a locality.
Any environmental impact on the ecosystems of the locality	The proposal will not result in environmental impacts to ecosystems of the locality. The quality of the vegetation to be impacted is low and will be offset in line with the Sydney Water policy. The proposal will lead to environmental improvements by ensuring a reliable wastewater service to collect and treat wastewater.
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	There may be temporary impacts to the locality from construction traffic. The works protect the locality in the longer term, improved odour management performance at the WRRF.
Any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations	The proposal will not have any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations.
Any impact on the habitat of any protected animals (within the meaning of the *Biodiversity Conservation Act 2016*)	The proposal will have a moderate impact on the habitat of protected animals. Impacts to important habitat features are restricted to a small area containing threatened fauna feed trees. The quantity of these specific habitat features to be impacted is low and is unlikely to adversely affect the occurrence or lifecycle of these species in the locality.
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 will not be endangering any species of animal, plant or other form of life, whether living on land, in water or in the air.
Any long-term effects on the environment	The proposal aims to improve long-term impacts on the environment by catering for growth and reducing odour problems.
Any degradation of the quality of the environment	The proposal will not cause the degradation of the quality of the environment. The proposal will improve odour management performance at the WRRF .

Section 171 checklist	REF finding
Any risk to the safety of the environment	The proposal will not increase risk to the safety of the environment. The proposal will improve safety by removing any asbestos encountered by the proposal.
Any reduction in the range of beneficial uses of the environment	The proposal will not reduce the range of beneficial uses of the environment. The proposal will improve odour management performance at the WRRF' .
Any pollution of the environment	Environmental mitigation measures will mitigate the potential for the proposal to pollute the environment during construction. The proposal is designed to ensure EPL compliance during operation. An EPL variation is not required during construction.
Any environmental problems associated with the disposal of waste	Waste disposal will be in accordance with the environmental mitigation measures. Asbestos will be managed in accordance with the Waste and Resource Recovery Plan.
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.
Any cumulative environmental effect with other existing or likely future activities	The proposal will not have any cumulative environmental effect with other existing or likely future activities.
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	The proposal will not 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	The proposal is to service growth and the applicable strategic planning statements or plans have been considered in the system planning and options selection process. In particular, the proposal is consistent with strategies listed in EPA Clean Air Strategy 2021-30 and the Campbelltown Local Strategic Planning Statement.
Any other relevant environmental factors.	The proposal has been assessed against factors including bushfires, flooding, extreme heat and extreme storm events related to climate change. 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?		✓
Be likely to generate traffic that will strain the capacity of the road system in the LGA?		✓
Connect to, and have a substantial impact on, the capacity of a council owned sewerage system?		✓
Connect to, and use a substantial volume of water from a council owned water supply system?		✓
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?		✓
Excavate a road, or a footpath adjacent to a road, for which the council is the roads authority, that is not minor or inconsequential?		✓
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?		✓
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?		✓
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)?		✓
Section 2.14, development with impacts on certain land within the coastal zone– council consultation		
Is the work on land mapped as coastal vulnerability area and inconsistent with a certified coastal management program?		✓
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).*		✓
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).*		✓
Will the proposal include a fixed or floating structure in or over navigable waters? *If so, consult TfNSW.*		✓
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.*		✓
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*.	✓	
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).*		✓

Appendix C – Specialist studies - Ecology

SWXXX XX/XX Insert a publication number. (*required if publicly displayed/published)*

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FLORA AND FAUNA ASSESSMENT

Glenfield Water Resource Recovery Facility

23 AUGUST 2024



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SYDNEY WATER
FLORA AND FAUNA ASSESSMENT

Glenfield Water Resource Recovery Facility

Author [redacted]

Checker

Approver

Report No 1

Date 23/08/2024

Revision B

This report has been prepared for Sydney Water in accordance with the terms and conditions of appointment for CW22439950 dated 23 May 2022. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared by	Approved by
A	02/07/2024	Draft report	AJ, ET	EE
B	23/08/2024	Final report	AJ	EE, NB

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1 INTRODUCTION

The Glenfield Water Resource Recovery Facility (WRRF) Upgrade (hereafter known as the "Proposal") involves the upgrade of existing water reclamation infrastructure including construction of new inlets and access roads. The proposed works will be split across two sites within the one Sydney Water property. The proposed works are required to increase capacity and performance of the WRRF.

An ecological assessment is required to inform the Review of Environmental Factors for the proposal. The assessment will investigate all areas where vegetation clearing or other direct and indirect impacts to biota is likely to occur (hereafter referred to as the "Study Area"). The Study Area has been depicted in Figure 1-2. Arcadis has been engaged by Sydney Water to prepare a Flora and Fauna Assessment for these sites.

1.1 Scope of the report

The scope of this report is to assess the biodiversity impacts associated with the Proposal to inform the Review of Environmental Factors (REF) under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The assessment will consider the potential impacts to threatened entities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act), and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The objective of the assessment is to identify and assess the quality of vegetation and ecological communities within the Study Area and identify species within the proposed footprint that may require removal.

The Proposal will aim to avoid and minimise impacts to biodiversity values, however any residual impacts to biota will require offsetting which will be calculated using the Sydney Water *Biodiversity Offset Guide*.

1.2 Site information

The Proposal is located at the Glenfield WRRF on Victoria Road, Macquarie Fields which is owned by Sydney Water. The Proposal is located 36 kilometres south-west of the Sydney central business district, in the Local Government Area (LGA) of City of Campbelltown and is part of the Macarthur region. The Proposal is occurring at the existing Sydney Water Glenfield WRRF which is situated centrally within a larger property on land zoned as SP2, Infrastructure (Sewage System). The broader property supports native and planted vegetation. Burnbury Creek and Georges River are located just outside of the northern and eastern boundaries of the property respectively. The Proposal sites will be situated on undeveloped lands either side of the existing WRRF.

Previous surveys on the Proposal site (Arup 2023) identified native vegetation constituting Plant Community Type (PCT) 3321 Cumberland Shale-Sandstone Ironbark Forest and Urban Exotic / Planted Native Vegetation as occurring on site. Koala (*Phascolarctos cinereus)* were identified as a threatened species on site, listed under both the BC Act and EPBC Act.

1.3 Proposed works

Upgrades within the WRRF are proposed to take place within Site 1, in the eastern portion of the WRRF and Site 2, in the western portion of the WRRF (Figure 1-2).

The Proposal design has been depicted in Figure 1-1 and includes the following activities within Glenfield WRRF:

- Decommission of existing inlet works and new inlet works including screening and grit removal and connect SPS353 to the new inlet works.
- Relocation of existing High Voltage (HV), construct new HV switching and switch-room, New Endeavour Energy HV point of connections. Modification to the existing HV switchboard. New LV switch rooms including new LV switchboards for new processing areas and load centres.

- Construct a temporary OCU, refurbish the existing primary sedimentation tanks (PSTs) including new scum removal, odour covers, ventilation. Construct new conventional PSTs, construct new effluent channels and flow control. Construct new membrane bioreactor (MBR) (and associated equipment). Construct new chemical dosing unit. Construct new chemical MBR cleaning system. Construct one new digester and associated mechanical and electrical works. Install a new odour control treatment unit, ducting and ventilation system. New biogas piping for new digester and integration with existing digester and existing cogen. Extension of biogas piping to new location of waste gas burner.
- Ancillary works include the relocation of the existing waste gas burners and LPG storage tank. Demolition of existing scour headwall structure and suitable backfill and compaction to enable location for new inlet works. Undertake utilities & general works including process water, compressed air, roads, drainage.

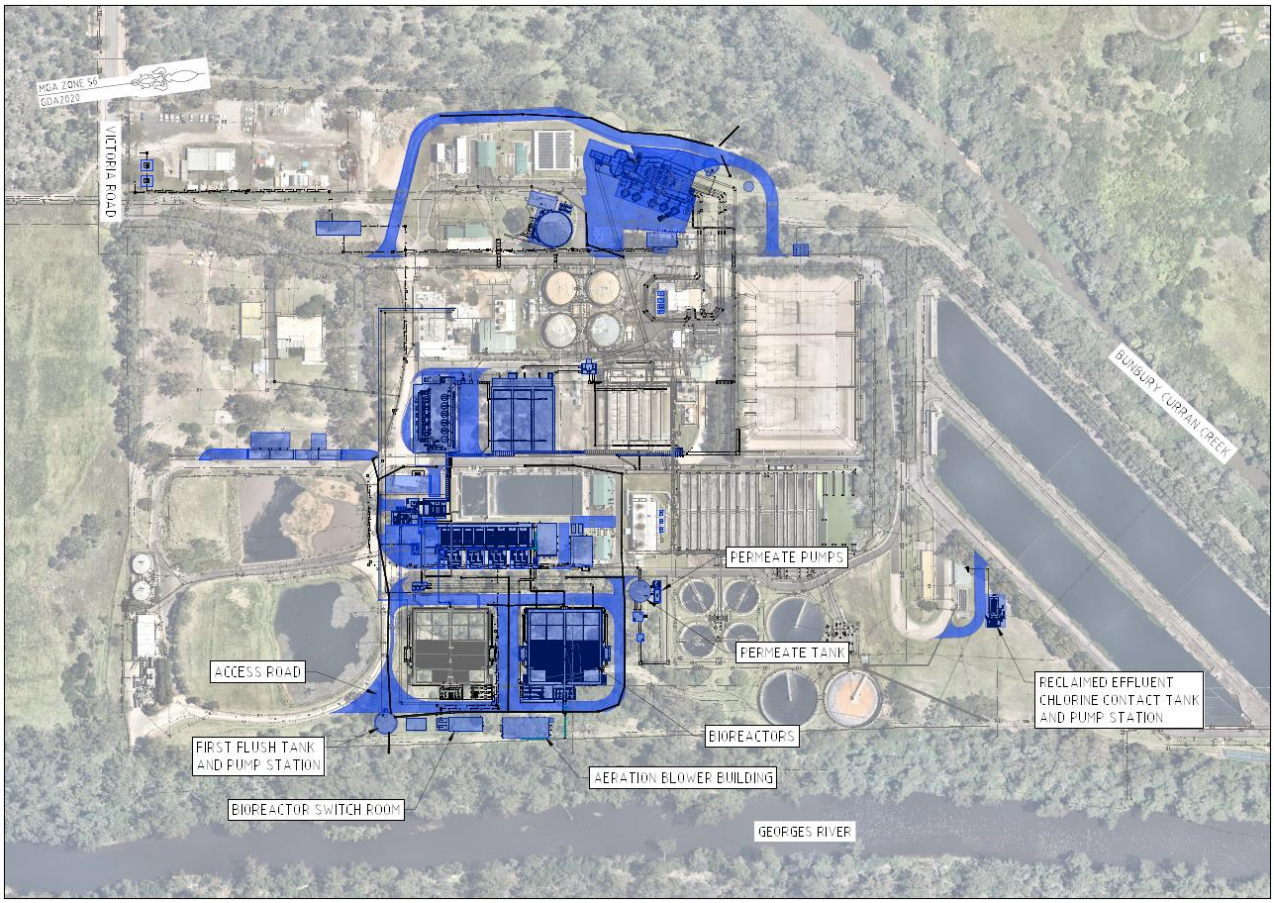


Figure 1-1. Proposed upgrades within the WRRF. The areas supporting the components of the development shaded translucent dark blue are the subject of this investigation.



Figure 1-2 Location of Study Area

1.4 Legislative context

The following sections provide a summary of the Commonwealth and State biodiversity legislation that is relevant to the Proposal.

1.4.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places as defined in the EPBC Act as Matters of National Environmental Significance (MNES). The MNES identified in the EPBC Act include:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Threatened species and communities.
- Migratory species protected under international agreements.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mines).

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a MNES require approval from the Australian Government Minister for the Department of the Environment (the Minister).

The Proposal has the potential to impact threatened species and communities listed under the EPBC Act. These impacts have been assessed against the Significant Impact Criteria to determine whether they have the potential to significantly impact a threatened entity and whether or not a referral to the Minister is required.

1.4.2 Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Conservation Act 2016* (BC Act) is to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

Under the BC Act, proponents of Part 5 activities must apply the Test of Significance to assess biodiversity impacts to a state listed threatened entity. If the activity is likely to have a significant impact or will be carried out in a declared Area of Outstanding Biodiversity Value (AOBV), the proponent must either apply the Biodiversity Offsets Scheme or prepare a Species Impact Statement (SIS).

As the Proposal is being assessed on behalf of Sydney Water, unless it is determined that there is a risk of a significant impact to threatened biodiversity values, this Flora and Fauna Assessment Report is adequate to assess impacts.

1.4.3 Biosecurity Act 2015

The primary objective of the *Biosecurity Act 2015* is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. Division 2 of the *Biosecurity Act 2015* defines local control authorities for weeds. Schedule 1 of the *Biosecurity Act 2015* outlines special provisions relating to weeds, including the duty of land occupiers to control and manage weeds.

Investigation of the Study Area will identify any pests or weeds listed under the *Biosecurity Act 2015* and include recommendations on how to handle these if they are to be managed in accordance with legislative requirements during construction.

1.4.4 State Environmental Planning Policy (Biodiversity Conservation) 2021

Chapters 3 and 4 of the *State Environmental Planning Policy (Biodiversity Conservation) 2021* (Biodiversity Conservation SEPP) incorporate Koala SEPP 2020 and Koala SEPP 2021, respectively. Chapter 3 applies to RU1, RU2 and RU3 zoned land in 74 of the 83 nominated LGAs, which includes the City of Campbeltown LGA. However, Campbelltown LGA is exempt under this Schedule as there is Campbelltown Koala Plan of Management in place (see Section 1.4.5).

The operative provision of both Koala SEPP 2020 and Koala SEPP 2021 apply to the determination of a development application. As the proposal is not occurring on land zoned as RU1, RU2 and RU3 and Part 5 activities are not development requiring development consent the Koala SEPP does not apply. Regardless, this document has been considered when assessing potential impacts on koalas and koala habitat.

1.4.5 Campbelltown Koala Plan of Management

Campbelltown has one of the last known koala populations in the Sydney region and was identified in the approved recovery plan as a priority area for preparation of a Koala Plan of Management (KPoM). Koalas in the Locality are part of the South West Sydney Area of Regional Koala Significance (ARKS). The vision of Campbelltown's KPoM is to "provide for the long-term maintenance of a viable, free-ranging koala population in the Campbelltown LGA" (Philips, 2018).

The aims of the Plan will be realised by way of the following objectives:

a) Seeking support and engagement from all relevant stakeholders with a view to increasing the extent of koala friendly habitat and associated connectivity options
b) Incorporating best-practice habitat assessment procedures to ensure that adequate detail is provided with all development and/or rezoning applications, along with an accompanying set of development standards and controls.
c) Developing appropriate fire management regimes to minimise bushfire risk.
d) Minimising koala mortalities due to vehicle-strike and domestic dog attacks

The KPoMs' objectives have been considered when assessing potential impacts on koalas and koala habitat. Compliance with the Campbelltown KPoM is necessary for proposals where development consent is required. Although Part 5 activities do not require development consent, the objective b) best practice habitat assessment for development application, has been specifically considered when assessing the Proposals potential impact on koalas and reflected in this report's recommendations. Objectives a), c) and d) were also considered in this report however are less applicable to the proposed Glenfield WRRF.

1.4.6 Cumberland Plain Conservation Plan (CPCP) 2022

The Cumberland Plain Conservation Plan (CPCP) facilitates growth in Western Sydney to 2056 and beyond and delivers important development and biodiversity outcomes. The Cumberland Plain Conservation Plan (CPCP) was finalised with NSW approvals in place in August 2022 and Commonwealth approvals were granted in March 2024. The Plan has been developed to meet requirements for strategic biodiversity certification under the BC Act and strategic assessment under the EPBC Act.

The CPCP categorises land into the following:

- Avoided land: land that has been avoided from development and which represents areas of high biodiversity value to be protected.
- Certified-urban capable land: land where future development is likely to occur.

- Excluded land: land that has not been included in the CPCP.
- Strategic conservation area: large remnants of regionally significant biodiversity with good connectivity, or areas with the potential to enhance connectivity in the CPCP Area.

Depending on the land category in which a development is situated will guide the approach for development including requirements for biodiversity approvals and mitigation requirements to achieve the commitments in the CPCP.

The Infrastructure Guidelines for the CPCP apply to activities under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A act).

The Study Area is located entirely within lands applicable to the Cumberland Plain Conservation Plan and South West Sydney Area of Regional Koala Significance (ARKS). The Study Area is adjacent to Strategic Conservation Area and Excluded Land. South of the Study Area, across the road at Loftus Street, there are areas mapped as Protected Koala Habitat and Potential Restoration for Protected Koala Habitat, however this does not occur within the Study Area. There is Native Vegetation mapped within the Study area, however the Study Area is within unclassified land and not within a CPCP Land category. As such it is subject to the regular planning provisions for development in non-biodiversity-certified areas.

2 METHODS

2.1 Desktop assessment

A review of existing literature and database searches was undertaken in May 2024 to identify State and Commonwealth records of threatened entities and Commonwealth Matters of National Environmental Significance (MNES) that occur or have the potential to occur within a 10-kilometre radius of the Study Area. The databases interrogated for this purpose are listed in Table 2-1. All flora and fauna species identified in the database searches are listed in Appendix A and Appendix B.

Table 2-1 Database searches

Database	Purpose of the search	Date the search was completed
BioNet Atlas of NSW Wildlife, managed by the Department of Planning and Environment, Environment, Energy and Science division (DPIE EES)	Used to compile a list of threatened species records listed under the BC Act to within 10 km of the Study Area	27 May 2024
Protected Matters Search Tool managed by the Commonwealth Department of Agriculture, Water and the Environment (DAWE)	Used to compile a list of potentially occurring MNES listed under the EPBC Act to within 10 km of the Study Area	27 May 2024
Threatened species, populations and ecological communities profile database, managed by DPIE EES	Contains information for all listed threatened species, populations and communities	Referenced throughout

2.1.1 Review of existing literature

A review of existing literature was conducted as part of the desktop assessment, including review of the following report:

- Glenfield Biodiversity Memo 2.0 (Arup, 2024)

The likelihood of threatened biodiversity to occur within the Study Area was considered using knowledge of each species' habitat and lifecycle requirements regarding the habitat likely to be present within the Study Area. The location and number of nearby, recent records were also considered in determining the likelihood of occurrence. Table 2-2 outlines the criteria used to determine the likelihood of occurrence of threatened biodiversity within the Study Area. Threatened species likelihood of occurrence was appraised before site surveys and updated after surveys to reflect ground-truthed habitat suitability and site observations. Likelihood of occurrence tables have been prepared for both flora and fauna and haven been included in Appendix A and Appendix B.

Marine species were excluded from assessment there is no marine habitat present in the Study Area

Table 2-2 Likelihood of occurrence criteria

Likelihood of occurrence	Criteria - one or more of the following conditions applies for threatened flora species	Criteria - one or more of the following conditions applies for threatened fauna species
Low	The species has not been recorded previously within 10km of the Study Area. The species has historically (>20 years ago) been recorded within 10km of the Study Area, and suitable habitat is no longer present. The Study Area is beyond the current known geographic range of the species. The species has specific habitat requirements that are not present on the Study Area. The species is considered extinct.	The species has not been recorded previously within 10km of the Study Area. The species has historically (>20 years ago) been recorded within 10km of the Study Area, and suitable habitat is no longer present. The Study Area is beyond the current known geographic range. The species has specific habitat requirements that are not present on the Study Area. The species is considered extinct.
Moderate	The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area. The species has historically (>20 years ago) been recorded (no recent records) within 10km of the Study Area and suitable habitat is present on the Study Area. The species has specific habitat requirements that are present on the Study Area, but in a poor or modified condition.	The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area. The species has historically (>20 years ago) been recorded (no recent records) within 10km of the Study Area and suitable habitat is present on the Study Area. The species has recently (<20 years) been recorded within 10km of the Study Area and the Study Area contains marginally suitable habitat for the species. The species is unlikely to maintain a resident population on the Study Area, however, may occasionally utilise resources within the Study Area.
High	The species has recently (within the last 20 years) been recorded on the Study Area or nearby. The species has specific habitat requirements that are present on the Study Area and are in good condition. A known population of the species is located in similar habitat in proximity to the Study Area.	The species has recently (within the last 20 years) been recorded on the Study Area or nearby. The species has specific habitat requirements that are present on the Study Area. The species is known or likely to maintain resident populations in proximity to the Study Area and could utilise resources within the Study Area. The species is known or likely to regularly utilise resources on the Study Area.
Known	The species was recorded in the Study Area during the current survey.	The species was recorded on or in proximity to the Study Area during the current survey.

2.2 Field survey

Surveys were conducted by Arcadis ecologists Elijah Elias and Acacia Jennings on 31 May 2024 to ground truth biodiversity values identified during desktop assessment and identify any other threatened biota.

The following activities were undertaken during site inspection of the Field Survey Area, with the outcome of these assessments given in Section 4 below:

- Ground-truthing vegetation mapping previously completed by Arup (2024) for Site 1 and existing State Vegetation Type Mapping (SVTM) (DPE 2022c) for Site 2; identifying and mapping vegetation assemblages to Plant Community Types (PCTs)
- Conducting Rapid Assessment Vegetation Points (RAVP) to confirm PCTs,
- Identifying and mapping Threatened Ecological Communities (TECs),
- Biodiversity Assessment Method (BAM) Plots where required in accordance with the BAM,
- Undertaking random meander searches for threatened flora with a moderate or high likelihood of occurrence where suitable habitat is present,
- Identifying priority weed species as listed in the Greater Sydney Local Land Services Region
- Where possible, conducting searches for threatened fauna species with a moderate or high likelihood of occurrence where suitable habitat is present:
  - opportunistic searches for the Cumberland Plain Land Snail (*Meridolum corneovirens*) in coarse woody debris and piled bark at the base of Eucalyptus trees,
  - general searches for Koala and signs of Koala (i.e., scats) using the spot assessment technique (SAT) (Phillips, S. and Callaghan, J., (2011).)
- Identifying and recording fauna habitat features, including
  - Hollow-bearing trees
  - Waterbodies
  - Caves, crevices, and culverts
  - Bird nests
  - Logs and rock habitat

Biodiversity data, including vegetation and threatened species habitat mapping were spatially recorded using Field Maps on an iPad.

Weather conditions on the date of survey, at the closest weather station in Glenfield (Holsworthy, Approximately 5.4 kilometres away, ID: 95761) is given below in Table 2-3.

Table 2-3 Weather conditions during current surveys

Date	Temperature (°C)		Rain (mm)	Max wind gust (km/h)	Wind direction
	Min	Max			
31/05/2024	10.6	20.3	0	37	NNE

Survey limitations

Fieldwork was limited to a one-day survey and did not include targeted flora surveys and nocturnal species surveys. The seasonality of the survey did not coincide with the recommended seasonal survey window for some threatened species (as described in the Threatened Biodiversity Data Collection) assessed to have a moderate or higher likelihood to occur. This limits the chance of a positive identification, particularly for flora when not in the flowering time.

3 EXISTING ENVIRONMENT

The results of desktop assessment and field investigations for the Study Area are presented in this chapter.

3.1 Soil landscape (Bannerman S.M. and Hazelton P.A., 2011)

The soil landscapes the Study Area is located within are South Creek Alluvial (9030sc) and Blacktown Residual (9030bt).

South Creek Alluvial soils are in a floodplain landscape with valley flats and drainage depressions of the channels on the Cumberland Plain. These are usually flat with incised channels; mainly cleared. The soils are often very deep layered sediments over bedrock or relict soils. Where pedogenesis has occurred Structured Plastic Clays or Structured Loams in and immediately adjacent to drainage lines; Red and Yellow Podzolic Soils are most common terraces with small areas of Structured Grey Clays, leached clays and Yellow Solodic Soils. A limitation for this soil landscape is flood hazards, with the soil landscape prone to seasonal waterlogging, localised permanently high watertables, localised water erosion hazard, localised surface movement potential.

Blacktown Residual soil landscapes are characterised by gently undulating rises on Wianamatta Group shales with local relief to 30 m, slopes usually >5% and broad rounded crests and ridges with gently inclined slopes. Typically consists of cleared Eucalypt woodland and tall open forest (dry sclerophyll forest). The soils are shallow to moderately deep (>100 cm) hard setting mottled texture contrast soils, Red and Brown Podzolic Soils on crests grading to Yellow Podzolic Soils on lower slopes and in drainage lines. This soil landscape is limited by localised seasonal waterlogging, localised water erosion hazard, moderately reactive highly plastic subsoil, localised surface movement potential.

3.2 Desktop findings

3.2.1 Vegetation (existing mapping)

A biodiversity memo (Arup, 2024) prepared for Site 1 mapped present vegetation as Plant Community Type (PCT) 3321 (Cumberland Shale-Sandstone Ironbark Forest) and Exotic/Planted vegetation. State Vegetation Type Mapping (SVTM) (DPE 2022) was used to determine what vegetation has been mapped to occur within Site 2. A total of four PCTs were mapped to occur in the Study Area. These PCTs and their associated TECs are listed in Table 3-1.

Table 3-1 Vegetation communities mapped in the Study Area (DPE 2024)

Mapped vegetation (Arup 2024; DPE 2022)	PCT ID	Associated TECs
Sydney Hinterland Grey Gum Transition Forest	3616	No Associated TEC.
Cumberland Bangalay x Blue Gum Riverflat Forest	3145	Elderslie Banksia Scrub Forest (BC Act) - Critically Endangered River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions (BC Act)- Endangered Elderslie Banksia Scrub Forest in the Sydney Basin Bioregion (EPBC Act)- Critically Endangered River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (EPBC Act)- Critically Endangered
Castlereagh Scribbly Gum Woodland	3629	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion (BC Act)- Vulnerable Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion (EPBC Act)- Endangered

Mapped vegetation (Arup 2024; DPE 2022)	PCT ID	Associated TECs
Sydney Hinterland Apple-Blackbutt Gully Forest	3615	No Associated TEC.

3.2.2 Threatened flora

Database searches identified a total of 38 threatened flora species as being recorded or predicted to occur within a 10-kilometre radius of the Study Area; of which 36 are listed under the BC Act and 28 are listed under the EPBC Act (Appendix A). Surveys undertaken by Arup (2024) did not identify any threatened flora species and did not make comment on the suitability of habitat on the site to threatened plants known to occur in the region.

An assessment of likelihood of occurrence (Appendix A) for threatened flora within the Study Area prior to site inspection identified 20 species as having a moderate or higher likelihood of occurrence.

3.2.3 Threatened fauna

Database searches identified a total of 55 threatened and migratory fauna species as being recorded or predicted to occur within a 10-kilometre radius of the Study Area; of which 29 are listed under the BC Act and 38 are listed under the EPBC Act (Appendix B). Surveys undertaken by Arup (2024) confirmed Koala to occur on the Site 1.

An assessment of likelihood of occurrence (Appendix B) for threatened fauna within the Study Area prior to site inspection identified 31 species as having a moderate or higher likelihood of occurrence across both sites within the Study Area.

4 FIELD SURVEY FINDINGS

4.1 Vegetation

Site inspection confirmed the presence of two PCTs within the Study Area of which, none of the four PCTs mapped in the State Vegetation Type Mapping (SVTM) were present. The distribution of PCTs was mapped during site inspection. PCT extents across the sites are presented in Figure 4-1, depicting Site 1 and Figure 4-2, Site 2. The PCTs present are:

- 3321: Cumberland Shale-Sandstone Ironbark Forest, and
- 4024: Cumberland Blue Box Riverflat Forest.

The characteristics of each PCT within the Study Areas has been described in the tables; Table 4-1, Table 4-2, and Table 4-3, below. Descriptions of the assemblages within the Study Area have been included below, including the diagnostic species used to classify each PCT.

4.1.1 Site 1

Site 1 is on the eastern portion of the WRRF adjacent to the Georges River. The site is vegetated with a line of planted native trees along the western perimeter. The planted line of trees include: *Corymbia maculata* (Spotted gum) *and Corymbia citriodora* (Lemon scented gum) (Plate 4-1). The total extent of planted vegetation within the Study Area at Site 1 is 0.16 hectares. Exotic grass is present along an access trail running through the middle of Site 1 and is comprised predominantly of *Eragrostis curvula* (African love grass) with some scattered *Olea europaea subsp. cuspidata,* (African Olive) (Plate 4-2, Plate 4-3 and Plate 4-4). These areas do not conform to any PCTs listed on the BioNet Vegetation Classification Database.

Native grassy woodland throughout the majority of the site conforms to PCT Cumberland Shale-Sandstone Ironbark Forest (Table 4-1). Within the native woodland, *Eucalyptus punctata* (Grey gum) is dominant with *Angophora floribunda* (Rough-barked apple)*, Eucalyptus crebra* (Narrow-leaved ironbark) and *Acacia parramatensis* (Parramatta wattle) is subdominant. There is a degree of disturbance and edge effects at the site, specifically following an access trail, presenting heavy weed incursions.

Table 4-1 Description of PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest (Bionet Vegetation Classification DPIE, 2024)

PCT name	Cumberland Shale-Sandstone Ironbark Forest
PCT number	3321
Vegetation formation	Grassy Woodlands
Vegetation class	Coastal Valley Grassy Woodlands
Conservation status	Associated with: • Shale Sandstone Transition Forest in the Sydney Basin Bioregion (BC Act) • Shale Sandstone Transition Forest of the Sydney Basin Bioregion (EPBC Act)
Distribution	Sydney Basin

PCT name	Cumberland Shale-Sandstone Ironbark Forest
Vegetation description	A tall sclerophyll open forest with a mid-stratum of dry and soft-leaved shrubs or small trees and a ground cover of grasses and graminoids found on the fringes of the Cumberland Plain in the Sydney Basin. It is one of a suite of forests that are associated with the subtle intergrade between clay-rich shale soil and the coarse sandy substrates of the sandstone plateau. The canopy almost always includes ironbark eucalypts (*Eucalyptus crebra, Eucalyptus fibrosa*) and commonly *Eucalyptus punctata* and stringybark eucalypts (*Eucalyptus globoidea* or *Eucalyptus eugenioides*). A sparse small tree layer almost always includes one or more *Acacia* species, of which *Acacia parramattensis* and *Acacia decurrens* are the most frequent and abundant, commonly with *Allocasuarina littoralis* or *Allocasuarina torulosa*. The shrub layer includes a mix of species that typically occur on sandstone soils and shale substrates. The sandstone shrubs very frequently include *Persoonia linearis* and shale species commonly include *Bursaria spinosa* and *Leucopogon juniperinus*. The mid-dense ground layer typically consists of graminoids, forbs and hardy ferns, and very frequently includes *Microlaena stipoides*, *Lobelia purpurascens, Cheilanthes sieberi subsp. sieberi, Entolasia stricta, Aristida vagans, Lepidosperma laterale, Themeda triandra and Lomandra multiflora subsp*. multiflora. This PCT occurs in a warm, moist climate on the western edge of the Woronora Plateau, on the rim of the Nepean and Georges rivers, along the edge of the Lapstone Monocline and in Hawkesbury and The Hills local government areas.
Total extent in the Study Area	0.88 ha (Figure 4-1)
Species identified during site investigation relied upon for PCT identification	*Eucalyptus punctata* (Grey gum), *Angophora floribunda* (Rough-barked apple), *Eucalyptus crebra* (Narrow-leaved ironbark) and *Acacia parramatensis* (Parramatta wattle)



Plate 4-1. Row of planted native trees along the fence line at Site 1.



Plate 4-2. Habitat tree and exotic understorey



Plate 4-3. Highly disturbed portions of vegetation



Plate 4-4. Priority weed Olea europaea subsp. cuspidata, African Olive.

4.1.2 Site 2

Site 2 includes vegetation within the western portion of the WRRF and outside of the Plant, following a fire trail (north to south). Outside of the WRRF Site 2 is vegetated and comprises of PCT 3321: Cumberland Shale-Sandstone Ironbark Forest (Table 4-2), transitioning to PCT 4024: Cumberland Blue Box Riverflat Forest (Table 4-3). Lawns within the WRRF are maintained exotic *Pennistum clandestinum* (Kikuyu grass) (Plate 4-5). Planted native trees within the WRRF, include *Casuarina glauca* (She-oak), *Eucalyptus microcorys* (Tallowwood), Spotted gum and Lemon scented gum (Plate 4-6). These areas are planted and do not conform to a remnant PCT as listed on the BioNet Vegetation Classification Database. The total extent of planted native trees within the Study Area at Site 2 is 0.45 ha. Exotic lawn at Site 2 comprises of 0.63 ha.

The grassy woodland (3321) and forested wetland (4024) vegetation outside of the WRRF is dominated by Grey gum and Rough-barked apple. The transition from PCT 3321 to 4024 is evident as the vegetation nears the creek line entering a riparian corridor, where the dominant canopy species changes from the grey gum dominated 3321 to the rough-barked apple dominated 4024.

Table 4-2 Description for PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest (Bionet Vegetation Classification DPIE, 2024)

PCT name	Cumberland Shale-Sandstone Ironbark Forest
PCT number	3321
Vegetation formation	Grassy Woodlands
Vegetation class	Coastal Valley Grassy Woodlands
Conservation status	Associated with: • Shale Sandstone Transition Forest in the Sydney Basin Bioregion (BC Act) • Shale Sandstone Transition Forest of the Sydney Basin Bioregion (EPBC Act)
Distribution	Sydney Basin

PCT name	Cumberland Shale-Sandstone Ironbark Forest
Vegetation description	A tall sclerophyll open forest with a mid-stratum of dry and soft-leaved shrubs or small trees and a ground cover of grasses and graminoids found on the fringes of the Cumberland Plain in the Sydney Basin. It is one of a suite of forests that are associated with the subtle intergrade between clay-rich shale soil and the coarse sandy substrates of the sandstone plateau. The canopy almost always includes ironbark eucalypts (*Eucalyptus crebra, Eucalyptus fibrosa*) and commonly *Eucalyptus punctata* and stringybark eucalypts (*Eucalyptus globoidea* or *Eucalyptus eugenioides*). A sparse small tree layer almost always includes one or more *Acacia* species, of which *Acacia parramattensis* and *Acacia decurrens* are the most frequent and abundant, commonly with *Allocasuarina littoralis* or *Allocasuarina torulosa*. The shrub layer includes a mix of species that typically occur on sandstone soils and shale substrates. The sandstone shrubs very frequently include *Persoonia linearis* and shale species commonly include *Bursaria spinosa* and *Leucopogon juniperinus*. The mid-dense ground layer typically consists of graminoids, forbs and hardy ferns, and very frequently includes *Microlaena stipoides*, *Lobelia purpurascens, Cheilanthes sieberi subsp. sieberi, Entolasia stricta, Aristida vagans, Lepidosperma laterale, Themeda triandra and Lomandra multiflora subsp*. multiflora. This PCT occurs in a warm, moist climate on the western edge of the Woronora Plateau, on the rim of the Nepean and Georges rivers, along the edge of the Lapstone Monocline and in Hawkesbury and The Hills local government areas.
Total extent in the Study Area	0.60 ha (Figure 4-2)
Species identified during site investigation relied upon for PCT identification	*Eucalyptus punctata* (Grey gum), *Eucalyptus amplifolia* (Cabbage gum), *Angophora floribunda* (Rough-barked apple), *Acacia decurrens* (Black wattle) and *Persoonia linearis* (Narrow-leaved geebung)

Table 4-3 PCT description for PCT 4024 - Cumberland Blue Box Riverflat Forest (Bionet Vegetation Classification DPIE, 2024)

PCT name	Cumberland Blue Box Riverflat Forest
PCT number	4024
Vegetation formation	Forested Wetlands
Vegetation class	Coastal Floodplain Wetlands
Conservation status	Associated with: • BC Act listed EEC 10787: River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. • EPBC Act listed CEEC 20383: River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria
Distribution	Cumberland; Sydney Cataract
Vegetation description	A tall sclerophyll open forest with soft-leaved shrubs, small trees and Melaleucas with a grassy ground cover situated on the alluvial flats below 30 metres asl alongside the Georges River near Voyagers Point with smaller occurrences at Cobbitty and Richmond on the Hawkesbury-Nepean river systems. The canopy very frequently includes *Eucalyptus baueriana* and *Angophora floribunda*, commonly associated with *Eucalyptus tereticornis*. The open to mid-dense mid-stratum is layered and almost always includes *Acacias* and very frequently *Melaleucas*, the most frequent of which are *Acacia decurrens, Melaleuca nodosa, Melaleuca decora* and *Melaleuca styphelioides*. Scattered individuals of *Casuarina glauca, Exocarpos cupressiformis, Bursaria spinosa and Ozothamnus diosmifolius* commonly complete the mid-stratum. The ground layer is typically characterised by an dense cover of grasses, soft-leaved forbs and

PCT name	Cumberland Blue Box Riverflat Forest
	ferns that almost always includes *Microlaena stipoides* and *Entolasia marginata*. Common ground covers *include Cynodon dactylon, Echinopogon ovatus, Lobelia purpurascens, Pteridium esculentum, Dichondra repens, Einadia hastata, Glycine clandestina, Lomandra longifolia and Echinopogon caespitosus*. This PCT typically occurs at elevations of below 30 metres asl in a warm, moist climate, often in small, disturbed patches situated in an urban matrix. It has floristic overlap with PCT 4025 however *Eucalyptus baueriana* and species such as *Casuarina glauca* and *Cynodon dactylon* are rare in that PCT.
Extent in the Study Area	0.50 ha, (Figure 4-2)
Species identified during site investigation relied upon for PCT identification	*Angophora floribunda* (Rough-barked apple) and *Acacia decurrens* (Black wattle)



Plate 4-5. Exotic lawns within WRRF and planted Casurarina glauca.



Plate 4-6. Planted Casuarina glauca and Eucalyptus microcorys inside the WRRF.



Plate 4-7. Transition to PCT 4024.



Plate 4-8. PCT 3321, sprayed exotic understorey.

4.1.3 Priority Weeds

Of the exotic species recorded in the Study Area, five are listed as priority weeds under the *Greater Sydney Regional Strategic Weed Management Plan 2023-2027*. These weeds are listed in Table 4-4 with the associated biosecurity duty.

Table 4-4 Priority weeds present in the Study Area

Scientific name	Common name	Category	Biosecurity duty
Olea europaea subsp. Cuspidata	African Olive	Containment	*Mandatory Measure (Division 8, Clause 33, Biosecurity Regulation 2017): A person must not import into the State or sell.*
Asparagus virgatus	Asparagus fern		
Anredera cordifolia	Madeira Vine		
Lantana camara	Lantana		
Senecio madagascariensis	Fireweed		

4.2 Threatened ecological communities

PCT 3321 and PCT 4024 have associated Threatened Ecological Communities listed under the BC Act and EPBC Act (TECs). The section below provides an assessment of PCT assemblages within the Study Area and how they do or do not meet the criteria to qualify for listing as the relative BC Act and EPBC Act listed communities.

Patches of PCT within the Study Area which meet the listing criteria for these TECs are summarised in Table 4-5. The extent of these TECs across the Study Area are illustrated in Figure 4-1 (Site 1) and Figure 4-2 (Site 2).

Table 4-5 Threatened ecological communities within the Study Area

PCT	BC Act	Extent within the Study Area (ha)	Site
PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest	Shale Sandstone Transition Forest in the Sydney Basin Bioregion – Critically Endangered	0.88	Site 1
PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest	Shale Sandstone Transition Forest in the Sydney Basin Bioregion – Critically Endangered	0.60	Site 2
PCT 4024 – Cumberland Blue Box Riverflat Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. - Endangered	0.50	Site 2

Shale Sandstone Transition Forest in the Sydney Basin Bioregion – Critically Endangered (BC Act)

The assemblage of PCT 3321 within the Study Area (at both Site 1 and Site 2) has been compared against the diagnostic characteristics of the Critically Endangered Ecological Community, Shale Sandstone Transition Forest (SSTF) in the Sydney Basin Bioregion as listed under the BC Act (NSW

Scientific Committee 2002) (Table 4-6). The distribution, vegetation composition, landscape position and supporting geologies of this PCT are consistent with the SSTF community.

The areas of SSTF within the Study Area are shown as PCT 3321 in Figure 4-1 and Figure 4-2.

Table 4-6 Diagnostic characteristics of Shale Sandstone Transition Forest in the Sydney Basin Bioregion – Critically Endangered under the BC Act (NSW Scientific Committee 2014).

TEC Attributes	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Native vegetation (PCT 3321) in the Study Area
Locality	SSTF is known from Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas within the Sydney Basin Bioregion	**CONSISTENT** The Study Area is in the LGA of Campbelltown in the Sydney Basin Bioregion
Landscape position and geology	SSTF occurs mainly on the edges of the Cumberland Plain, where clay soils from the shale rock intergrade with earthy and sandy soils from sandstone, or where shale caps overlay sandstone.	**CONSISTENT** The soils within the Study Area are South Creek Alluvial and Blacktown Residual soil. Evidence of clay and sandy soils from sandstone as per the TEC were evident on site.
Vegetation composition	The main tree species include Forest Red Gum (*Eucalyptus tereticornis),* Grey Gum (*E. punctata*), stringybarks (*E. globoidea, E. eugenioides*) and ironbarks (*E. fibrosa and E. crebra*).	**CONSISTENT** The dominant species within patches of PCT 3321 in the Study Area include *E. punctata, Angophora floribunda, E. crebra* and *Acacia parramatensis* all of which are characteristic of the SSTF EEC.

Shale Sandstone Transition Forest in the Sydney Basin Bioregion – Critically Endangered (EPBC Act)

To be considered a matter of National Environmental Significance under the EPBC Act, areas of the ecological community must meet:

- The key diagnostic characteristics (Table 4-7) AND
- At least the minimum condition thresholds for the moderate condition (Table 4-8)

The assemblage of PCT 3321 within the Study Area has been compared against the diagnostic characteristics of the Critically Endangered Shale Sandstone Transition Forest in the Sydney Basin Bioregion in Table 4-7.

The patches within the Study Area are 0.88 hectare and 0.60 ha, at Sites 1 and 2 respectively. These patches are connected to contiguous vegetation outside the Study Area.

The condition of understory vegetation has a very low cover of native species and a high composition of weeds. The cover of native species was measured to be less than 30% across a 20 x 20 metre BAM composition plot. As such the vegetation was determined to not reach the minimum condition threshold for EPBC listing (Table 4-8). Although the vegetation forms a patch >0.5 hectare and has several hollow-bearing trees present, the degraded understorey comprising mainly of weeds means it does not meet the minimum threshold of having an understorey over 30% native. As such this vegetation is not considered to meet the EPBC listing.

Table 4-7. Diagnostic characteristics of Community Shale Sandstone Transition Forest in the Sydney Basin Bioregion ecological community under the EPBC Act (Threatened Species Scientific Committee 2014)

Key diagnostic characteristic	Native vegetation (PCT 3321) in the Study Area
Limited to the Sydney Basin Bioregion (IBRA v7).	**CONSISTENT** The in the Sydney Basin Bioregion.
Occurs at the transition between shales and sandstones of the Wianamatta and Hawkesbury Groups, including the transitional Mittagong Formation	**CONSISTENT** The Study Area has South Creek Alluvial soils and Blacktown Residual soil. These are characterised by undulating rises on Wianamatta Group and a floodplain landscape on the Cumberland Plain.
Occurs as forest or woodland, and may have a primarily shrubby or primarily grassy understorey, or be a mixture.	**CONSISTENT** Occurs as a woodland with a primarily grassy understorey in site 2 and shrubby understorey in site 1.
Canopy is a mix of species typically including two or more of the following: *Eucalyptus punctata* (grey gum), *E. crebra* (narrow-leaved ironbark), *E. fibrosa subsp. fibrosa* (broad-leaved ironbark), *E. tereticornis subsp. tereticornis* (forest red gum), *E. resinifera subsp. resinifera* (red mahogany), *E. eugenioides* (or *E. globoidea depending* on local species present and degree of sandstone influence) and *Angophora bakeri* (narrow leaved apple).	**CONSISTENT** *Eucalyptus punctata* (Grey Gum), *E. crebra* (Narrow-leaved Ironbark) and *E. fibrosa subsp. fibrosa* (Broad-leaved Ironbark) are present in the canopy.
Where present the mid layer of the understorey varies in structure and floristics. Where present, the small tree layer is likely to be dominated by Eucalypt species and *Allocasuarina littoralis* (black she-oak). Where shrubs are present, the mid layer is likely to be dominated by *Bursaria spinosa* (blackthorn) in areas with low sandstone influence, with other common species including Le*ucopogon juniperinus, Kunzea ambigua* (tick bush), *Persoonia linearis* (narrow-leaved geebung), *Ozothamnus diosmifolius* (rice flower, sago bush, white dogwood) and *Hibbertia aspera* (rough guinea flower).	**CONSISTENT** Dominated by Eucalypt species and *Allocasuarina littoralis* (Black She-oak). *Leucopogon juniperinus*, and *Persoonia linearis* (Narrow-leaved Geebung) are present.
Where present, the ground layer of the understorey is typically diverse and dominated by grasses and herbs including: *Aristida vagans* (three-awned spear grass), *Austrostipa pubescens* (spear grass), *Cheilanthes sieberi subsp. sieberi* (poison rock fern), *Dichondra repens* (kidney weed), *Echinopogon ovatus* (forest hedgehog grass), *Entolasia marginata* (bordered panic), *Entolasia stricta* (wiry panic), *Lepidosperma laterale* (saw sedge),*Lomandra multiflora, Microlaena stipoides var. stipoides* (weeping grass), *Oxalis perennans* (wood-sorrel), *Pimelea linifolia subsp. linifolia, Pomax umbellata, Phyllanthus hirtellus, Pratia purpurascens* (white root), *Solanum prinophyllum* (forest nightshade) and *Themeda triandra syn. T. australis* (kangaroo grass). The ground layer may also contain small shrubs, including *Hibbertia aspera* (rough guinea flower).	**CONSISTENT in part** Largely exotic understorey present. Native *Dichondra repens (*kidney weed*),* *Microlaena stipoides var. stipoides (*weeping grass*),* and *Entolasia stricta* (wiry panic grass) present.

Table 4-8 Minimum condition threshold of Ecological Community Shale Sandstone Transition Forest in the Sydney Basin Bioregion under the EPBC Act (Threatened Species Scientific Committee 2014)

Category and rationale	Thresholds			Native vegetation on the Study Area
A. Moderate condition class Represented by medium to large-size patch as part of a larger native vegetation remnant and/or with mature trees	Patch size >0.5ha **And** >30% of the perennial understorey vegetation cover is made up of native species. **And**			**INCONSISTENT** Less than 30% perennial native understorey
	The patch is contiguous with a native vegetation remnant (any native vegetation where cover in each layer present is dominated by native species) >1ha in area.	**OR**	The patch has at least one tree with hollows or at least one large locally indigenous tree (>80cm dbh).	
B. Moderate condition class Represented by medium to large size patch with high quality native understorey	Patch size >0.5ha **And** >50% of the perennial understorey vegetation cover is made up of native species.			
C. High condition class Represented by medium to large size patch with very high quality native understorey	Patch size >0.5ha **And** >70% of the perennial understorey vegetation cover is made up of native species.			
D. High condition class Represented by larger size patch with high quality native understorey	Patch size >2ha **And** >50% of the perennial understorey vegetation cover is made up of native species			
Perennial understorey vegetation cover includes vascular plant species of both the ground layer and mid/shrub layer (where present) with a lifecycle of more than two growing seasons. Measurements of perennial understorey vegetation cover exclude annuals, cryptogams, leaf litter or exposed soil. Contiguous means the patch of the ecological community is continuous with, or in close proximity (within 100 m) to another area of vegetation that is dominated by native species in each vegetation layer present.				

River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. – Endangered (BC Act)

The assemblage of PCT 4024 within the Study Area has been compared against the diagnostic characteristics of the Endangered Ecological Community (EEC) River-Flat Eucalypt Forest (RFEF) on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, as listed under the BC Act (NSW Scientific Committee 2004) in Table 4-9. The distribution, vegetation composition, landscape position and supporting geologies of this PCT are consistent with the RFEF community.

All patches of PCT 4024 are considered to be the EEC within the Study Area (Figure 4-2).

Table 4-9 Diagnostic characteristics of Community Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions under the BC Act (NSW Scientific Committee 2004)

TEC Attributes	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Native vegetation (PCT 4024) on the Study Area
Locality	Known from parts of the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Palerang, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions.	**CONSISTENT** The Study Area is in the Campbelltown LGA in the Sydney Basin Bioregion an identified area of RFEF distribution.
Landscape position and geology	RFEF is associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Generally, occurs below 50 m elevation, but may occur on localised river flats up to 250 m above sea level.	**CONSISTENT** The Study Area is situated is below 250m above sea level ranging from 10-30m above sea level across the sites. The Study Area is near Bunburry Curran Creek and the Georges River.
Vegetation composition	Characteristic qualities of the RFEF assemblage include species of eucalypt belonging to either the genus *Angophora* or the sections *Exsertaria* or *Transversaria* of the genus *Eucalyptus*; the relatively low abundance or sub-dominance of *Casuarina* and *Melaleuca* species; the relatively low abundance of *Eucalyptus robusta*; and the prominent groundcover of soft-leaved forbs and grasses.	**CONSISTENT** The dominant species observed within the mapped region include *Angophora floribunda* and *Acacia decurrens* both of which conform to the RFEF EEC.

River-flat Eucalypt Forest on Coastal Floodplains of southern New South Wales and eastern Victoria – Critically Endangered (EPBC Act)

To be considered a matter of National Environmental Significance under the EPBC Act, areas of the ecological community must meet:

- The key diagnostic characteristics (Table 4-10) AND
- At least the minimum condition thresholds for the moderate condition (Table 4-11)

The assemblage of PCT 4024 within the Study Area has been compared against the diagnostic characteristics of the Critically Endangered River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria ecological community as listed under the EPBC Act in Table 4-10.

Although the patch of vegetation within the Study Area is contiguous with native vegetation, the weedy understorey means that the vegetation assessed does not meet the condition threshold to be classified as the federally listed community. To be listed as a federally recognised EEC at least 30% of its total perennial understorey cover must be comprised of native species (Table 4-11). As such vegetation present within the Study Area, diagnostic to PCT 4024 does not meet the condition threshold to be considered a TEC under the EPBC Act.

Table 4-10 Diagnostic characteristics of River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria ecological community under the EPBC Act (Threatened Species Scientific Committee 2020)

Key diagnostic characteristic	Native vegetation (PCT 4024) in the Study Area
The ecological community occurs from Occurs in the South East Corner and Sydney Basin IBRA Bioregions, in eastern Victoria and south eastern New South Wales.	**CONSISTENT** Occurs in the Sydney Basin Bioregion.
Occurs within catchments of the eastern and southern watershed of the Great Dividing Range. Occurs at elevations up to 250 metres above sea-level (ASL), but most typically below 50 metres ASL. Occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones,lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans.	**CONSISTENT** Occurs below 50m ASL on river floodplains where transient water accumulates (Bunburry Curran Creek and the Georges River).
Occurs on alluvial soils of various textures including silts, clay loams, sandy loams, gravel and cobbles. Does not occur on soils that are primarily marine sands, or aeolian sands	**CONSISTENT** Occurs on South Creek Alluvial (9030sc) and Blacktown Residual (9030bt) soils.
Occurs as a tall closed-forest, tall open-forest, closed forest, open forest, tall woodland, or woodland. The canopy has a crown cover of at least 20 percent	**CONSISTENT** Woodland with 20% canopy.
Has a canopy dominated by one or a combination of the following species: *Angophora floribunda, A. subvelutina, Eucalyptus amplifolia, E. baueriana, E. benthamii, E. bosistoana, E. botryoides, E. botryoides x E. saligna14, E. elata, E. grandis, E. longifolia, E. moluccana, E. ovata, E. saligna, E. tereticornis, E. viminalis*	**CONSISTENT** Dominated by *Angophora floribunda*

Table 4-11 Minimum condition threshold of River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria ecological community under the EPBC Act (Threatened Species Scientific Committee 2020)

Condition thresholds Patch size thresholds → ↓ biotic thresholds	**Large patch** Patch size ≥ 2 ha	**Small contiguous* patch** Patch size ≥ 0.5 ha within a larger area of native vegetation ≥ 5 ha	**Small patch** Patch size ≥ 0.5 ha
High condition ≥ 80% of its total perennial understorey vegetation cover1 is comprised of native species **AND** Ground cover richness2 ≥ 10 native species per sample plot **AND** ≥ 20 large trees3 per ha	**CLASS A1** Large or contiguous patch in high condition		**CLASS B1** Small patch in high condition

Condition thresholds Patch size thresholds → ↓ biotic thresholds	**Large patch** Patch size ≥ 2 ha	**Small contiguous* patch** Patch size ≥ 0.5 ha within a larger area of native vegetation ≥ 5 ha	**Small patch** Patch size ≥ 0.5 ha
Good condition with arboreal mammals ≥ 50% of its total perennial understorey vegetation cover1 is comprised of native species **AND** Ground cover richness2 ≥ 6 native species per sample plot **AND** At least 10 large trees3 per ha **AND** Evidence of 4 or more species of arboreal mammals4 detected5 in the patch	**CLASS A2** Large or contiguous patch in good condition with arboreal mammals		**CLASS B2** Small patch in good condition with arboreal mammals
Good condition ≥ 50% of its total perennial understorey vegetation cover1 is comprised of native species **AND** Ground cover richness2 ≥ 6 native speciesper sample plot **AND** At least 10 large trees3 per ha	**CLASS B3** Large or contiguous patch in good condition		**CLASS C1** Small patch in good condition
Moderate condition ≥ 30% of its total perennial understorey vegetation cover is comprised of native species **AND** Ground cover richness ≥ 4 native species per sample plot2	**CLASS C2** Large or contiguous patch in moderate condition		

1 Perennial understorey vegetation cover includes vascular plant species of all layers below the canopy with a life-cycle of more than two growing seasons. It includes herbs (graminoids and forbs), grasses, shrubs and juvenile plants of canopy species, but does not include annual plants, cryptogams, plant litter or exposed soil.
2 Ground cover richness includes combined species richness of native grasses, forbs, ferns and sedges per 0.04 ha (20 x 20 m sample plot).
3 Large eucalypt trees are greater than 45 cm [diameter at breast height (dbh)]. This is used as a surrogate for tree hollows and habitat values.
4 Excluding micro-bats (Microchiroptera).
5 Survey guidelines (DSEWPC 2011).
7 Contiguous means the patch is connected to, or in close proximity to (i.e. within 30 m of), another area of native vegetation (i.e. an area where the total perennial vegetation cover is dominated (50 percent or more) by native plant species).



Figure 4-1 Biodiversity values within the Study Area at Site 1.

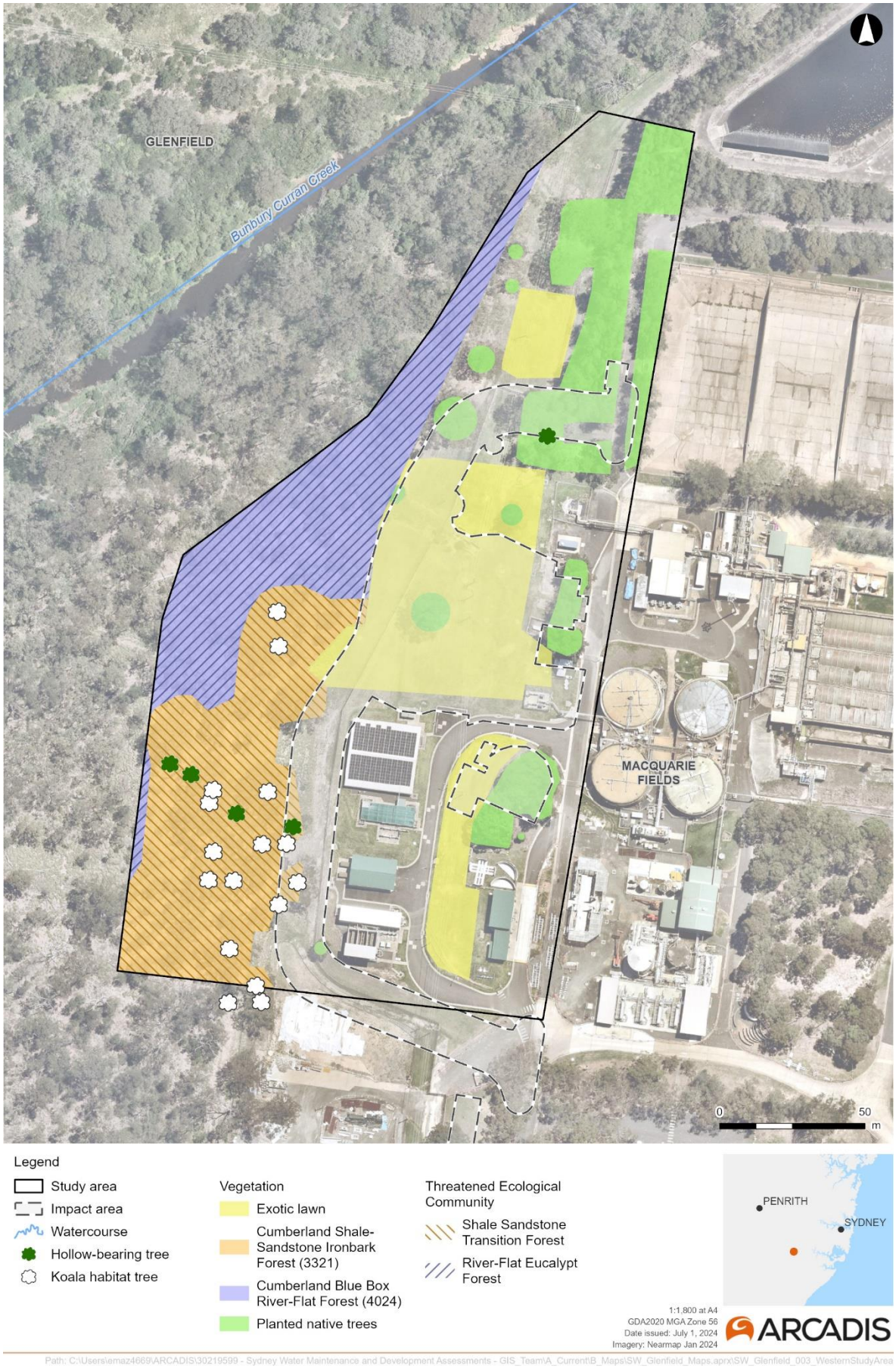


Figure 4-2 Biodiversity values within the Study Area at Site 2. Grey gums included as Koala habitat trees.

4.3 Threatened flora

During field surveys, ecologist did not find any threatened flora species. The quality of habitat present for threatened flora was considered low due to the degraded understorey dominated by exotic perennial grasses and evidence of a recent herbicide spraying at Site 2. As such, the number of threatened flora species with a moderate or higher likelihood to occur was downgraded from 20 to zero following field surveys. Based on the observations made during field survey the Study Area is considered unlikely to support threatened flora species known from the locality.

4.4 Threatened fauna

During field surveys ecologist did not find any threatened fauna species or migratory fauna species listed under the EPBC Act or BC Act. Based on the observations made during field survey the Study Area is considered moderately likely to support threatened fauna species known from the Locality. Despite the remnant vegetation across Site 1 and Site 2, the overall quality of habitat present was degraded with strong evidence of edge effects evident in the understorey dominated by weeds.

Koalas *(Phascolarctos cinereus)* have previously been identified in the Study Area (Arup, 2024). Arcadis ecologists corroborated this finding with observations of Koala scratching's on *Eucalyptus punctata* (Grey gums) identified during the field survey.

Across both Site 1 and Site 2 there were 12 hollow-bearing trees identified with hollows of varying sizes (small, medium, and large) located on the trunks and limbs, in addition to other mature woodland trees with decorticating bark and small fissures. This vegetation is likely to support hollow dependent microbats, woodland birds with the larger hollows potentially supporting lorikeets, cockatoos or owls. Many of the hollows are above eye-level and were not possible to inspect during the field survey. As such, the occupation of hollow-bearing trees was not confirmed. Species suitability for hollows is assumed based on species size and preferences as opposed to observation of use.

A total of 31 species were identified of having a moderate to high likelihood of occurrence within Site 1 and Site 2 of the Study Area during the desktop investigation. Following field survey, it was determined that 15 of the 31 species could be downgraded to having a low likelihood of occurrence within the Study Area. This is due to the species or signs of the species not being observed during field survey, the lack of suitable habitat features within the Study Area, and/or fragmentation of habitat within the Study Area from other areas of suitable habitat in the region.



Plate 4-9 Hollow bearing trees.

4.4.1 Exotic grassland

There is dispersed exotic grassland along cleared trails in Site 1 (Figure 4-1) and at Site 2, exotic grassland is present within the WRRF (Figure 4-2). Exotic grasslands cover approximately 0.63 hectares and is not considered priority habitat for the threatened fauna likely to occur on site.

4.4.2 Woodland

Woodland vegetation occurs in patches of PCT 3321 and 4024 throughout the Study Area. At both sites woodland habitat is exposed to disturbance associated with edge effects due to its proximity to the roadside, exotic grasslands, and industrial scale infrastructure. Although the understorey is degraded the trees are in good condition and offer potential habitat to locally occurring fauna species. The woodland supports a mixture of eucalypt species which may be intermittently used by threatened woodland birds when flowering to forage. Myrtaceous trees and shrubs within the Study Area would provide foraging habitat for some nectivorous birds and threatened species such as Grey-headed Flying Fox, which may forage in this vegetation on occasion.

12 Hollow Bearing Trees (HBTs) were identified within the Study Area. Stags and HBTs are considered suitable habitat for common and threatened fauna species in the area, specifically hollow nesting woodland birds and hollow-dependent microbat species for whom hollows are a limited habitat.

*Eucalyptus punctata (*Grey Gum) have been identified as a Preferred Koala Feed Tree (Philips, 2018) with 16 within the Study Area at Site 2. Seven of these trees have koala scratches present, demonstrating evidence of koala use. These have been included in Figure 4-2 as Koala habitat trees and are important fauna habitat.

Woodland within the Study Area also contains a moderate amount of fallen debris and logs which provides refuge habitat for reptiles and the Cumberland Plain Land Snail.

4.4.3 Artificial structures

Artificial structures in the form of industrial infrastructure, such as silos and pump stations are present across the Study Area within Site 2. These potentially have grooves and spaces in the eaves which could be utilised by microbats for roosting. They were inspected for signs of occupation however none were found.

4.5 Aquatic environments

The Georges River and associated tributaries is mapped as Key Fish Habitat (KFH) and passes close to the Study Area, however, falls outside of the Study Area.

As part of this assessment, The Bureau of Meteorology's Groundwater Dependent Ecosystem (GDE) Atlas was reviewed to determine the occurrence of potential groundwater dependent ecosystems within and surrounding the Study Area. The Georges River and associated tributaries are categorised as having a high and medium probability of having GDEs while results show that the Study Area has a low potential for a GDE to occur.

5 IMPACT ASSESSMENT

5.1 Direct impacts on native vegetation and habitat

To conduct this impact assessment, it has been assumed that construction works associated with installation of the assets described in Section 1 of this report would require wholescale clearing within Site 1 of the Study Area. As such the Impact Area comprises the whole of Site 1.

The proposed works at Site 2 involve the clearing of native vegetation for the development of: inlet works, a support pump station, a digester, switch room, flush tanks and an access road. For this assessment a 5m buffer has been included to both sides of the proposed access road, to account for potential impacts as depicted in Figure 4-2.

This impact assessment considers removal of all vegetation within Site 1 and within the Impact Area of Site 2 and is considered to present a worst-case scenario assessment for this Impact Area. It is likely that impacts can be minimised on-site through minor reductions in the works impact where feasible.

5.1.1 Removal of native vegetation

Under a worst-case scenario the proposed works would remove a total of 1.60 hectare of vegetation in the Study Area comprising native, planted and exotic vegetation. Of this, 0.91 hectare of vegetation constitutes a native Plant Community Type (3321) and Threatened Ecological Community (SSTF). The breakdown of vegetation removal required to facilitate the Proposal is listed in Table 5-1.

Within Site 1 seven HBTs will be removed and within the Impact Area, at Site 2 a further two HBTs and up to three identified preferred Koala trees with an average DBH (diameter at breast heigh) of 50cm would be removed.

Table 5-1 Direct impacts on native vegetation

PCT	Equivalent TEC (BC Act)	Impact Area (ha)		
		Site 1	Site 2	All
PCT 3321 - Cumberland Shale-Sandstone Ironbark Forest	Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CE)	0.88	0.03	0.91
PCT 4024 – Cumberland Blue Box Riverflat Forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)	0.00	0.00	0.00
Planted Native Vegetation	None	0.16	0.13	0.29
Exotic Lawn	None	0.00	0.40	0.40
			TOTAL	1.60

A total of 0.91 hectare of vegetation associated with Shale Sandstone Transition Forest in the Sydney Basin Bioregion occurs within the Impact Area and may be removed by the Proposal.

In accordance with Section 7.3 of the BC Act, a Test of Significance assessment has been undertaken to determine the significance of impacts to Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC and has been included in Appendix D. No Test of Significance was undertaken for RFEF considering no vegetation constituting this TEC will be removed by the Proposal.

No Significant Impact Criteria assessment was undertaken for either vegetation community as per Section 4.1.3 neither community met the condition threshold to be listed as a federally recognised TEC.

It was determined that the Proposal is unlikely to have a significant impact upon Shale Sandstone Transition Forest in the Sydney Basin Bioregion for the following reasons:

- The Proposal will not result in or increase the likelihood of extinction of the local occurrence of these communities.
- The Proposal will remove a minor fraction of the total extent of these communities.
- The Proposal would not fragment an existing patch of these communities.
- The Proposal is unlikely to impact adjoining patches of these communities or suitable habitat such that they substantial reduce in quality or integrity.

Threatened flora species impacts

Following field surveys, it was determined that the 20 threatened flora species identified as moderate to highly likely to occur on site, are unlikely to be impacted by the Proposal. As such the likelihood of impact has been decreased to a low. These 20 species including their listing status, the predicted level of impact from the proposed works and a justification for their impact levels are listed in Table 5-2.

As no threatened flora was observed during field surveys, and all relevant species have been identified as having a low likelihood of impact, no Tests of Significance or Significant Impact Criteria assessments for threatened flora were conducted. A refined likelihood of occurrence and species-specific impact justifications is included below (Table 5-2).

Table 5-2 Impact of works on threatened flora Identified in desktop assessment as having a moderate to high likelihood to occur

Scientific name	Common name	BC Act	EPBC Act	Likelihood of Occurrence	Impact Level	Justification
Acacia bynoeana	Bynoe's Wattle	Endangered	Vulnerable	Moderate	Low	Not identified on site. 160 records in the past 20 years within the Locality. All records are greater than 1km from the Study Area
Acacia pubescens	Downy Wattle	Vulnerable	Vulnerable	Moderate	Low	Not identified on site. 320 records in the past 20 years within the Locality. All records are greater than 1km from the Study Area
Allocasuarina diminuta subsp. mimica	Allocasuarina diminuta subsp. mimica	Endangered Population	Not Listed	Moderate	Low	Not identified on site. Only 1 record in the Locality over the past 20 years.
Callistemon linearifolius	Netted Bottle Brush	Vulnerable	Not Listed	Moderate	Low	Not identified on site. Only 1 record in the Locality over the past 20 years.
Epacris purpurascens var. purpurascens		Vulnerable	Not Listed	Moderate	Low	Not identified on site. Only 1 record in the Locality over the past 20 years.
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	Vulnerable	Vulnerable	High	Low	Not identified on site. 1632 records within the Locality within the past 20 years. Despite records within proximity to the Study Area there are no records within the Sites.
Hibbertia fumana		Critically Endangered	Not Listed	Moderate	Low	Not identified on site. 1117 records within the Locality within the past 20 years. All records are greater than 1km from the Study Area
Hibbertia puberula		Endangered	Not Listed	High	Low	Not identified on site. 1086 records within the Locality within the past 20 years. Despite records within proximity to the Study Area there are no records within the Sites.
Hibbertia sp. Bankstown		Critically Endangered	Critically Endangered	Moderate	Low	Not identified on site. 1 record within the Locality within the past 20 years.
Leucopogon exolasius	Woronora Beard-heath	Vulnerable	Vulnerable	Moderate	Low	Not identified on site. 1 record within the Locality within the past 20 years.
Leucopogon fletcheri subsp. fletcheri		Endangered	Not Listed	Moderate	Low	Not identified on site. 1 record within the Locality within the past 20 years.
Macadamia integrifolia	Macadamia Nut	Not Listed	Vulnerable	Moderate	Low	Not identified on site. 1 record within the Locality within the past 20 years.
Marsdenia viridiflora subsp. viridiflora	Native Pear	Not Listed	Not Listed	Moderate	Low	Not identified on site. 3 records within the Locality within the past 20 years.

Scientific name	Common name	BC Act	EPBC Act	Likelihood of Occurrence	Impact Level	Justification
Persoonia hirsuta	Hairy Geebung	Endangered	Endangered	Moderate	Low	Not identified on site. 1 record within the Locality within the past 20 years.
Persoonia nutans	Nodding Geebung	Endangered	Endangered	Moderate	Low	Not identified on site. 454 records within the Locality within the past 20 years. All records are greater than 1km from the Study Area
Pimelea spicata	Spiked Rice-flower	Endangered	Endangered	Moderate	Low	Not identified on site. 3 records within the Locality within the past 20 years.
Pomaderris brunnea	Brown Pomaderris	Endangered	Vulnerable	Moderate	Low	Not identified on site. 7 records within the Locality within the past 20 years.
Pterostylis saxicola	Sydney Plains Greenhood	Endangered	Endangered	Moderate	Low	Not identified on site. 91 records within the Locality within the past 20 years. All records are greater than 1km from the Study Area
Pultenaea pedunculata	Matted Bush-pea	Endangered	Not Listed	Moderate	Low	Not identified on site. 3 records within the Locality within the past 20 years.
Syzygium paniculatum	Magenta Lilly Pilly	Endangered	Vulnerable	Moderate	Low	Not identified on site. 1 record within the Locality within the past 20 years.

Threatened fauna species impacts

Under a worst-case scenario a total of 1.20 hectare of potential habitat (excluding exotic lawns) would be removed by the Proposal which would impact foraging resources for threatened fauna species that inhabit woodlands. A summary of impacts to habitat features from the Proposal is included in Table 5-3. Buildings containing potential microbat roosting habitat are not proposed for removal.

Table 5-3 Habitat features present within construction corridor and expected impacts

Habitat feature	Expected impacts to habitat and threatened species
Foraging vegetation	A total of 1.20 ha of native vegetation, and 0.40 ha of exotic lawn would be removed by the Proposal under a worst-case scenario. Of the 1.20 ha of native vegetation, 0.91 constitutes a PCT, namely PCT 3321. The removal of PCT 3321 and planted native vegetation would impact potential foraging resources for threatened fauna species that inhabit woodlands. *Eucalyptus punctata* (Grey Gum) is a listed preferred Koala feed tree and is a dominant canopy species in the area of PCT 3321 (0.91 ha) to be removed, three Grey Gums at Site 2 are proposed to be removed as a result of the proposed works.
Hollow-bearing trees	A total of nine hollow-bearing trees would be removed by the Proposal under a worst-case scenario; seven in Site 1 and two within the Impact Area at Site 2. The removal of nine hollow-bearing trees would impact potential breeding resources for threatened fauna species that inhabit woodlands.
Artificial structures	Buildings containing potential microbat roosting habitat are not proposed for removal.

All fauna species with a likelihood of occurrence including their listing status and the predicted impact of the works are presented in Table 5-4. Due to the presence of suitable habitat and these species potential presence within the Study Area, Test of Significance (BC Act) and/or Significant Impact Criteria assessment (EPBC Act) were considered for species in Table 5-4 with a moderate or high likelihood to occur, and a moderate to high predicted impact. This was conducted to assess whether there is a risk of a significant impact to a threatened fauna entity from the Proposal. Of the species listed; no species were determined likely to be significantly impacted by the proposed work. Impacts associated with the removal of habitat features as described in Table 5-3 have been assessed species specifically in the Significant Impact Criteria (Appendix C) and Test of Significance (Appendix D) Assessments. As the hollow-bearing trees were not assessed for occupancy their fauna suitability is based on hollow size.

Table 5-4 Impact of works on threatened fauna Identified in desktop assessment as having a moderate to high likelihood to occur

Scientific name	Common name	BC Act	EPBC Act	Likelihood of Occurrence	Impact Level	Justification
Anthochaera phrygia	Regent Honeyeater	CE	CE	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale and limited to relatively low-quality foraging habitat. Higher quality foraging habitat is in proximity to the Study Area and could be utilised by this species. Additionally, this species was not identified during the site assessment.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale and limited to relatively low-quality foraging habitat. Higher quality foraging habitat is in proximity to the Study Area and could be utilised by this species. Additionally, this species was not identified during the site assessment.
Burhinus grallarius	Bush Stone-curlew	E	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale and limited to relatively low-quality foraging habitat. Higher quality foraging habitat is in proximity to the Study Area, closer to the coast and could be utilised by this species. Additionally, this species was not identified during the site assessment.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	Moderate	Moderate	The impact on this species will remain at a moderate level as a total of nine hollow-bearing trees will be removed as part of the proposal, impacting potential breeding habitat. A ToS and SIC have been prepared for this species in Appendix C and Appendix D.
Calyptorhynchus lathami lathami	Glossy Black-Cockatoo	V	V	Moderate	Moderate	The impact on this species will remain at a moderate level as a total of nine hollow-bearing trees will be removed as part of the proposal, impacting potential breeding habitat. A ToS and SIC have been prepared for this species in Appendix C and Appendix D.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Moderate	Moderate	The impact on this species will remain at a moderate level as 1.20 hectares of potential foraging habitat will be removed as part of the proposal. A ToS and SIC have been prepared for this species in Appendix C and Appendix D.
Daphoenositta chrysoptera	Varied Sittella	V	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale and limited to relatively low-quality foraging habitat. Higher quality foraging habitat is in proximity to the Study Area and could be utilised by this species. Additionally, this species was not identified during the site assessment.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	Not Listed	Moderate	Moderate	The impact on this species will remain at a moderate level as 1.20 hectares of potential foraging habitat and nine hollow-bearing trees constituting breeding habitat will be removed as part of the proposal. A ToS has been prepared for this species in Appendix D.

Scientific name	Common name	BC Act	EPBC Act	Likelihood of Occurrence	Impact Level	Justification
Glossopsitta pusilla	Little Lorikeet	V	Not Listed	Moderate	Moderate	The impact on this species will remain at a moderate level as a total of nine hollow-bearing trees will be removed as part of the proposal, impacting potential breeding habitat. A ToS has been prepared for this species in Appendix D.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	M	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale and limited to relatively low-quality foraging habitat. Higher quality foraging habitat is in proximity to the Study Area and could be utilised by this species. Additionally, this species was not identified during the site assessment.
Hieraaetus morphnoides	Little Eagle	V	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale and limited to relatively low-quality foraging habitat. Higher quality foraging habitat is in proximity to the Study Area and could be utilised by this species. Additionally, this species was not identified during the site assessment.
Lathamus discolor	Swift Parrot	E	CE	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale. Additionally, this species was not identified during the site assessment.
Litoria aurea	Green and Golden Bell Frog	E	V	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale. Additionally, this species was not identified during the site assessment.
Lophoictinia isura	Square-tailed Kite	V	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale and limited to relatively low-quality foraging habitat. Higher quality foraging habitat is in proximity to the Study Area and could be utilised by this species. Additionally, this species was not identified during the site assessment.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale and limited to relatively low-quality foraging habitat. Higher quality foraging habitat is in proximity to the Study Area and could be utilised by this species. Additionally, this species was not identified during the site assessment.
Meridolum corneovirens	Cumberland Plain Land Snail	E	Not Listed	Moderate	Moderate	The impact on this species will remain at a moderate level as 1.20 hectares of potential breeding and foraging habitat will be removed as part of the proposal. A ToS has been prepared for this species in Appendix D.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	Not Listed	High	Moderate	The impact on this species was changed to a moderate level as 1.20 hectares of potential foraging habitat and nine hollow-bearing trees constituting breeding habitat will be removed as part of the proposal,

Scientific name	Common name	BC Act	EPBC Act	Likelihood of Occurrence	Impact Level	Justification
						but the species was not identified on site. A ToS has been prepared for this species in Appendix D.
Miniopterus australis	Little Bent-winged Bat	V	Not Listed	Moderate	Moderate	The impact on this species will remain at a moderate level as 1.20 hectares of potential foraging habitat and nine hollow-bearing trees constituting breeding habitat will be removed as part of the proposal. A ToS has been prepared for this species in Appendix D.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	Not Listed	High	Moderate	The impact on this species was changed to a moderate level as 1.20 hectares of potential foraging habitat will be removed as part of the proposal, but the species was not identified on site. A ToS has been prepared for this species in Appendix D.
Myotis macropus	Southern Myotis	V	Not Listed	High	Moderate	The impact on this species was changed to a moderate level as 1.20 hectares of potential foraging habitat and nine hollow-bearing trees constituting breeding habitat will be removed as part of the proposal, but the species was not identified on site. A ToS has been prepared for this species in Appendix D.
Ninox strenua	Powerful Owl	V	Not Listed	Moderate	Moderate	The impact on this species will remain at a moderate level as a total of nine hollow-bearing trees will be removed as part of the proposal, impacting potential breeding habitat. A ToS has been prepared for this species in Appendix D.
Petaurus norfolcensis	Squirrel Glider	V	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale. Additionally, this species was not identified during the site assessment.
Petroica boodang	Scarlet Robin	V	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale and limited to relatively low-quality foraging habitat. Higher quality foraging habitat is in proximity to the Study Area and could be utilised by this species. Additionally, this species was not identified during the site assessment.
Phascolarctos cinereus	Koala	V	E	High	Moderate	The impact on this species is considered moderate as 0.91 hectares of potential habitat (breeding and foraging) may be removed as part of the proposal. However, there are mitigation measures in place to reduce potential impacts to the species, despite their assumed presence in the vicinity of the Study Area. Higher quality habitat is available to this species beyond the Study Area. A ToS and SIC have been prepared for this species in Appendix C and Appendix D.

Scientific name	Common name	BC Act	EPBC Act	Likelihood of Occurrence	Impact Level	Justification
Pseudomys novaehollandiae	New Holland Mouse	Not Listed	V	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale. Additionally, this species was not identified during the site assessment.
Pseudophryne australis	Red-crowned Toadlet	V	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale. Additionally, this species was not identified during the site assessment.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Moderate	Moderate	The impact on this species will remain at a moderate level as 1.20 hectares of potential foraging habitat will be removed as part of the proposal. A ToS and SIC have been prepared for this species in Appendix C and Appendix D.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	Not Listed	Moderate	Moderate	The impact on this species will remain at a moderate level as 1.20 hectares of potential foraging habitat and nine hollow-bearing trees constituting breeding habitat will be removed as part of the proposal. A ToS has been prepared for this species in Appendix D.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	Not Listed	Moderate	Moderate	The impact on this species will remain at a moderate level as 1.20 hectares of potential foraging habitat and nine hollow-bearing trees constituting breeding habitat will be removed as part of the proposal. A ToS has been prepared for this species in Appendix D.
Tyto novaehollandiae	Masked Owl	V	Not Listed	Moderate	Moderate	The impact on this species will remain at a moderate level as a total of nine hollow-bearing trees will be removed as part of the proposal, impacting potential breeding habitat. A ToS has been prepared for this species in Appendix D.
Varanus rosenbergi	Rosenberg's Goanna	V	Not Listed	Moderate	Low	The impact level for this species has been changed to low as any impact would be minimal in scale. Additionally, this species was not identified during the site assessment.

Fauna injury and mortality

Fauna injury or mortality may occur during vegetation clearing activities or may result from collisions with work vehicles or plant, or accidental entrapment in plant or equipment. Mitigation measures would be implemented to minimise the risk of occurrence.

Aquatic habitats and GDEs

Georges River and Bunbury Curran Creek are adjacent to the Study Area and are mapped as Key Fish Habitat. These aquatic habitats are unlikely to be affected by the proposed works, falling just outside of the Impact Area. Therefore, impacts to the KFH are considered unlikely.

Georges River and Bunbury Curran Creek have moderate to high potential for GDEs, however they fall outside the Study Area. There is a low potential for GDEs to occur within the Study Area and as such may be impacted by the proposed works.

5.1.2 Indirect impacts on native vegetation and habitat

Edge effects on native vegetation

Vegetation within the Study Area is already experiencing edge effects where it interacts with the adjacent roadside and industrial infrastructure. The clearing of areas of vegetation may create some new edges. These new edges could be subject to degradation by the establishment and spread of weeds and enriched runoff from the use of the maintenance access tracks.

Noise, vibration and lighting

Indirect impacts to suitable habitat in adjacent buildings and retained vegetation beyond the construction footprint are possible from noise and vibration during construction. Any lighting proposed during nighttime hours also has the potential to impact on the suitability of some habitat for nocturnal species. These impacts could cause adjacent areas of habitat in patches of native vegetation to become temporarily or permanent unsuitable. If the mitigation measures included in Section 6 are implemented to minimise light spill during construction and operation of the Proposal, impacts are likely to be negligible and unlikely to have a significant impact on locally occurring fauna.

Invasion and spread of weeds, pathogens and disease

It is likely that the vegetation within the Study Area already experiences some invasion by exotic species through edge effects, this represents a threat to native vegetation. An increase in the movement of people, vehicles, machinery, vegetation waste and soil during the proposed works may facilitate the introduction or spread of exotic grasses and other weeds. Management measures would be required to minimise the risk of introduction and spread of weeds.

The Proposal has the potential to increase the spread of pathogens that threaten native biodiversity values, such as the soil-borne pathogen Phytophthora (*Phytophthora cinnamomi*). Phytophthora infects roots and is associated with damage and death to native plants. It may be dispersed over large distances in flowing water, such as storm runoff, or may be spread within a site via mycelial growth from infected roots to roots of healthy plants. Propagules of Phytophthora may also be dispersed by vehicles (e.g. cars and earth moving equipment), animals, walkers and movement of soil. There may be an increased risk of dispersal of Phytophthora as a result of the Proposal if appropriate management measures are not in place.

6 RECOMMENDATIONS

The following mitigation measures are recommended to ensure the potential impacts on biodiversity associated with the Proposal are minimised:

Risk minimising practices:

- Vehicles, equipment, materials, and footwear are to be clean on entry (free of soil, mud and/or seeds) to minimise the risk of introduction or spread of *Phytophthora cinnamomia*.
- Appropriate erosion and sediment controls in accordance with the Blue Book (Landcom 2004) should be installed to protect adjacent waterways when soil is being exposed.
- Follow Sydney Water SWEMS0009 incident response procedure in the event of a pipeline leak.
- Sydney Water will offset any impacts because of the Proposal in accordance with the Sydney Water Biodiversity Offset Guide.

Pre-clearing practices:

- Physically delineating areas of native vegetation that will not be removed and designate those areas as ‘no-go zones’.
- Any unexpected threatened species or ecological communities identified during the pre-clearing assessment should be appropriately assessed through a supplementary impact assessment.
- Pre-clearance surveys would identify any breeding or nesting activities by native fauna and as far as practical no breeding sites would be disrupted.
- During the pre-clearance surveys, any hollow-bearing trees not previously identified in or near the proposed Study Area would be marked by an ecologist so that they are retained and avoided by contractors.
- Ecologist will undertake a count for all planted trees, exotic and native, that will be removed by the development. These counts will be used to calculate the required offsets as per the Sydney Water’s Biodiversity Offset Guide (see Section 7).

Clearing practices:

- Where fauna species are identified in vegetation to be cleared, animals would be removed and relocated to adjacent bushland prior to felling. If this is not possible, the tree would be sectionally dismantled or soft felled under the supervision of an ecologist or wildlife carer, before relocating the animal.
- If any priority weeds are identified during the proposed works, these would be removed and disposed of at an appropriately licenced waste facility. The equipment used for removing them would be cleaned to minimise the likelihood of transferring and exotic plant materials.
- Cover open trenches overnight to avoid fauna becoming trapped. Additionally, trenches should be checked each morning for possible trapped fauna.
- Minimise the removal of vegetation within Proximity Areas to Coastal Wetlands during detailed design and construction.
- Manage potential impacts to hollow-dependent fauna through:
  - Retention of branch hollows on site, reinstalling them within trees in an area to be retained.
  - Relocation of cleared hollow-bearing trees, with hollows in the stem, should be retained as hollow-bearing logs in an area of site outside the impact footprint.
  - If unfeasible to retain hollows on site, these can be donated to the local council (Campbelltown City Council) to be installed within the local area.
- Manage potential impacts to GDEs through the implementation of the following controls:

- Use exclusion methods to reduce groundwater ingress into open excavations to reduce inflow of groundwater into open trench
- Where practicable, do not de-water excavation areas if works are not taking place, to prevent further ingress.
- The pipes would be designed and constructed in accordance with Sydney Water standard and technical specifications and in consultation with Sydney Water engineers.
- To prevent or avoid failure, pipes would be monitored and maintained in accordance with Sydney Water's asset management and maintenance program.
- In the unlikely event of pipe failure, incidents would be managed by following Sydney Water's internal pollution incident response management plan.

Light spill

- Construction should occur during standard daylight hours to avoid potential indirect impacts on nocturnal fauna such as owls, amphibians, and mammals. If construction is to occur at night, then light mitigation measures outlined in the National Light Pollution Guidelines for Wildlife should be applied to mitigate impacts to native fauna (DEE 2020). Any permanent lighting proposed as part of the development should adopt directional fittings and lighting posts to minimise light spill into adjacent areas of native vegetation.

Koala management practices (Phillips., 2018):

- Road design standards and/or approved vehicle calming devices (e.g. speed humps, chicanes and wildlife activated signage) must be incorporated on new roads created with a maximum speed of 40km/hr.
- Approved wildlife exclusion fencing must be installed along the WRRF, the lower half of which must be clad with galvansied tin sheeting on the outside face. This is recommended to be implemented along the existing fence line around the compound, with the purpose of excluding Koalas from accessing the facility.
- Round pipe koala-grids or other approved devices must be installed at fence-ends and driveways and other access points to prevent koala access to the WRRF.
- Clearing of native vegetation and/or earthworks must be temporarily suspended within a range of 25 metres from any tree which is concurrently occupied by a koala and must not resume until the koala has moved from the tree of its own volition.
- Any clearing of land must not commence until the area proposed for clearing has been inspected for the presence of koalas by a suitably qualified person. The individual, or a nominated representative, must remain on site during any approved clearing of vegetation. If clearing operations are being undertaken concurrently in different sections of a property, a suitably qualified person must be present in each section.
- Retained Preferred Koala food trees and shelter trees that occur outside of the Impact Area of the Proposal must be protected. These are marked as Koala habitat trees in Figure 4-2 within Site 2 of the Study Area. This recommendation is not applicable at Site 1 considering the whole site will be cleared.

7 BIODIVERSITY OFFSETS

Residual impacts to biodiversity from the Proposal that could not be avoided during design will be offset in accordance with Sydney Water's Biodiversity Offset Guide (Sydney Water 2024).

Under Part 5 of the *Environmental Planning and Assessment Act 1979*, Sydney Water must assess the environmental impact of all its activities. Sydney Water developed a Biodiversity Offset Guide (the Guide) to consider possible offset options for Sydney Water activities that fall outside statutory requirements. The Guide facilitates appropriate levels of native vegetation offsets and/or tree offsets on Sydney Water Proposals.

Under Section 5 of the Guide, the impacts to native vegetation from the Proposal is classified as a Moderate Impact. The Moderate Impact category includes larger scale impacts (≥ 100 m^2), but that are not considered to be significant.

Under this framework, offset multipliers are required for TECs, non-threatened native vegetation, and habitat area of threatened flora and/or fauna are given in Table 7-1. Vegetation and habitat impact of the Proposal will be offset in accordance with this framework.

Table 7-1 Offsetting options for vegetation

Residual loss of biodiversity values resulting from works	Offset multiplier (Moderate Impacts)
Threatened Ecological Communities	3
Non-threatened native vegetation (e.g. native remnant vegetation, riparian vegetation, planted native vegetation)	2
Habitat Area of threatened flora and/or fauna	3
Tree removal (locally native species)	3
Tree hollows	2 nest boxes or salvaged hollows (for each removed)
Tree Removal (Non-locally native or exotic tree or street tree)	1

Table 7-2 outlines the restoration requirements for the TEC in the Study Area. Considering the TEC will have an impact greater of 100 square metres or greater, an offset multiplier of 3:1 will apply. To satisfy the requirements of the Guide, each restoration areas is required to be like-for-like and must restore the same TEC that is being impacted.

Vegetation mapped as 'planted native/exotic' contains mostly planted native trees and will require offsets of one tree per removed native tree. This offset will be calculated based on the results of pre-clearance surveys which will count the number fo planted trees which will be removed by the proposal.

Table 7-2. A summary of offsets obligation for Proposal impacts

Biodiversity Value	Impact			Required restoration
	Site 1	Site 2	Total	
Threatened Ecological Community				
Shale Sandstone Transition Forest in the Sydney Basin Bioregion (BC Act)	0.88 ha	0.03 ha	0.91 ha	2.73 ha
Tree Hollows				

Biodiversity Value	Impact			Required restoration
	Site 1	Site 2	Total	
Hollow-bearing trees	7	2	9	18

Table 7-3 outlines the offsetting options available to Sydney Water, ranked in order of offsetting priority. Where possible, it is the first preference for offsetting to occur on the site of impact. If this is not achievable, a nearby site either owned by Sydney Water or the local Council (Campbelltown City Council) should be chosen. If this is not achievable, the purchase or retirement of biodiversity credits from a Biodiversity Stewardship Site should be considered. Should biodiversity credits be required to offset the impacts of the Proposed works, consideration is required as to the type of offset and the offset location. Importantly the offset should be in an area with the potential to have a positive impact on a known population of Koalas, such as the replanting of Preferred Koala feed trees.

Table 7-3. Offsetting options available to Sydney Water

Residual loss of biodiversity values resulting from works	Offset Options Moderate Impacts
Threatened vegetation: Threatened flora and/or fauna habitat) Non-threatened native vegetation	On site: native revegetation or bushland restoration, AND/ OR Nearby site: native revegetation or bushland restoration, OR Sydney Water offset site bushland restoration, OR Purchase and retire biodiversity credits generated by Sydney Water Offset sites or from the open market.
Tree removal	On site: tree replacement, AND/ OR Nearby site: tree replacement.

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APPENDIX A THREATENED FLORA – LIKELIHOOD OF OCCURRENCE ASSESSMENT

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Acacia baueri subsp. aspera		V	Not Listed	Restricted to the Sydney region, occurring on the Kings Tableland in the central Blue Mountains and with sporadic occurrences on the Woronora Plateau in the Royal National Park, Mt. Keira district and at Wedderburn. May also occur on the escarpment/ Woronora Plateau in the Flat Rock Junction and Stanwell Tops area of the Illawarra.	Occurs in low, damp heathlands, often on exposed rocky outcrops over a wide range of climatic and topographical conditions. Appears to prefer open conditions; rarely observed where there is any shrub or tree canopy development; and many of the observations of this species have been made following fire, suggesting the species prefers early successional habitats.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Acacia bynoeana	Bynoe's Wattle	E	V	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. The species is currently known from about 30 locations, with the size of the populations at most locations being very small. It has recently been found in the Colymea and Parma Creek areas west of Nowra.	Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	160 (2021) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Acacia pubescens	Downy Wattle	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon.	Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	312 (2021) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Acacia terminalis subsp. Eastern Sydney	Sunshine wattle	E	E	Very limited distribution, mainly in near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay, with most records from the Port Jackson area and the eastern suburbs of Sydney. Recorded from North Head, Middle Head, Dover Heights, Parsely Bay, Nielsen Park, Cooper Park, Chifley, Watsons Bays, Wollstonecraft and Waverley.	Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered. Most areas of habitat or potential habitat are small and isolated. Most sites are highly modified or disturbed due to surrounding urban development.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Allocasuarina diminuta subsp. mimica	Allocasuarina diminuta subsp. mimica population in the Sutherland Shire and Liverpool City local government areas	EP	Not Listed	The endangered population occurs along sandstone ridges and upper hillsides in the region northwest from Heathcote, towards Menai and Holsworthy, in heathy and low open woodland communities. It is restricted to the Local Government Areas listed in this instance (Sutherland and Liverpool). Other occurrences in the Blue Mountains and Southern Highlands (Blackheath to Bundanoon and Taralga), and also in the coastal communities from Kingsford to Little Bay) are not included in the Endangered population listing.	Found in heathy woodlands, heathlands and low open woodlands	1 (2021)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Allocasuarina glareicola		E	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool.	Grows in Castlereagh woodland on lateritic soil. Found in open woodland with Eucalyptus parramattensis, *Eucalyptus fibrosa*, *Angophora bakeri*, *Eucalyptus sclerophylla* and *Melaleuca decora*. Not killed outright by fire but resprouts from the rootstock. Spreads by vegetative means, such that clumps of up to 100s of stems may be a single individual.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Caladenia tessellata	Thick Lip Spider Orchid	E	V	The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border.	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Callistemon linearifolius	Netted Bottle Brush	V	Not Listed	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Three of the remaining populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve and Spectacle Island Nature Reserve. The species has also been recorded from Yengo National Park.	Grows in dry sclerophyll forest on the coast and adjacent ranges.	1 (2021)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	The Leafless Tongue Orchid has been recorded from as far north as Gibraltar Range National Park south into Victoria around the coast as far as Orbost. It is known historically from a number of localities on the NSW south coast and has been observed in recent years at many sites between Batemans Bay and Nowra (although it is uncommon at all sites). Also recorded at Munmorah State Conservation Area, Nelson Bay, Wyee, Washpool National Park, Nowendoc State Forest, Ku-Ring-Gai Chase National Park and Ben Boyd National Park.	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. Little is known about the ecology of the species; being leafless it is expected to have limited photosynthetic capability and probably depends upon a fungal associate to meet its nutritional requirements from either living or dead organic material.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Cynanchum elegans	White-flowered Wax Plant	E	E	Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley.	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree, Coastal Banksia coastal scrub; Forest Red Gum aligned open forest and woodland; Spotted Gum aligned open forest and woodland; and Bracelet Honeymyrtle scrub to open scrub.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Epacris purpurascens var. purpurascens		V	Not Listed	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South.	Found in a range of habitat types, most of which have a strong shale soil influence. Lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild.	1 (2015)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
							10km of the Study Area.
Genoplesium baueri	Bauer's Midge Orchid	E	E	The species has been recorded from locations between Ulladulla and Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments.	Grows in dry sclerophyll forest and moss gardens over sandstone.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	V	Sporadically distributed throughout the Sydney Basin with sizeable populations around Picton, Appin and Bargo (and possibly further south to the Moss Vale area) and in the Hunter at in the Cessnock - Kurri Kurri area (particularly Werakata NP). Separate populations are also known from Putty to Wyong and Lake Macquarie on the Central Coast.	Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from the Mittagong Formation. Soil landscapes include Lucas Heights or Berkshire Park. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. In Sydney it has been recorded from Shale Sandstone Transition Forest and in the Hunter in Kurri Sand Swamp Woodland. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Hunter occurrences are usually 30-70m ASL, while the southern Sydney occurrences are typically at 100-300m ASL.	1632 (2023) PMST	High- The species has recently (within the last 20 years) been recorded on the Study Area or nearby.
Hibbertia fumana		CE	Not Listed	Originally collected by R. Brown, Caley and Sieber from sites as diverse as 'near South Head' and 'western Sydney' At the beginning of the species rediscovery the only known extant population was found to occur in the Moorebank area. As a result of recent surveys populations of this species have been detected over a wider range within greater Sydney stretching from Richmond to Mittagong.	Species is known to occur in a long intergrade between Castlereagh Scribbly Gum Woodland and Castlereagh Ironbark Forest. Also recently found associated with aeolian sand deposits. Species has been found to occur in a variety of structural habitats including open areas, disturbed sites and also within thick ground cover dominated by a heavy cover of sedges, rushes and grasses.	1117 (2021)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Hibbertia puberula		E	Not Listed	Recent work on this species and its relatives have shown it to be widespread, but never common. It extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains. It favours low heath on sandy soils or rarely in clay, with or without rocks underneath.	Occurs on sandy soil often associated with sandstone, or on clay. Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied. One of the recently described subspecies also favours upland swamps.	1086 (2023)	High- The species has recently (within the last 20 years) been recorded on the Study Area or nearby.
Hibbertia sp. Bankstown		CE	CE	This species is endemic to New South Wales and is currently known to occur in only one population at Bankstown Airport in Sydney's southern suburbs, in the Bankstown local government area known only from Tertiary alluvial soil along Airport Creek on Bankstown Airport and not from areas where subsequent fill has been deposited in between. The plant assemblage is attributable to "Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion.	The airport site is very heavily modified from the natural state, lacks canopy species and is currently a low grass/shrub association with many pasture grasses and other introduced herbaceous weeds. Soil at the site is a sandy (Tertiary) alluvium with a high silt content. The remnant at the site and soil type are consistent with an inferred pre-settlement cover of Castlereagh Ironbark Forest although some remnant vegetation at and near the site (along the channel in particular) suggests Castlereagh Scribbly Gum Woodland is equally valid.	1 (2011)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Leucopogon exolasius	Woronora Beard-heath	V	V	Woronora Beard-heath is found along the upper Georges River area and in Heathcote National Park.	The plant occurs in woodland on sandstone.	1 (2019) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
							been recorded more recently (<20 years ago) within 10km of the Study Area.
Leucopogon fletcheri subsp. fletcheri		E	Not Listed	Restricted to north-western Sydney between St Albans in the north and Annangrove in the south, within the local government areas of Hawkesbury, Baulkham Hills and Blue Mountains.	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs.	1 (2015)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Macadamia integrifolia	Macadamia Nut	Not Listed	V	Not known to occur naturally in the wild in NSW.	N/A	1 (2004)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Marsdenia viridiflora subsp. viridiflora	Native Pear	Not Listed	Not Listed	N/A	N/A	3 (2021)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Melaleuca biconvexa	Biconvex Paperbark	V	V	Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Melaleuca deanei	Deane's Paperbark	V	V	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/ Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas.	The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Persicaria elatior	Tall Knotweed	V	V	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace and the Grafton area. The species also occurs in Queensland.	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Persoonia hirsuta	Hairy Geebung	E	E	Persoonia hirsuta has a scattered distribution around Sydney. The species is distributed from Singleton in the north, along the east coast to Hilltop in the south west, Dombarton in the south east and the Blue Mountains to the west. Persoonia hirsuta has a large area of occurrence, but occurs in small populations or isolated individuals, increasing the species' fragmentation in the landscape.	The Hairy Geebung is found in clayey and sandy soils in dry sclerophyll open forest, woodland and heath, primarily on the Mittagong Formation and on the upper Hawkesbury Sandstone. It is usually present as isolated individuals or very small populations.	1 (2020) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Persoonia nutans	Nodding Geebung	E	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. The species has a disjunct distribution, with the majority of populations (and 99% of individuals) occurring in the north of the species range in the Agnes Banks, Londonderry, Castlereagh, Berkshire Park and Windsor Downs areas. Core distribution occurs within the Penrith, and to a lesser extent Hawkesbury, local government areas, with isolated and relatively small populations also occurring in the Liverpool, Campbelltown, Bankstown and Blacktown local government areas. The southern and northern populations have distinct habitat differences.	Northern populations are confined to aeolian and alluvial sediments and occur in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River / Castlereagh Ironbark Forests. Southern populations also occupy tertiary alluvium but extend onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest.	454 (2023)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Pimelea curviflora var. curviflora		V	V	Confined to the coastal area of the Sydney and Illawarra regions. Populations are known between northern Sydney and Maroota in the north-west. New population discovered at Croom Reserve near Albion Park in Shellharbour LGA in August 2011. Formerly recorded around the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly.	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowalnd Grassy Woodland habitat at Albion Park on the Illawaraa coastal plain.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Pimelea spicata	Spiked Rice-flower	E	E	Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama).	In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils.On the Cumberland Plain sites it is associated with Grey Box communities and in areas of ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites. The IIllawarra populations usually occur in one of two communities - a woodland or a coastal grassland.	3 (2022) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Pomaderris brunnea	Brown Pomaderris	E	V	Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands and in far eastern Gippsland in Victoria.	Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	7 (2019) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Pterostylis gibbosa	Illawarra Greenhood	E	E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). It is apparently extinct in western Sydney which is the area where it was first collected (1803).	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Red Gum, Woollybutt and White Feather Honey-myrtle. Near Nowra, the species grows in an open forest of Spotted Gum, Forest Red Gum and Grey Ironbark.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Pterostylis saxicola	Sydney Plains Greenhood	E	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Two populations occur within a conservation reserve (Georges River National Park; Scheyville NP).	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where Pterostylis saxicola occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils. All species of Pterostylis are deciduous and die back to fleshy, rounded underground tuberoids.	91 (2022) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Pultenaea aristata	Prickly Bush-pea	V	V	Prickly Bush-pea is restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong.	The species occurs in either dry sclerophyll woodland or wet heath on sandstone.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Pultenaea pedunculata	Matted Bush-pea	E	Not Listed	Matted Bush-pea is widespread in Victoria, Tasmania, and south-eastern South Australia. In NSW however, it is represented by just three disjunct populations, in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn and is now found at Villawood and Prestons, and north-west of Appin between the Nepean River and Devines Tunnel number 2.	The Matted Bush-pea occurs in a range of habitats. NSW populations are generally among woodland vegetation but plants have also been found on road batters and coastal cliffs. It is largely confined to loamy soils in dry gullies in populations in the Windellama area. The ability of stems to creep and root from the nodes has made this species a very good coloniser of bare ground in many parts of its range.	3 (2008)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Rhizanthella slateri	Eastern Australian Underground Orchid	V	E	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface,	PMST	Low- The species has not been recorded previously within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
					with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed.		
Rhodamnia rubescens	Scrub Turpentine	CE	CE	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm.	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Rhodomyrtus psidioides	Native Guava	CE	Not Listed	Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW.	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Syzygium paniculatum	Magenta Lilly Pilly	E	V	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest.	On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	1 (2016) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Thelymitra kangaloonica	Kangaloon Sun Orchid	CE	CE	Thelymitra kangaloonica is only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. It is known to occur at three swamps that are above the Kangaloon Aquifer. These swamps are a part of the ecological community Coastal Upland Swamp. The majority of known plants are located on land managed by the Sydney Catchment Authority. One small population is located in Budderoo National Park.	It is found in swamps in sedgelands over grey silty grey loam soils.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.
Thesium australe	Austral Toadflax	V	V	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region.	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.

APPENDIX B THREATENED FAUNA – LIKELIHOOD OF OCCURRENCE ASSESSMENT

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Anthochaera phrygia	Regent Honeyeater	CE	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast.	1 (2012) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Aphelocephala leucopsis	Southern Whiteface	V	V	Southern Whiteface occur across most of mainland Australia south of the tropics, from the north-eastern edge of the Western Australian wheatbelt, east to the Great Dividing. There is a broad hybrid zone between the two subspecies extending north from the western edge of the Nullarbor Plain. The northern boundary	Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both; habitat with low tree densities and an herbaceous understory litter cover which provides essential foraging habitat; living and dead trees with hollows and crevices which are essential for roosting and nesting.	PMST	Low- The species has not been recorded previously within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				extends to about Carnarvon in the west, to the southern Northern Territory in central Australia, but is slightly further south in Queensland where the species is largely confined to the south-west of the Mitchell Grass Downs and along the southern state border.			
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the Southwestern Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory.	Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass. Sites are typically well-drained, with rocky outcrops or scattered, partially buried rocks. Commonly found beneath small, partially embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	Not Listed	Dusky Woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range.	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	10 (2014)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Botaurus poiciloptilus	Australasian Bittern	E	E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west.	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails.	PMST	Low- The species has not been recorded previously within 10km of the Study Area

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Burhinus grallarius	Bush Stone-curlew	E	Not Listed	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range.	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.	2 (2016)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Calidris acuminata	Sharp-tailed Sandpiper	Not Listed	V	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. They are widespread in most regions of New South Wales (NSW) and Victoria, especially in coastal areas, but they are sparse in the south-central Western Plain and east Lower Western Regions of NSW, and north-east and north-central Victoria	Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Callocephalon fimbriatum	Gang-gang Cockatoo	E	E	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark	1 (2006)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.	assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (Eucalyptus pauciflora) woodland and occasionally in temperate rainforests. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger in eucalypts.		years ago) within 10km of the Study Area.
Calyptorhynchus lathami lathami	Glossy Black-Cockatoo	V	V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia.	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (Allocasuarina littoralis) and Forest Sheoak (A. torulosa) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, Allocasuarina diminuta, and A. gymnanthera. Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (Casuarina cristata). Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites.	8 (2022) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Chalinolobus dwyeri	Large-eared Pied Bat	V	E	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in	2 (2016) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				Tablelands and North West Slopes.	sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy.		10km of the Study Area.
Charadrius leschenaultii	Greater Sand-plover	V	V	The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries.	Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Daphoenositta chrysoptera	Varied Sittella	V	Not Listed	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades.	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	15 (2015)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Dasyornis brachypterus	Eastern Bristlebird	E	E	The distribution of the Eastern Bristlebird has contracted to three	Habitat for central and southern populations is characterised by dense,	PMST	Low- The species has not been

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				disjunct areas of south-eastern Australia. There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. The central population comprises an estimated 1600 birds, mainly from Barren Grounds Nature Reserve, Budderoo National Park and the Jervis Bay area.	low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone. Age of habitat since fires (fire-age) is of paramount importance to this species. The Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years; however, habitat in northern NSW requires frequent fires to maintain habitat condition and suitability. then retreat into dense vegetation.		recorded previously within 10km of the Study Area
Dasyurus maculatus maculatus	Spotted tailed quoll	V	E	The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common.	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Are known to traverse their home ranges along densely vegetated creeklines.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Delma impar	Striped Legless Lizard	V	V	The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes, the Upper Hunter and possibly on the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma, Muswellbrook, and Tumut areas. Also occurs in the ACT, Victoria and south-eastern South Australia.	Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass, spear-grasses and poa tussocks, and occasionally wallaby grasses. Sometimes present in modified grasslands with a significant content of	PMST	Low- The species has not been recorded previously within 10km of the Study Area

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
					exotic grasses. Sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter. Sometimes utilises dried cowpats for shelter. Actively hunts for spiders, crickets, moth larvae and cockroaches.		
Erythrotriorchis radiatus	Red Goshawk	C E	V	This unique Australian endemic raptor is distributed sparsely through northern and eastern Australia, from the western Kimberley Division of northern Western Australia to north-eastern Queensland and south to far north-eastern NSW, and with scattered records in central Australia. The species is very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens.	Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, swamp forest and riparian forest of coastal rivers. Adults appear to occupy territories throughout the year and breeding territories are traditionally used from year to year.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Falco hypoleucos	Grey Falcon	E	Not Listed	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW.	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three eggs are laid.	PMST	Low- The species has not been recorded previously within 10km of the Study Area

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	Not Listed	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania.	Prefers moist habitats, with trees taller than 20m. Generally, roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer.	16 (2022)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Gallinago hardwickii	Latham's Snipe	Not Listed	V	Latham's Snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia. The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. The range extends inland over the eastern tablelands in south-eastern Queensland and to west of the Great Dividing Range in New South Wales. The species is widespread in Tasmania and is found in all regions of Victoria except for the north-west. Most birds spend the non-breeding period at sites located south of the Richmond River in New South Wales. The species is occasionally recorded at sites located to the west of the core range. It is also an irregular visitor to Norfolk Island and Lord Howe Island, and possibly to Macquarie Island.	Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. The foraging habitats of Latham's Snipe are characterized by areas of mud (either exposed or beneath a very shallow covering of water) and some form of cover (e.g. low, dense vegetation). The snipe roost on the ground near (or sometimes in) their foraging areas, usually in sites that provide some degree of shelter, e.g. beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Glossopsitta pusilla	Little Lorikeet	V	Not Listed	The Little Lorikeet is distributed widely across the coastal and	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also	36 (2021)	Moderate- The species has

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs.	finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.		historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Grantiella picta	Painted Honeyeater	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution.	Inhabits Boree/ Weeping Myall, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	M	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways.	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp	4 (2021)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
					sclerophyll forest close to foraging habitat.		
Heleioporus australiacus	Giant Burrowing Frog	V	V	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria.	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Hieraaetus morphnoides	Little Eagle	V	Not Listed	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW.	Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	5 (2016)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Hirundapus caudacutus	White-throated Needletail	Not Listed	V	Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south-eastern Siberia, Mongolia, the Korean Penninsula and northern Japan June-August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. These conditions are often used by insects to swarm (eg termites and ants) or tend to lift insects away from the surface which favours	In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but	PMST	Low- The species has not been recorded previously within 10km of the Study Area

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				sighting of White-throated Needletails as they feed. More common in coastal areas, less so inland.	they are less commonly recorded flying above woodland.		
Hoplocephalus bungaroides	Broad-headed Snake	E	V	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney.	Nocturnal. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevieces or hollows in large trees within 500m of escarpments in summer. Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. Females produce four to 12 live young from January to March, which is a relatively low level of fecundity.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	E	The Southern Brown Bandicoot has a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland.	Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruiting) fungi.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Lathamus discolor	Swift Parrot	E	CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes.	Migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Forest Red Gum, Mugga Ironbark, and White Box. Commonly used lerp infested trees include Inland Grey Box, Grey Box, and	3 (2010) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
					Yellow Box. Following winter they return to Tasmania to breed.		
Litoria aurea	Green and Golden Bell Frog	E	V	Formerly distributed from the NSW north coast near Brunswick Heads, southwards along the NSW coast to Victoria where it extends into east Gippsland. Records from west to Bathurst, Tumut and the ACT region. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands.	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas.	1 (2022) PMST	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Lophoictinia isura	Square-tailed Kite	V	Not Listed	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March.	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland.	3 (2021)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	Not Listed	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies picata. Two other subspecies occur outside NSW.	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Often perches on low dead stumps and fallen timber or on low-hanging branches, using a perch-and-pounce method of hunting insect prey.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	Not Listed	The Black-chinned Honeyeater has two subspecies, with only the nominate occurring in NSW. The eastern subspecies extends south from central Queensland, through NSW, Victoria into south eastern South Australia, though it is very rare in the last state. In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence River areas. It has also been recorded at a few scattered sites in the Hunter, Central Coast and	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. A gregarious species usually seen in pairs and small groups of up to 12 birds. Feeding territories are large making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares. Moves quickly from tree to tree, foraging rapidly along outer twigs, underside of branches and trunks, probing for insects.	2 (2007)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				Illawarra regions, though it is very rare in the latter.			
Meridolum corneovirens	Cumberland Plain Land Snail	E	Not Listed	Lives in small areas on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. known from over 100 different locations, but not all are currently occupied, and they are usually isolated from each other as a result of land use patterns.	Primarily inhabits Cumberland Plain Woodland. This community is a grassy, open woodland with occasional dense patches of shrubs. It is also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest, which are also listed communities. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.	92 (2022)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	Not Listed	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW.	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.	18 (2015)	High- The species has recently (within the last 20 years) been recorded on the Study Area or nearby.
Miniopterus australis	Little Bent-winged Bat	V	Not Listed	East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW.	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	2 (2015)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	Not Listed	Eastern Bentwing-bats occur along the east and north-west coasts of Australia.	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the	28 (2022)	High- The species has recently (within the last 20 years) been recorded on the

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
					birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals.		Study Area or nearby.
Mixophyes balbus	Stuttering Frog	E	V	Stuttering Frogs occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east NSW. It is the only Mixophyes species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. The Dorrigo region, in north-east NSW, appears to be a stronghold for this species.	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Feed on insects and smaller frogs. Breed in streams during summer after heavy rain.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Myotis macropus	Southern Myotis	V	Not Listed	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers.	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	12 (2022)	High- The species has recently (within the last 20 years) been recorded on the Study Area or nearby.
Ninox strenua	Powerful Owl	V	Not Listed	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds	14 (2022)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover. Recent increases in population density across Sydney and some other semi-urban areas do not seem to be solely due to increased awareness of this flagship species.	and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine, Black She-oak, Blackwood, Rough-barked Apple, Cherry Ballart and a number of eucalypt species.		more recently (<20 years ago) within 10km of the Study Area.
Notamacropus parma	Parma Wallaby	V	V	It is present in suitable forests scattered throughout the escarpment up to 1000 m above sea level. Upper altitudinal sites include the Dorrigo Plateau, Gibraltar Range and Barrington Tops. Its distribution extends from the area around Olney State Forest southwest of Newcastle, to south of the Bruxner Highway between Tenterfield and Casino.	Occupies wet sclerophyll forest with a thick, shrubby understorey and nearby grassy patches. The species also occurs in dry sclerophyll forest with a dense understorey and occasionally in rainforest. The Parma wallaby shelters in the thick understorey through which it moves along runways	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Numenius madagascariensis	Eastern Curlew	Not Listed	C E	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern Curlews are rarely recorded inland. In NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast.	It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on sandy spits and islets, especially on dry beach sand near	PMST	Low- The species has not been recorded previously within 10km of the Study Area

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				The Eastern Curlew breeds in Russia and north-eastern China but its distribution is poorly known. During the non-breeding season a few birds occur in southern Korea and China, but most spend the non-breeding season in north, east and south-east Australia.	the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. May also roost on wooden oyster leases or other similar structures.		
Petaurus australis australis	Yellow-bellied Glider	V	Not listed	The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Petaurus norfolcensis	Squirrel Glider	V	Not Listed	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria.	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum Forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstory. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites.	1 (2006)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Study Area.
Petroica boodang	Scarlet Robin	V	Not Listed	The Scarlet Robin is found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet	5 (2010)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter.	forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. The Scarlet Robin is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees		been recorded more recently (<20 years ago) within 10km of the Study Area.
Phascolarctos cinereus	Koala	V	E	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range.	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Generally solitary but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery.	420 (2024) PMST	High- The species has recently (within the last 20 years) been recorded on the Study Area or nearby.
Pseudomys novaehollandiae	New Holland Mouse	Not Listed	V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Genetic evidence indicates that the New	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. It is a social animal, living predominantly in burrows shared with other individuals.	7 (2020) PMST	Moderate- The species has historically (>20 years ago) been recorded on the

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				Holland Mouse once formed a single continuous population on mainland Australia and the distribution of recent subfossils further suggest that the species has undergone a large range contraction since European settlement. Total population size of mature individuals is now estimated to be less than 10,000 individuals although, given the number of sites from which the species is known to have disappeared between 1999 and 2009, it is likely that the species' distribution is actually smaller than current estimates.	Distribution is patchy in time and space, with peaks in abundance during early to mid-stages of vegetation succession typically induced by fire		Study Area or has been recorded more recently (<20 years ago) within 10km of the Proposal
Pseudophryne australis	Red-crowned Toadlet	V	Not Listed	The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters	2 (2010)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Proposal
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations.	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	178 (2023)	High- The species is known or likely to maintain resident populations in proximity to the Study Area and could utilise resources within the Study Area.

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
Rostratula australis	Australian Painted Snipe	E	E	The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys.	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves.	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	Not Listed	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and Northwest Slopes.	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	9 (2015)	Moderate- The species has recently (<20 years) been recorded within 10km of the Study Area and the Study Area contains marginally suitable habitat for the species.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	Not Listed	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying	21 (2022)	Moderate- The species has recently (<20 years) been recorded within 10km of the Study Area and the

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
				is widespread on the New England Tablelands, however does not occur at altitudes above 500 m.	slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species.		Study Area contains marginally suitable habitat for the species.
Stagonopleura guttata	Diamond Firetail	V	Not Listed	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and Southwestern Slopes and the Northwest Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River.	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland separate into small colonies to breed, between August and January	PMST	Low- The species has not been recorded previously within 10km of the Study Area
Tringa nebularia	Common Greenshank	Not Listed	E	The species has been recorded in most coastal regions. It is widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and north-west regions	Found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayment's, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated	PMST	Low- The species has not been recorded previously within 10km of the Study Area

Scientific name	Common name	BC Act	EPBC Act	Distribution	Habitat	Records	Likelihood of Occurrence
					floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores		
Tyto novaehollandiae	Masked Owl	V	Not Listed	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution.	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	1 (2016)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Proposal
Varanus rosenbergi	Rosenberg's Goanna	V	Not Listed	Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the Southwest Slopes near Khancoban and Tooma River. Also occurs in South Australia and Western Australia.	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. Runs along the ground when pursued (as opposed to the Lace Monitor, which climbs trees).	1 (2023)	Moderate- The species has historically (>20 years ago) been recorded on the Study Area or has been recorded more recently (<20 years ago) within 10km of the Proposal

APPENDIX C SIGNIFICANT IMPACT CRITERIA ASSESSMENTS (EPBC ACT)

Significant Impact Criteria assessments have been prepared for all threatened species or ecological communities considered to have a moderate to high likelihood of occurrence in the Study Area. Assessments have been prepared in accordance with the *Matters of National Environmental Significance: Significant impact guidelines* (Commonwealth Department of the Environment, 2013). Assessment outcomes for threatened species or ecological communities are summarised in Table 7-4.

Table 7-4 Summary of Significant Impact Criteria assessments for threatened species or ecological communities

Common name	Scientific name	EPBC Act	Significant Impact
Fauna			
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Endangered	Unlikely
Glossy-black Cockatoo	*Calyptorhynchus lathami*	Vulnerable	Unlikely
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable	Unlikely
Koala	*Phascolarctos cinereus*	Endangered	Unlikely
Large-eared Pied Bat	*Chalinolobus dwyeri*	Endangered	Unlikely

Threatened fauna

Gang-gang Cockatoo (*Callocephalon fimbriatum)*

The Gang-gang Cockatoo is listed as Endangered under both the BC and EPBC Act.

The action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
a) Lead to a long-term decrease in the size of a population	The proposed works would be removing up to 1.20 hectares of potential foraging and dispersal habitat for Gang-gang Cockatoo (PCT 3321, native planted vegetation). Additionally, if the hollows present in the hollow bearing tree are potentially suitable for Gang-gang Cockatoo breeding habitat. Gang-gang Cockatoo are highly mobile and able to move between patches of available habitat easily. The proposed works are removing a small area habitat comprising a minute proportion of available habitat in the vicinity, including a small area of potential breeding habitat. It is unlikely the removal of this small area of habitat by the proposed works would lead to a long-term decrease in the species population
b) Reduce the area of occupancy of the species	The proposed works are removing a small area habitat (1.20 hectares) comprising a minute proportion of available habitat in the vicinity, including a small area of potential breeding habitat. It is unlikely the removal of this small area of habitat would reduce the area of occupancy of the species.
c) Fragment an existing population into two or more populations	The proposed works are removing a small area habitat (1.20 hectares). It is unlikely that the proposed works would fragment an existing population into two or more populations.
d) Adversely affect habitat critical to the survival of a species	Habitat critical to the survival of a species or ecological community' refers to areas that are necessary: • For activities such as foraging, breeding, roosting, or dispersal; • for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • to maintain genetic diversity and long-term evolutionary development; or • for the reintroduction of populations or recovery of the species or ecological community The proposed works would be removing up to 1.20 hectares of potential habitat for Gang-gang Cockatoo. While it is possible the species may use the Study Area on occasion, the species is highly mobile and unlikely to be dependent on the habitat. No habitat to be removed by the proposed works is therefore considered critical habitat to the survival of the Gang-gang Cockatoo
e) Disrupt the breeding cycle of a population	The proposed works would be removing up to 1.20 hectares of potential habitat for Gang-gang Cockatoo, including up to one hollow bearing tree which may contain breeding habitat for the species. However, as no sightings of the species exist on the Study Area, nor were any of the species observed during surveys it is unlikely the habitat to be removed would be essential breeding habitat of the species.
f) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The removal of a small area of habitat for Gang-gang Cockatoo would not decrease availability or quality of habitat such that the species is likely to decline.
g) Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	The proposed works could result in further spread of invasive plant species, impacting foraging habitat for the species. However, the Study Area is already subject to a moderate level of disturbance due to exotic vegetation, and subsequently impacts by the proposed works on the spread of invasive species are minimal.

h) Introduce disease that may cause the species to decline	The proposed works are highly unlikely to introduce disease that may cause a decline in Gang-gang Cockatoo.
i) Interfere substantially with the recovery of the species.	While the proposed works would be removing foraging habitat of the Gang-gang Cockatoo, the extent of impacts is not enough to interfere substantially with the recovery of the species
Conclusion	The proposed action would not impact on an important population of Gang-gang Cockatoo. Though the proposed action would result in the removal of potential habitat it is not likely to lead to a decline in the species or reduce the area of occupancy. Therefore, the proposed works would not have a significant impact on Gang-gang Cockatoo and as such, Referral to the Minister is not required.

Glossy-black Cockatoo (*Calyptorhynchus lathami)*

The Glossy-black Cockatoo is listed as Vulnerable under both the BC and EPBC Act.

The action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
a) Lead to a long-term decrease in the size of an important population of a species	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal. • Populations that are necessary for maintaining genetic diversity and/or; • Populations that are near the limit of the species range. No Glossy Black-cockatoo signs of occurrence were found during surveys. Around 1.20 hectares of associated vegetation containing areas of foraging habitat (*Allocasuarina littoralis* and *Casuarina glauca*) would be removed as part of the proposed works. Additionally, if the hollows present in the hollow bearing tree are potentially suitable for Gang-gang Cockatoo breeding habitat The small amount of potential dispersal habitat proposed for removal is unlikely to significantly impact the size of this population given the abundance of suitable habitat in the local landscape.
b) Reduce the area of occupancy of an important population	The Proposal would remove up to 1.20 ha (comprising PCTs 3321 and planted native vegetation) of potential Glossy-black Cockatoo habitat, including multiple feed trees that may provide foraging habitat for the species. The extent of foraging habitat to be removed is considered minor given the availability of substantial areas of suitable habitat remaining in nearby areas. Hollow-bearing trees which may constitute breeding habitat of this species may be removed by the proposed works. As direct Impact Areas are small and there is sufficient suitable habitat in the Locality, the Proposal would not reduce the occupancy of this species in the area.
c) Fragment an existing important population into two or more populations	Glossy Black-cockatoos extend from Central Queensland down to north-eastern Victoria. This species is highly mobile, able to fly long distances in search of suitable habitat resources. The removal of a small section of potential dispersal is unlikely to fragment an existing local population, nor interfere with the genetics of such a population, if it occurs.
d) Adversely affect habitat critical to the survival of a species	Habitat critical to the survival of the Glossy Black-cockatoo is detailed in the Approved Conservation Advice (DCCEEW, 2022) and refers to areas that are necessary: • For activities such as foraging, breeding, roosting, or dispersal;

The action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
	• for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • to maintain genetic diversity and long-term evolutionary development; or • for the reintroduction of populations or recovery of the species or ecological community The Study Area contains known foraging habitat; however, hollows are unlikely to be big enough to house Glossy Black Cockatoos. Therefore, the abundance of retained suitable habitat in the local landscape provides sufficient breeding and foraging resources for locally occurring populations. Therefore, this Proposal is unlikely to adversely affect habitat critical to the survival of the Glossy Black-cockatoo.
e) Disrupt the breeding cycle of an important population	Hollow-bearing trees which may constitute breeding habitat of this species may be removed by the proposed works however, no individuals were observed. Therefore, the proposed works are unlikely to disrupt the breeding cycle of an important population.
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	1.20 hectares of native vegetation comprising of PCTs 3321 and native planted vegetation is proposed to be removed. Given the small area that is to be removed and the abundance of suitable habitat in the Locality, it is unlikely removal of vegetation would lead to a decline in the local Glossy Black-cockatoo population.
g) Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The Proposal could result in further spread of invasive plant species, impacting foraging habitat for the species. However, the Study Area is already subject to a moderate level of disturbance due to exotic vegetation, and subsequently impacts by the Proposal on the spread of invasive species are minimal. There was no evidence of pest species such as feral cats, foxes etc within the area, but if present, they are unlikely to cause significant harm to this species, nor is the Proposal likely to exacerbate pest species impacts.
h) Introduce disease that may cause the species to decline	Standard measures to minimise the spread of pests, weeds and disease, including specific diseases to birds such Psittacine Beak and Feather Disease, are recommended as part of a flora and fauna management plan. These measures should include hygiene protocols to prevent transfer of disease from vehicles, humans and soil/vegetation from other areas. The removal of 1.20 hectares of potential foraging habitat is unlikely to introduce disease that may cause the Glossy Black-cockatoo to decline.
i) Interfere substantially with the recovery of the species.	There is no recovery plan for the mainland sub-species of Glossy Black-cockatoos. Threatening processes that apply to this species include destruction and fragmentation of habitat, high intensity fires, loss of hollow earing trees, loss of watering sites, particularly within proximity to nest sites on coastal islands and competition with other native and introduced species. The proposed works do require the removal of a small area of foraging habitat; however, it is not expected to interfere with any recovery actions for this species
Conclusion	No signs of Glossy Black-cockatoos were found within the Study Area however given that the species has been recorded within 10km of the Study Area and the presence of suitable feed trees and hollow-bearing trees, the area could be used as foraging and breeding habitat for the species. The proposed works would require the removal of up to 1.20 hectares of associated vegetation for this species. Given the small area that is to be removed and the abundance of suitable habitat in the Locality, it is unlikely that the proposed works would have a significant impact on this species and a referral to the Minister is not recommended.

Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox is listed as Vulnerable under both the BC and EPBC Act.

The action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
a) Lead to a long-term decrease in the size of an important population of a species	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal. • Populations that are necessary for maintaining genetic diversity and/or; • Populations that are near the limit of the species range. The Grey-headed Flying-fox has no separate or distinct populations (Parry-Jones & Wardle 2004). The species constantly exchanges genetic information between camps throughout its geographic range. Nationally important camps are those that have contained ≥ 10,000 Grey-headed Flying-foxes in more than one year in the last 10 years or have been occupied by more than 2,500 Grey-headed Flying-foxes permanently or seasonally every year for the last 10 years (DAWE 2021). Grey-headed Flying-fox have been recorded in high numbers within close proximity of the Study Area, with the nearest breeding camp located approximately 2.5 kilometres from the Study Area in Macquarie Fields, a Nationally Significant Camp (Camp ID: 9482, Category 4). No camps are located in the Study Area. The Study Area could be utilised by individuals from these camps for foraging, however they do not currently use the Study Area for permanent roosting or as a maternity camp. Native trees across the Study Area provide a food resource for the Grey-Headed Flying-Fox, although this foraging resource does not comprise a significant area of foraging habitat within the Locality. The loss of foraging habitat is considered the primary threat to the species (DAWE 2021) and there has been an overall reduction in foraging habitat in the region and across the species geographic range. However, the area of potential habitat removed by the Proposal is up to 1.20 ha, a negligible portion of the available habitat in the vicinity and therefore it is unlikely the Proposal will lead to a long-term decrease in the population.
b) Reduce the area of occupancy of an important population	The Proposal would remove up to 1.20 ha (comprising PCTs 3321 and native planted vegetation), of potential Grey-headed Flying-fox habitat, including multiple feed trees that may provide foraging habitat for the species. The extent of foraging habitat to be removed is considered minor given the availability of substantial areas of suitable habitat remaining in nearby areas. As direct Impact Areas are small and there is sufficient suitable habitat in the Locality, the Proposal would not reduce the occupancy of this species in the area.
c) Fragment an existing important population into two or more populations	The removal of foraging habitat from the Study Area would not fragment an existing population into two or more populations.
d) Adversely affect habitat critical to the survival of a species	No roosts for GHFF occur within the Study Area, as such the Proposal is unlikely to impact critical habitat for roosting. The Proposal will be removing up to 1.20 ha (comprising PCTs 3321 and native planted vegetation) that represent potential foraging habitat. However, this area of habitat is not considered a significant proportion of habitat available within the Locality. Due to the

The action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
	high mobility of the species and the high availability of suitable habitat in the surrounding foraging range, the Proposal will not affect this Grey-headed Flying-fox habitat to an extent such that the survival of the species is adversely impacted.
e) Disrupt the breeding cycle of an important population	The Study Area does not contain breeding habitat for this species. Foraging resources are important during critical periods in the reproductive cycle of Grey-headed Flying-fox. Grey-headed Flying-foxes have a foraging range of up to 50 kilometres, and the Proposal will remove approximately 1.20 ha of foraging habitat. Habitat to be removed by the Proposal comprises a very small portion of available habitat in the vicinity, therefore the Proposal will unlikely disrupt the breeding cycle of local populations.
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The removal of a small area of potential foraging habitat for the Grey-headed Flying-fox would not decrease availability or quality of habitat such that the species is likely to decline.
g) Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The Proposal could result in further spread of invasive plant species, impacting foraging habitat for the species. However, the Study Area is already subject to a moderate level of disturbance due to exotic vegetation, and subsequently impacts by the Proposal on the spread of invasive species are minimal. There was no evidence of pest species such as feral cats, foxes etc within the area, but if present, they are unlikely to cause significant harm to this species, nor is the Proposal likely to exacerbate pest species impacts.
h) Introduce disease that may cause the species to decline	GHFF are known to carry at a number of diseases, some of which have been found to be dangerous to humans (e.g Hendra and Lyssa virus). Impacts of disease is not well understood in the GHFF population, although incidence of disease in the population is low (DAWE 2021). The removal of up to 1.20 ha of potential foraging habitat is unlikely to introduce disease that may cause the Grey-headed Flying-fox to decline.
i) Interfere substantially with the recovery of the species.	The Recovery Plan for the Grey-headed Flying-fox (*Pteropus poliocephalus*) (DAWE 2021) lists two recovery objectives for the species. These are: • To improve the Grey-headed flying-fox national population trend by reducing the impact of threatening processes on Grey-headed Flying-foxes through habitat identification, protection, restoration and monitoring, and; • To assist communities and Grey-headed flying-fox to coexist through better education, stakeholder engagement, research, policy and continued support to fruit growers. Other more specific actions are detailed in the plan that are not relevant to the Proposal. While the Proposal does not contribute to these actions, it does not substantially interfere with any recovery actions for this species, since removal is only of a small amount of potential foraging habitat. Therefore, the extent of impacts is not enough to interfere substantially with the recovery of the species.
Conclusion	Although the proposed action would result in the removal of potential foraging habitat, it is not likely to lead to a decline in the species or reduce the area of occupancy. Therefore, the Proposal would not have a significant impact on Grey-headed Flying-fox and as such, Referral to the Minister is not required.

The action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
References	Department of Agriculture, Water and Environment [DAWE] 2021. *National Recovery Plan for the Grey-headed Flying-fox 'Pteropus poliocephalus',* Department of Agriculture, Water and the Environment, Canberra. Parry-Jones, K. & G. Wardle 2004. *A sink or source? - The Grey-headed Flying-fox, Pteropus poliocephalus at an urban colony site*. Lumsden, L. & G. Ford, eds. 11th Australasian Bat Conference, Toowoomba 13th-16th April 2004, Program and Abstracts. Australasian Bat Society Newsletter.

Koala (*Phascolarctos cinereus)*

The Koala is listed as Endangered under both the BC and EPBC Act.

The action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
a) Lead to a long-term decrease in the size of a population	There are 420 records of Koalas within 10 kilometres of the Study Area with many in the reserves along the Georges River. There are three records along Bunbury Curran Creek in close proximity to the Study Area recorded between 2017 and 2023. Koalas were detected adjacent to the Study Area in November 2023 during the Arup field survey. There are no Koalas BioNet records within the Study Area, and none were identified during the current site surveys. The Proposal will remove 0.91 hectares of potential habitat for Koalas (PCTs 3321). Given the area of removal in relation to the abundance of suitable habitat in close proximity (contiguous vegetation to the west of Site 2 and mapped Koala habitat south of the site), it is unlikely that the proposal will lead to a long-term decrease in the size of the population.
b) Reduce the area of occupancy of the species	Up to 0.91hectares of potential Koala habitat will be removed for the Proposal. Koalas in the Locality are part of the South West Sydney Area of Regional Koala Significance (ARKS), however the Study Area does not support the key areas of habitat for this population as there is no Koala Habitat or Koala Habitat Restoration Mapping under the CPCP. Given the relatively small area of removal, and the extent of quality habitat in the Locality, it is unlikely to reduce the occupancy of this species in the area.
c) Fragment an existing population into two or more populations	Koalas in the Locality are part of the South West Sydney ARKS, which is considered one whole population. The area of removal (0.91 hectares) is a small area of potential habitat for Koalas and its removal would not fragment the existing population.
d) Adversely affect habitat critical to the survival of a species	Habitat critical to the survival of the Koala refers to area that are necessary: • For activities such as foraging, breeding, roosting, or dispersal; • for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • to maintain genetic diversity and long-term evolutionary development; or

The action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
	• for the reintroduction of populations or recovery of the species or ecological community. 0.91 hectares of potential habitat will be removed for the Proposal. While there are records in proximity to the Study Area and the Study Area is part of the South West Sydney ARKS, the removal of such a small amount of potential habitat is unlikely to affect habitat critical to the survival of the species.
e) Disrupt the breeding cycle of a population	The Proposal will be removing 0.91 hectares of potentially suitable habitat for Koala, which may contain breeding habitat for the species. However, the area of habitat being removed by the Proposal represents a small area of habitat compared to Locality surrounding the Study Area. Furthermore, no Koalas were identified on-site, during the current assessment, and the habitat removed by the Proposal is, therefore, unlikely to disrupt the breeding cycle of local Koala populations considering the Koala previously observed during Arup's survey are likely to be occupying the adjacent higher quality habitat.
f) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	While the Proposal will remove 0.91 hectares of habitat for the Koala, the habitat in the Study Area the habitat is low quality with strong edge effects evident given the exotic understorey. Therefore, given the removal of a small amount of habitat and the amount of quality habitat in the proximity to the Study Area, it is unlikely the Proposal will not decrease the availability or quality of habitat such that the species is likely to decline.
g) Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	The Proposal could result in the further spread of invasive plant species, impacting the foraging habitat for the species. However, the Study Area is already subject to a moderate level of disturbance due to exotic vegetation, and subsequently, the impacts of the Proposal on the spread of invasive species are minimal.
h) Introduce disease that may cause the species to decline	The Proposal is highly unlikely to introduce a disease that may cause a decline in Koala.
i) Interfere substantially with the recovery of the species.	A National Recovery Plan was prepared by the Department of Agriculture, Water, and the Environment (DAWE) in March 2022. The plan outlines three key objectives related to reversing population declines, increasing metapopulation processes and improving community and individual roles in Koala Conservation. The Proposal would not impede on these objectives, as no Koalas were discovered within the Study Area during the current assessment, and a comparatively small amount of potential habitat is to be removed (0.91 hectares) in compared to the habitat available in the Locality.
Conclusion:	Although the proposed action would result in the removal of potential habitat, it is not likely to lead to a decline in the species or reduce the area of occupancy. Therefore, the Proposal would not have a significant impact on the Koala and as such, Referral to the Minister is not required.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

The Large-eared Pied Bat is listed as Endangered under the EPBC Act and Vulnerable under the BC Act.

The action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
a) Lead to a long-term decrease in the size of a population	There are 2 records of Large-eared Pied Bats within 10 kilometres of the Study Area. The closest record occurs approximately 2 kilometres from the Study Area and was recorded in 2016. No Large-eared Pied Bats have been recorded within the Study Area, and none were identified during recent surveys. The Proposal will remove 1.20 hectares of potential habitat for the Large-eared Pied Bat. Given the small area of removal and the abundance of suitable habitat in close proximity, it is unlikely that the proposal will lead to a long-term decrease in the size of the population.

b) Reduce the area of occupancy of the species	No potential roosting or breeding habitat would be removed by the Proposal. A total of 1.20 hectares of potential foraging and dispersal habitat would be removed for the species. Habitat resources to be removed are general in nature and relatively widespread in the Locality. As such, the Proposal is not likely to reduce the area of occupancy of a population.
c) Fragment an existing population into two or more populations	The removal of foraging habitat from the Study Area would not fragment an existing population into two or more populations. A total of 1.20 hectares of potential foraging and dispersal habitat will be removed by the Proposal. No rocky habitat constituting roosting/breeding habitat for this species is present within the Study Area. The removal of potential foraging habitat is considered unlikely to lead to fragmentation of an existing population.
d) Adversely affect habitat critical to the survival of a species	Habitat critical to the survival of a species or ecological community' refers to areas that are necessary: • for activities such as foraging, breeding, roosting, or dispersal • for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development, or • for the reintroduction of populations or recovery of the species or ecological community. The proposed works would be removing up to 1.20 hectares of potential foraging habitat for the Large-eared Pied Bat. The loss of such a small amount of foraging habitat compared to foraging habitat in the Locality is unlikely to adversely affect habitat critical to the survival of the Large-eared Pied Bat.
e) Disrupt the breeding cycle of a population	The proposed works would not be removing any breeding habitat for the Large-eared Pied Bat. The Proposal may be removing 1.20 hectares of potential foraging habitat for Large-eared Pied Bat, however, the foraging habitat in the Study Area is a small amount of available foraging habitat in the vicinity. Therefore, it is unlikely the habitat to be removed would be essential breeding habitat of the species.
f) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The removal of a small area of habitat for the Large-eared Pied Bat would not decrease availability or quality of habitat such that the species is likely to decline
g) Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	The proposed works could result in further spread of invasive plant species, impacting foraging habitat for the species. However, the Study Area is already subject to a moderate level of disturbance due to exotic vegetation, and subsequently impacts by the proposed works on the spread of invasive species are minimal.
h) Introduce disease that may cause the species to decline	The proposed works are highly unlikely to introduce disease that may cause a decline in Large-eared Pied Bat
i) Interfere substantially with the recovery of the species.	While the proposed works would be removing foraging habitat of the Large-eared Pied Bat, the extent of impacts is not enough to interfere substantially with the recovery of the species
Conclusion:	The proposed action would not impact on an important population of Large-eared Pied Bat. Though the proposed action would result in the removal of potential habitat it is not likely to lead to a decline in the species or reduce the area of occupancy. Therefore, the proposed works would not have a significant impact on Large-eared Pied Bat and as such, Referral to the Minister is not required.

APPENDIX D TESTS OF SIGNIFICANCE (BC ACT)

Tests of significance have been prepared for all threatened species or ecological communities considered to have a moderate to high likelihood of occurrence in the Proposal area. Tests have been prepared in accordance with the *Threatened Species Test of Significance Guidelines* (OEH, 2018) and address the following five factors as required by section 7.3 of the BC Act:

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity

- (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,*

(c) in relation to the habitat of a threatened species or ecological community—

- (i) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*
- (ii) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
- (iii) *the importance of the habitat to be removed, modified, fragmented or isolated to the try long-term survival of the species or ecological community in the Locality,*

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Threatened ecological communities

The following threatened ecological community will be affected by the Proposal:

(a) Shale Sandstone Transition Forest in the Sydney Basin Bioregion, *Critically Endangered*

These TEC has been assessed using tests of significance (Section 7.3 of the *Biodiversity Conservation Act 2016*) and is presented below (Table 7-5).

Table 7-5 Test of significance: Threatened Ecological Communities. BC denotes the communities' listing under the Biodiversity Conservation Act 2016 (V: vulnerable, E: endangered, CE: critically endangered)

Factor	Threatened Ecological Community
	***Shale Sandstone Transition Forest in the Sydney Basin Bioregion,* (BC Act: CE)**
Ecological community information	Shale Sandstone Transition Forest in the Sydney Basin Bioregion is listed as Critically Endangered under the BC Act. The Shale Sandstone Transition Forest (SSTF) is known only within the Sydney Basin Bioregion, on the edges of the Cumberland Plain. SSTF occurs on soils that are derived from shale substrates and weathered sandstone substrates. SSTF primarily occurs where the Wianamatta Group shale underlying the Cumberland Plain grades into sandstone, mainly from the Hawkesbury Group, which dominates the surrounding elevated plateaux. SSTF generally occurs in areas receiving between 800mm and 1100mm mean annual rainfall and typically, it occurs at elevations less than 200 m Above Sea Level (ASL). Diagnostic species for SSTF include canopy species such as *Eucalyptus punctata* (grey gum), *E. crebra* (narrow-leaved ironbark) and *E. fibrosa* (broad-leaved ironbark), shrub species such as *Bursaria spinosa* and *Kunzea ambigua* and ground layer species including *Arista vagans, Microlaena stipoides* and *Themeda australis.* Based on the location and soil characteristics of the Proposal, the vegetation in areas mapped as PCT 3021 is most likely to fall within the definition of the Shale Sandstone Transition Forest CEEC.
Proposed impacts	The Proposal would remove up to 0.91 ha of PCT 3021, which is associated with the Shale Sandstone Transition Forest.
(a) Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction	Not applicable.
(b) Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction	According to the Threatened Species Test of Significance Guidelines (OEH 2018), the local occurrence of an ecological community is defined as the ecological community that occurs within the Study Area and may also include adjacent areas if the ecological community in the Study Area forms part of a larger contiguous area of that ecological community and functional connectivity across the boundary of the Study Area can be demonstrated. The removal of up to 0.91 ha of Shale Sandstone Transition Forest for the Proposal represents a reduction of less than 0.001% extent of the potential local occurrence of the community.

Factor	Threatened Ecological Community
	***Shale Sandstone Transition Forest in the Sydney Basin Bioregion,* (BC Act: CE)**
	The area to be removed is in an already modified condition, with evidence of invasive vegetation. The patch represents a small fraction of the estimated local occurrence of the community, and its removal is unlikely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction. The removal of up to 0.91 ha of Shale Sandstone Transition Forest is unlikely to substantially and adversely modify the composition of retained patches of the ecological community such that its local occurrence is likely to be placed at risk of extinction. The areas of TEC to be retained in adjoining areas are already modified from previous disturbance and are currently subject to weed invasion. While edge effects from the creation of new edges may result in some changes to the composition of retained patches in some areas, these are likely to be minimal given the extent of current disturbance. The Proposal will be removing up to 0.91 ha of Shale Sandstone Transition Forest which has potential to increase isolation from nearby patches and increase susceptibility to degradation through edge effects, invasion from invasive species and overall biodiversity value. However, due to the small area being removed by the Proposal it is unlikely that this endangered ecological community will be impacted such that the local occurrence of the community is placed at risk of extinction.
(c) In relation to habitat of a threatened species or community: *(i) extent to which habitat is likely to be removed or modified* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat* *(iii) importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community*	The Proposal would result in the clearing of up to 0.91 ha of Shale Sandstone Transition Forest. The impacts of removal of this area to the extent of the critically endangered ecological community (CEEC) is discussed above in the response to point. (i) The area of CEEC being removed by the Proposal amounts to around 0.91 ha of an already isolated patch of Shale Sandstone Transition Forest. The remnant patch to be impacted by the Proposal is in an already modified condition with presence of invasive flora species. (ii) The vegetation being removed by the Proposal is exclusive to the edge of the existing patch, so while the size of the patch will be reduced no further fragmentation will occur. It is therefore unlikely that the Proposal will exacerbate fragmentation or isolation. (iii) The removal of up to 0.91 ha of Shale Sandstone Transition Forest from the Study Area will impact patches that are already are exposed to severe edge effects with an entirely degraded understorey. The area of CEEC being removed by the Proposal comprises a very small portion of habitat in the Locality. It is therefore unlikely that the removal of the up to 0.91 ha of Shale Sandstone Transition Forest by the Proposal will impact the long-term survival of the CEEC in the area.
(d) Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for Shale Sandstone Transition Forest.
(e) Whether the Proposal *is or is part of a key threatening process or is likely to increase the impact of a key threatening process*	Schedule 4 of the BC Act provides a list of the 'key threatening processes' (KTPs). Of the KTPs listed in Part 4, Division 5 of the BC Act, several are applicable to the Proposal. Of those, the following are relevant to Shale Sandstone Transition Forest: • Removal of native vegetation - Native vegetation would be cleared for the Proposal, however the extent of vegetation to be removed represents a small area of the local occurrence of the CEEC. • Invasion of native plant communities by exotic perennial grasses – exotic perennial grasses are present throughout the Study Area. Including within the patch of Shale Sandstone Transition Forest. The Proposal may exacerbate the KTP by facilitating the spread of seeds or fragments of plant, via plants or contaminated topsoil. This could include area of Shale Sandstone Transition Forest, although it is noted that the patch of TEC in vicinity to the Proposal already have exotic flora present in the ground layer.

Factor	Threatened Ecological Community
	***Shale Sandstone Transition Forest in the Sydney Basin Bioregion,* (BC Act: CE)**
Conclusion	In light of the consideration of the above five factors, the Proposal is not likely to have a significant impact on the endangered ecological community Shale Sandstone Transition Forest, as: • The removal of up to 0.91 ha would have an adverse effect on the extent of the ecological community, but not such that its local occurrence is likely to be placed at risk of extinction; and • The proposed works would be impacting two small, isolated patches of CEEC that are already impacted by exotic weed species and fragmentation. The Proposal would not further fragment or isolate this patch of the CEEC, and impacts are constrained to a small area. Consequently, preparation of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is not required for impacts to this TEC.

Threatened fauna

Habitat loss resulting from removal of vegetation is anticipated to be the primary impact of the Proposal on threatened fauna. This impact includes removal of nine hollow-bearing trees, as well as 1.20 ha of native vegetation (PCT 3321 and planted native vegetation) which provide potential foraging resources for threatened fauna. Impacts of the Proposal on this threatened species have been assessed using tests of significance (Section 7.3 of the *Biodiversity Conservation Act 2016*) and are presented below (Table 7-6). Areas of habitat loss for each species have been calculated based on associated PCTs.

Mammals

Table 7-6 Test of significance: Threatened Fauna Species. BC denotes the communities' listing under the Biodiversity Conservation Act 2016 (V: Vulnerable, E: Endangered, CE: Critically Endangered)

Factor	Species
	Koala ***Phascolarctos cinereus* (BC Act: E) (high likelihood)**
Species information	The Koala is listed as Endangered under the BC Act and EPBC Act. There are 420 records of Koala within 10 kilometres of the Study Area, most of these along the Georges River which runs by within 500m of the Study Area. There are three records along Bunbury Curran Creek in close proximity to the Study Area recorded between 2017 and 2023. No Koalas have been recorded within the Study Area on BioNet, and none were identified during Arcadis surveys. Despite this in November 2023 a Koala was detected on site during the Arup site survey.
Proposed impacts	The Proposal will remove up to 0.91 hectares of potential habitat for Koala (PCTs 3321).
a. *Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction*	Up to 0.91 hectares of potential Koala habitat will be removed for the Proposal. Koalas in the Locality are part of the South West Sydney Area of Regional Koala Significance (ARKS), however the Study Area does not support the key areas of habitat for this population and is less than 0.0001% of the available habitat in the Campbeltown Local Government Area. Extent of occurrence is estimated at 15,225 ha (KPoM). Given the relatively small area of removal, and the extent of quality habitat in the Locality, it is unlikely to affect the life cycle of the Koala such that the local population is placed at risk of extinction due to the relatively small area of impact.
b. *Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not applicable.
c. *In relation to habitat of a threatened species or community:*	(i) The Proposal will remove up to 0.91 hectares of potential habitat for Koala (PCTs 3321). (ii) The habitat to be removed is of low quality and is connected to a larger contiguous patch of PCT 3321 which is of higher quality, west of Site 2, and to the East/South, therefore the removal of vegetation by the Proposal is unlikely to further isolate or significantly fragment existing habitat.

i. *extent to which habitat is likely to be removed or modified* ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat* iii. *importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community*	(iii) This foraging resource does not comprise a significant area of foraging habitat within the Study Area or the Locality. The small area of potential habitat to be removed is not likely to be important to the long-term survival of the Koala in the Locality.
d. *Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)*	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for Koala.
e. *Whether the* Proposal *is or is part of a key threatening process or is likely to increase the impact of a key threatening process*	Of the key threatening processes listed in Part 4, Division 5 of the BC Act, one is relevant to the potential impacts of the Proposal on Koala. • Clearing of native vegetation – up to 0.91 hectares of native vegetation that contains potential habitat for Koala would be cleared. This does not represent a significant area of habitat in the Locality.
Conclusion	The Proposal would require the removal of up to 0.91 hectares of habitat including several feed trees. The removal of this vegetation is unlikely to significantly impact the species as it would not fragment the local population, affect critical habitat, or interfere with the recovery of the species. The 0.91 hectares of potential foraging habitat to be cleared is not considered to be a significant area of habitat or of importance to the long-term survival of the Koala in the Locality. As a result, it is considered unlikely that the Proposal represents a significant impact to this vulnerable species. A Species Impact Statement is not required for this species.

Factor	Species
	Grey-headed Flying-fox *Pteropus poliocephalus* (BC Act: V) (high likelihood)
Species information	Grey-headed Flying-fox disperse nocturnally from daytime camps, where hundreds or thousands of flying foxes gather to roost in colonies. These camps are also where the species breed and creche young. Grey-headed Flying-fox forage mainly on flowering Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. Grey-headed Flying-fox have a feeding range of 20-50 kilometres, and adults migrate during winter up to 750 kilometres from their summer camps. Grey-headed Flying-fox have been recorded in high numbers within close proximity of the Study Area, with the nearest breeding camp located approximately 2.5 kilometres from the Study Area in Macquarie Fields (Camp ID: 9482, Category 3). No camps are located in the Study Area.
Proposed impacts	The removal of up to 1.20 ha of potential foraging habitat for Grey-headed Flying-fox. The Proposal will not be impacting roosting or breeding sites for this species.
(a) Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction	The Proposal would remove up to 1.20 ha of potential Grey-headed Flying-fox habitat, including multiple feed trees that may provide foraging habitat for the species. The extent of foraging habitat to be removed is considered minor given the availability of substantial areas of suitable habitat remaining in nearby areas. No Grey-headed Flying-fox camps were identified on site, therefore there will be no adverse effects on breeding and roosting sites for the species. It is unlikely that the Proposal would affect the life cycle of local Grey-headed Flying-fox populations such that the local population is placed at risk of extinction due to the relatively small area of impact.
(b) Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction	Not applicable.
(c) In relation to habitat of a threatened species or community: *(i) extent to which habitat is likely to be removed or modified* *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat* *(iii) importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community*	(i) The Proposal would remove up to 1.20 ha of potential foraging habitat, including several feed trees throughout the Study Area. (ii) The habitat to be removed comprise several small roadside remnants of several PCTs, which are already fragmented from nearby habitat due to extensive clearing of the surrounding landscape. Grey-headed Flying-foxes are highly mobile with large foraging ranges, therefore the Proposal is unlikely to further isolate or fragment existing habitat such that the species dispersal ability is impacted. (iii) This foraging resource does not comprise a significant area of foraging habitat within the Study Area or the Locality. The small area of potential habitat to be removed is not likely to be important to the long-term survival of Grey-headed Flying Fox in the Locality.
(d) Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for Grey-headed Flying-fox.

Factor	Species
	Grey-headed Flying-fox *Pteropus poliocephalus* (BC Act: V) (high likelihood)
(e) Whether the Proposal *is or is part of a key threatening process or is likely to increase the impact of a key threatening process*	Of the key threatening processes listed in Part 4, Division 5 of the BC Act, one is relevant to the potential impacts of the Proposal on Grey-headed Flying-fox. • Clearing of native vegetation – Up to 1.20 ha of vegetation, comprising potential foraging habitat for Grey-headed Flying-fox, would be cleared by the Proposal. This does not represent a significant area of habitat in the Locality.
Conclusion	The Proposal would require the removal of up to 1.20 ha of potential foraging habitat, including several feed trees. The removal of this vegetation is unlikely to significantly impact the species as it would not fragment the local population, affect critical habitat or interfere with the recovery of the species. The potential foraging habitat to be cleared is not considered to be a significant area of habitat or of importance to the long-term survival of the Grey-headed Flying-fox in the Locality. As a result, it is considered unlikely that the Proposal represents a significant impact to this vulnerable species. A Species Impact Statement is not required for this species.

Factor	Species
	Eastern False Pipistrelle *Falsistrellus tasmaniensis* (BC Act: V) (moderate likelihood) **Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (BC Act: V) (high likelihood)** **Little Bent-winged Bat *Miniopterus australis* (BC Act: V) (moderate likelihood)** **Southern Myotis *Myotis macropus* (BC Act: V) (high likelihood)** **Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (BC Act: V) (moderate likelihood)** **Greater Broad-nosed Bat *Scoteanax rueppellii* (BC Act: V) (moderate likelihood)**
Species information	Impacts to the above microbat species have been assessed in one test of significance due to the similarity in habitat requirements and potential impacts. Eastern False Pipistrelle prefers moist habitats, with trees taller than 20 metres and generally roosts in eucalypt hollows but has also been found under loose bark on trees or in buildings (Churchill 1998, OEH 2024a). The species has been recorded within 10 kilometres of the Study Area, most recently in 2022. Eastern Coastal Free-tailed Bat occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range (OEH 2024b). They roost primarily in tree hollows but will also roost under bark or in man-made structures. The species is usually solitary but also recorded roosting communally. They are most likely insectivorous. The species has been most recently recorded within 10 kilometres of Study Area in 2015. Little Bent-winged Bat has most recently been recorded within 10 kilometres of the Study Area in 2015. The species is found in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests, and banksia scrub; it is generally found in well-timbered areas. It roosts in maternity colonies within caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges (OEH 2024c). Only five nursery sites/maternity colonies are known in Australia. Southern Myotis has most recently been recorded within 10 kilometres of the Study Area in 2022. The species is found in vegetated habitats associated with streams and permanent waterways, most commonly at low elevations in flat or undulating terrain (Churchill 1998). Habitats include riparian vegetation and in mangroves, paperbark swamps, rainforest, wet and dry sclerophyll forest and open woodland (OEH, 2024d). Southern Myotis roosts near water in caves, mine shafts, tree hollows, under bridges and in buildings, stormwater drains, culverts and amongst dense vegetation fringing watercourses (Churchill 1998). Yellow-bellied Sheathtail-bat has most recently been recorded within 10 kilometres of the Study Area in 2015. It is found in a variety of habitat types including wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grassland, and desert. It roosts in tree hollows, abandoned sugar glider nests or animal's burrows (OEH 2024e). Greater Broad-nosed Bat has most recently been recorded within 10 kilometres of the Study Area in 2022. The species utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest (OEH 2024e). Although this species usually roosts in tree hollows, it has also been found in buildings. The Greater Broad-nosed Bat forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 to 6 metres. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species (OEH 2024f.)

Factor	Species
	Eastern False Pipistrelle *Falsistrellus tasmaniensis* (BC Act: V) (moderate likelihood) **Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (BC Act: V) (high likelihood)** **Little Bent-winged Bat *Miniopterus australis* (BC Act: V) (moderate likelihood)** **Southern Myotis *Myotis macropus* (BC Act: V) (high likelihood)** **Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (BC Act: V) (moderate likelihood)** **Greater Broad-nosed Bat *Scoteanax rueppellii* (BC Act: V) (moderate likelihood)**
Proposed impacts	The 1.20 hectares of native vegetation (PCTs 3321 and native planted vegetation) that could be removed by the Proposal may provide foraging habitat within woodland areas for Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, Southern Myotis, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat. The Proposal will be removing up to nine hollow bearing trees which may provide roosting habitats for these microbat species.
a. *Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction*	The Proposal may be impacting breeding habitat for the above species through the removal of the nine hollow-bearing trees. However, surrounding habitat is degraded such that it is unlikely a high proportion of local microbat populations would breed within the Study Area. Furthermore, no roosting or breeding sites were identified during the site inspection. It is not anticipated that impacts by the Proposal would impact the life cycle of any of the above microbat species such that local populations are placed at risk of extinction.
b. *Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not applicable.
c. *In relation to habitat of a threatened species or community:* i. *extent to which habitat is likely to be removed or modified* ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat* iii. *importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community*	i. The Proposal will be removing up to 1.20 hectares of native vegetation comprising PCTs 3321 and native planted vegetation. Up to nine hollow-bearing trees will also be removed that could provide potential roosting habitat for microbat species, although no microbat species were sighted, nor were there any signs of usage of these hollow-bearing trees. ii. The landscape surrounding the Study Area is of higher quality than the vegetation proposed to be removed by the works. As such the removal of vegetation exposed to a high level of edge effects with high weed incursions is unlikely to further isolate habitat as there is higher quality contiguous habitat surrounding the Study Area. iii. The small extent of habitat to be removed (1.20 hectares) is of low importance given the already modified and fragmented habitat within the Study Area. Furthermore, the extent of potential foraging habitat to be removed represents a minimal proportion of the overall available habitat within the greater surrounds. It is therefore unlikely that the removal of habitat for the Proposal is likely to affect the long-term survival of the species.
d. *Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)*	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for any of these threatened microbat species.
e. *Whether the* Project *is or is part of a key threatening process or is likely to increase the impact of a key threatening process*	Of the key threatening processes listed in Part 4, Division 5 of the BC Act, one is relevant to the potential impacts of the Proposal on the above microbat species. • Clearing of native vegetation – Up to 1.20 hectares of native vegetation containing potential foraging and dispersal habitat for threatened microbats would be cleared by the Proposal. This does not represent a significant area of habitat in the Locality.
Conclusion	The Proposal would require the removal of 1.20 hectares of potential habitat, including nine hollow bearing trees. While the Proposal may impact roosting and foraging habitat for Eastern False Pipistrelle, Eastern Coastal Free-tailed

Factor	Species
	Eastern False Pipistrelle *Falsistrellus tasmaniensis* (BC Act: V) (moderate likelihood) **Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (BC Act: V) (high likelihood)** **Little Bent-winged Bat *Miniopterus australis* (BC Act: V) (moderate likelihood)** **Southern Myotis *Myotis macropus* (BC Act: V) (high likelihood)** **Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (BC Act: V) (moderate likelihood)** **Greater Broad-nosed Bat *Scoteanax rueppellii* (BC Act: V) (moderate likelihood)**
	Bat, Little Bent-winged Bat, Southern Myotis, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat, the removal of this habitat is unlikely to significantly impact the species as it would not fragment the local population, affect critical habitat, or interfere with the recovery of the species. The potential habitat to be cleared is not considered to be a significant area of habitat or of importance to the long-term survival of threatened microbats in the Locality. As a result, it is considered unlikely that the Proposal represents a significant impact to these species. Species Impact Statements for these species are not therefore required.
References	Churchill, S. 2008. *Australian Bats*. Reed New Holland, Frenchs Forest. Office of Environment and Heritage [OEH] 2018. *Threatened Species Assessment Guidelines: The Assessment of Significance*. Office of Environment and Heritage, NSW. Office of Environment and Heritage [OEH] 2024a. *Eastern False Pipistrelle Threatened Species Profile.* Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10331 Office of Environment and Heritage [OEH] 2024b. *Eastern Coastal Free-tailed Bat Threatened Species Profile.* Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10544 Office of Environment and Heritage [OEH] 2024c. *Little Bent-winged Bat Threatened Species Profile.* Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10533 Office of Environment and Heritage [OEH] 2024d. *Southern Myotis Threatened Species Profile.* Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10549 Office of Environment and Heritage [OEH] 2024e. *Yellow-bellied Sheathtail-bat Threatened Species Profile*. Available from: http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10741 Office of Environment and Heritage [OEH] 2024f. *Greater Broad-nosed Bat Threatened Species Profile*. Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10748

Factor	Species
	Large Bent-winged Bat *Miniopterus orianae oceanensis* (BC Act: V) (high likelihood) **Large-eared Pied Bat *Chalinolobus dwyeri* (BC Act: V) (moderate likelihood)**
Species information	Impacts to the above microbat species have been assessed in one test of significance due to the similarity in habitat requirements and potential impacts. Large Bent-winged Bat occurs along the east coast of Australia. The species forages in forested areas and primarily roosts in caves but will also use a range of man-made structures. The species form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. The species has most recently been recorded within 10 kilometres of the Study Area in 2022. Large-eared Pied Bat frequents low to mid-elevation dry open forest and woodland in proximity to their roost sites in caves, crevices in cliffs, old mine working and in disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*). They remain loyal to the same cave over many years and are found in well-timbered areas containing gullies. The species has most recently been recorded within 10 kilometres of the Study Area in 2015.
Proposed impacts	Up to 0.91 hectares of potential foraging habitat (PCT 3321) for Large Bent-winged Bat and Large-eared Pied Bat will be removed for the Proposal. No natural breeding habitat suitable for these microbat species was located within the Study Area. Several old human-made structures represented potential roosting habitat for the Large Bent-winged Bat, however there were no signs of usage when investigated during the recent site inspection.
a. *Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction*	The removal of 0.91 hectares of PCT 3321 represent potential foraging habitat for the Large bent-winged Bat and Large-eared Pied Bat. The removal of this vegetation does not pose an adverse effect on breeding habitat, as both microbat species predominantly roost and breed within caves. Several old human-made structures (i.e. sheds, store rooms, etc) will be removed from the Study Area that represent potential roosting habitat for the Large Bent-winged Bat. However, no individuals were observed and nor were there any signs of occurrence within these structures during the site inspection. It is not anticipated that impacts by the Proposal would impact the life cycle of any of the above microbat species such that local populations are placed at risk of extinction.
b. *Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not applicable.
c. *In relation to habitat of a threatened species or community:* i. *extent to which habitat is likely to be removed or modified* ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat* ii. *importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community*	i. The Proposal will be removing up to 0.91 hectares of PCT 3321. This minimal extent of vegetation to be removed represents potential foraging habitat only, as neither species roost nor breed in hollow-bearing trees. ii. The landscape surrounding the Study Area is of higher quality than the vegetation proposed to be removed by the works. As such the removal of vegetation exposed to a high level of edge effects with high weed incursions is unlikely to further isolate habitat as there is higher quality contiguous habitat surrounding the Study Area. iii. The small extent of habitat to be removed of (0.91 hectares of PCT 3321) is of low importance given the already modified and fragmented habitat within the Study Area. Furthermore, the extent of potential foraging habitat to be removed represents a minimal proportion of the overall available habitat within the greater surrounds. It is therefore unlikely that the removal of habitat for the Proposal is likely to affect the long-term survival of the species.

Factor	Species **Large Bent-winged Bat *Miniopterus orianae oceanensis* (BC Act: V) (high likelihood)** **Large-eared Pied Bat *Chalinolobus dwyeri* (BC Act: V) (moderate likelihood)**
d. *Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)*	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for the large Bent-winged Bat or Large-eared Pied Bat.
e. *Whether the* Proposal *is or is part of a key threatening process or is likely to increase the impact of a key threatening process*	Of the key threatening processes listed in Part 4, Division 5 of the BC Act, one is relevant to the potential impacts of the Proposal on the above microbat species. • Clearing of native vegetation – Up to 0.91 hectares of PCT 3321 containing potential foraging and dispersal habitat for threatened microbats would be cleared by the Proposal. This does not represent a significant area of habitat in the Locality.
Conclusion	The Proposal would require the removal of 0.91 hectares of PCT 3321 which represent potential foraging habitat for both microbat species. The Proposal would not impact any natural areas of potential breeding and roosting habitat for either species. There are several human-made structures to be removed within the Study Area that could provide roosting habitat for the Large Bent-winged Bat, however there were no signs of usage when investigated during the recent site inspection. While the Proposal may impact foraging habitat for the Large Bent-winged Bat and Large-eared Pied Bat, the removal of this habitat is unlikely to significantly impact the species as it would not fragment the local population, affect critical habitat, or interfere with the recovery of the species. The potential habitat to be cleared is not considered to be a significant area of habitat or of importance to the long-term survival of threatened microbats in the Locality. As a result, it is considered unlikely that the Proposal represents a significant impact to these species. Species Impact Statements for these species are not therefore required.

Birds

Factor	Species
	Gang-gang Cockatoo *Callocephalon fimbriatum* (BC Act: V) (moderate likelihood) **Glossy Black-cockatoo (Calyptorhynchus lathami) (BC Act: V) (moderate likelihood)** **Little Lorikeet *Glossopsitta pusilla* (BC Act: V) (moderate likelihood)**
Species information	Impacts to the above hollow-dependent bird species have been assessed in one test of significance due to the similarity in habitat requirements and potential impacts. The Gang-gang Cockatoo is listed as Vulnerable under the BC Act. The Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes of NSW. The species favours old growth forest and woodland for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts (OEH 2024a). The species has most recently been recorded within 10 kilometres of the Study Area in 2006. The Little Lorikeet is listed as Vulnerable under the BC Act. The species is distributed widely from Cape York to South Australia and NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs. Little Lorikeet is hollow dependent, nesting in hollows with an approximate diameter of 3cm (OEH 2024b). The species has most recently been recorded within 10 kilometres of the Study Area in 2021. Glossy Black-Cockatoo is listed as Vulnerable under the BC Act. The Glossy Black-Cockatoo is uncommon but widespread throughout suitable forest and woodland habitats (OEH 2024c). In NSW, the species occurs from the coast inland to the southern tablelands and central western plains, with a small population in the Riverina. The Glossy Black-Cockatoo inhabits open forest and woodlands where stands of sheoak (Allocasuarina spp.) occur. The Glossy Black-Cockatoo feeds exclusively on the seeds of shoaks, taken from cones in living trees. Key food species on the coast and tablelands are Forest Sheoak and Black Sheoak, with some Scrub Sheoak (NSW Scientific Committee 2008). The species nests in hollows in living or dead eucalypts, commonly in a spout in a living tree, about 26 cm wide and up to 1.4 metres deep. The species has most recently been recorded within 10 kilometres of the Study Area in 2022. Remnant vegetation throughout the fragmented landscape within the Study Area may provide foraging habitat for the Little Lorikeet, Glossy Black-cockatoo and Gang-gang Cockatoo. Additionally there are tree hollows that could potential form nesting habitat.
Proposed impacts	Up to 1.20 hectares of potential foraging and breeding habitat (PCTs 3321 and native planted vegetation) for the Gang-gang Cockatoo, Glossy Black-cockatoo and Little Lorikeet will be removed within the Study Area, including nine hollow-bearing trees.
a. *Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction*	The Glossy Black-cockatoo, Gang-gang Cockatoo and Little Lorikeet are all hollow-dependent species for breeding. The Proposal will require the removal of nine hollow-bearing trees that contain several tree hollows of suitable size for both species to breed. However, no signs of hollow usage by these species were observed during site inspections. As such, it is unlikely that the impacts to a minimal extent of potential foraging and breeding habitat (1.20 hectares) would affect the lifecycle of these species such that a viable local population is placed at risk of extinction.

Factor	Species
	Gang-gang Cockatoo *Callocephalon fimbriatum* (BC Act: V) (moderate likelihood) **Glossy Black-cockatoo (Calyptorhynchus lathami) (BC Act: V) (moderate likelihood)** **Little Lorikeet *Glossopsitta pusilla* (BC Act: V) (moderate likelihood)**
b. *Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not applicable.
c. *In relation to habitat of a threatened species or community:* i. *extent to which habitat is likely to be removed or modified* ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat* iii. *importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community*	i. The Proposal will be removing up to 1.20 hectares of native vegetation comprising PCTs 3321 and native planted vegetation. This vegetation represents potential foraging and breeding habitat for these bird species. Up to nine hollow-bearing trees will also be removed that could provide potential roosting habitat for the Gang-gang Cockatoo, Glossy Black-cockatoo and Little Lorikeet, although no individuals were sighted, nor were there any signs of hollow usage for nesting. ii. The landscape surrounding the Study Area is of higher quality than the vegetation proposed to be removed by the works. As such the removal of vegetation exposed to a high level of edge effects with high weed incursions is unlikely to further isolate habitat as there is higher quality contiguous habitat surrounding the Study Area. iii. The small extent of habitat to be removed (1.20 hectares) is of low importance given the already modified and fragmented habitat within the Study Area. Furthermore, the extent of potential foraging habitat to be removed represents a minimal proportion of the overall available habitat within the greater surrounds. It is therefore unlikely that the removal of habitat for the Proposal is likely to affect the long-term survival of the species.
d. *Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)*	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for the Gang Gang-cockatoo, Glossy Black-cockatoo or Little Lorikeet.
e. *Whether the* Proposal *is or is part of a key threatening process or is likely to increase the impact of a key threatening process*	Of the key threatening processes listed in part 4, Division 5 of the BC Act, two are relevant to the potential impacts of the Proposal on the three bird species: • Clearing of native vegetation – Up to 1.20 hectares of native vegetation that contains potential foraging and nesting habitat would be cleared. This does not represent a significant area of habitat for either species in the Locality. • Loss of hollow-bearing trees – the Proposal will require the removal of nine hollow-bearing trees which could provide nesting habitat. However, no signs of hollow usage by either species were observed during the site inspection. Mitigation measures will ensure that pre-clearance surveys would identify any breeding or nesting activities by these species and as far as practical no breeding sites would be disrupted.
Conclusion	The Proposal would not remove, modify or further fragment or isolate a significant area of habitat for the Little Lorikeet, Glossy Black-cockatoo and Gang-gang Cockatoo. It would not impact the life cycle of any viable populations of the species. Therefore, the Proposal is unlikely to have a significant impact on either hollow dependent bird species. Consequently, a Species Impact Statement is not required to be prepared.
References	Office of Environment and Heritage [OEH] 2024a. *Gang Gang-cockatoo Threatened Species Profile*. Available from:https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10975

Factor	Species
	Gang-gang Cockatoo *Callocephalon fimbriatum* (BC Act: V) (moderate likelihood) **Glossy Black-cockatoo (Calyptorhynchus lathami) (BC Act: V) (moderate likelihood)** **Little Lorikeet *Glossopsitta pusilla* (BC Act: V) (moderate likelihood)**
	Office of Environment and Heritage [OEH] 2024b. *Little Lorikeet Threatened Species Profile*. Accessed from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20111 NSW Scientific Committee 2008. *Glossy Black-cockatoo Calyptorhynchus lathami: Review of Current Information in NSW*. Available from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/sc-glossy-black-cockatoo-calyptorhynchus-lathami-review-report.pdf?la=en&hash=7B9F0C51CE4288D0E59F19C8E2D374001C0BBEA7 Office of Environment and Heritage [OEH] 2024c. *Glossy Black-cockatoo Threatened Species Profile*. Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10140

Factor	Species
	Powerful Owl *Ninox strenua* (BC Act: V) (moderate likelihood) **Masked Owl *Tyto novaehollandiae* (BC Act: V) (moderate likelihood)**
Species information	Impacts to the above owl species have been assessed in one test of significance due to the similarity in habitat requirements and potential impacts. Powerful Owl is listed as Vulnerable under the BC Act. The species occurs along the east coast of Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. The species inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Powerful Owls require large tree hollows to nest. They will return to use the same nest hollow annually within a territory. Territories range in size depending on the quality the habitat, abundance of prey and nesting hollows from 400 hectares in high quality habitats to 4000 hectares in lesser quality habitats. During the day they will roost in densely foliaged trees often within gullies. The Powerful Owl preys on medium-sized arboreal gliders and possums. Birds and flying foxes also comprise an important part of their diet in different regions (OEH 2024a). The species has most recently been recorded within 10 kilometres of the Study Area in 2022. The Masked Owl is listed as Vulnerable under the BC Act. The Masked Owl is found throughout most of NSW, preferring dry eucalypt forests and woodlands as well as forested gullies for roosting and breeding. This species inhabits forests but also hunts along transitional habitats including the edges of roadsides. The diet includes arboreal and ground dwelling mammals. The Masked Owl requires large tree hollows to breed and occupy large territories ranging from 500 – 1000 hectares (OEH 2024b). The species has most recently been recorded within 10 kilometres of the Study Area in 2016. The fragmented remnant vegetation throughout the Study Area may provide foraging habitat for these owls. There are potentially suitable tree hollows for nesting within Site 1 vegetation, despite the weedy understorey. The owls were considered to have a moderate likelihood of occurrence within the Study Area.
Proposed impacts	Up to 1.20 hectares of potential foraging habitat (PCTs 3321 and native planted vegetation) for the Powerful Owl and Masked owl will be removed within the Study Area, as well as three hollow-bearing trees that contain hollows large enough for breeding purposes.
a. *Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction*	Hollow-bearing trees with hollows of suitable size for these owl species could potentially be removed for the Proposal. These owl species require large tree hollows to nest, often returning seasonally to the nest tree. During the site inspection these hollows were not observed to be inhabited by owls. The hollow-bearing trees that are to be removed occur in disturbed areas, which may reduce their suitability for owl nesting sites. Furthermore, mitigation measures will ensure that clearing activities would avoid breeding periods for these owl species, and that stagwatches will be conducted on suitable hollow-bearing trees. As such, it is unlikely that the impacts to open forest and remnant forest habitat would impact the life cycle of these species such that a viable local population is placed at risk of extinction.
b. *Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not applicable.

Factor	Species
	Powerful Owl *Ninox strenua* (BC Act: V) (moderate likelihood) **Masked Owl *Tyto novaehollandiae* (BC Act: V) (moderate likelihood)**
c. *In relation to habitat of a threatened species or community:* i. *extent to which habitat is likely to be removed or modified* ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat* iii. *importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community*	i. The area of potential habitat to be removed is located within a highly fragmented landscape. These species are highly mobile, with home ranges between 400-1450 hectares for the Powerful Owl and 500-1000 hectares for the Masked Owl. Given the mobility of these species, their large home ranges and the limited suitability of the study site, it is highly unlikely that the Proposal would result in the fragmentation or isolation of Owl habitat. Within the Study Area these owls may forage within remnants of open forest throughout the cleared landscape where prey species may nest, shelter or roost. The Proposal would require the removal of some areas of open woodland habitat which provide potential breeding and foraging habitat for these prey species. ii. There are limited mature trees with hollows large enough to provide nesting habitat for these Owl species. Hollow bearing trees and remnant vegetation are to be retained where possible. If hollows are identified as being used by these species during stagwatch activities, it is likely these trees will be retained. iii. As these owl species are highly mobile, their habitat is not likely to become fragmented or isolated from other areas of habitat as a result of the Proposal.
d. *Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)*	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for Powerful Owl or the Masked Owl.
e. *Whether the* Proposal *is or is part of a key threatening process or is likely to increase the impact of a key threatening process*	Of the key threatening processes listed in Part 4, Division 5 of the BC Act, two are relevant to the potential impacts of the Proposal on the above owl species. • Clearing of native vegetation – Up to 1.20 hectares of fragmented habitat would be cleared which provides potential habitat for the Powerful and Masked Owls. This minimal extent represents a small area of available habitat within the vicinity, particularly when taking both species' large home ranges into consideration. • Removal of tree hollows – up to three large tree hollows, suitably sized for owl nest trees, are to be removed for the Proposal. The removal of trees with suitable hollows will reduce the potential breeding habitat within the area. However, if hollow usage by these species are identified during pre-clearing surveys, the nest tree will be retained. No clearing activities will be conducted during the breeding season.
Conclusion	The Proposal will require the removal of up to 1.20 hectares of potential foraging habitat for these threatened owl species, as well as hollows that are of potentially suitable size for breeding. The minimal extent of native vegetation to be removed (1.20 hectares) is not considered to be a significant area of foraging habitat or of importance to the long-term survival of the two species in the Locality. The removal hollow-bearing trees with potentially suitable hollows does signify a potential impact on the availability of suitable breeding habitat, although mitigation measures will determine if these hollows are being used for breeding through stag watches, and clearing activities will not occur during the owls' breeding seasons. Therefore, it is not anticipated that the Proposal would impact the life cycle of the Owl species as such a local viable population of the species are placed at risk of extinction as a result of the minimal vegetation removal. Therefore, the Proposal is unlikely to have a significant impact on either threatened owl species. Consequently, Species Impact Statements are not required to be prepared for these species.
References	Office of Environment and Heritage [OEH] 2024a. *Powerful Owl Threatened Species Profile*. Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10562 Office of Environment and Heritage [OEH] 2024b. *Masked Owl Threatened Species Profile*. Available from: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10820

Factor	Species
	Cumberland Plain Land Snail *Meridolum corneovirens* (BC Act: E) (moderate likelihood)
Species information	Cumberland Plain Land Snail (CPLS) is listed as Endangered under the BC Act. CPLS inhabits Cumberland Plain Woodland. This community is a grassy, open woodland with occasional dense patches of shrubs. It is also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest. CPLS lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish. Little is known of its biology, including breeding biology, however is known to lay eggs in moist, dark areas (such as under logs). The species has most recently been recorded within 10 kilometres of the Study Area in 2022. CPLS is considered to have a moderate likelihood of occurrence within the Study Area.
Proposed impacts	Up to 1.20 hectares of potential habitat (PCTs 3321 and native planted vegetation) for the CPLS will be removed within the Study Area.
a. *Likelihood of an adverse effect on the life cycle of a threatened species such that a viable local population is likely to be placed at risk of extinction*	A total of 1.20 hectares of native vegetation (PCT 3321 and native planted vegetation) will be removed by the Proposal. The area of vegetation to be removed could provide potential foraging, sheltering and breeding habitat to this species. There is a low likelihood that the life cycle of Cumberland Plain Land will be impacted by the proposed works Foraging, sheltering and breeding habitat is limited and degraded within the patch of vegetation to be removed. There is a lack of course wood debris, leaf litter and piled bark habitat for this species to exploit. The ground stratum is largely dominated by exotic grasses and herbaceous weed which reduced the habitat suitability to this species. The proposal is therefore unlikely to place a viable local population at risk of extinction.
b. *Likelihood of an adverse effect on the extent or composition of an endangered or critically endangered ecological community such that its local occurrence is likely to be placed at risk of extinction*	Not applicable.
c. *In relation to habitat of a threatened species or community:* i. *extent to which habitat is likely to be removed or modified* ii. *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat* iii. *importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community*	i. The proposal would result in the removal of up to 1.20 hectares of potential habitat for Cumberland Plain Land Snail. This habitat is only likely to support a low number of individuals that occupy a large area, including a range of other habitats within the Locality. The removal of such a small amount of potential habitat would have a minimal impact on the area of occupancy of the species. ii. The removal of 1.20 hectares of potential habitat from the Study Area would not result in a significant reduction in habitat connectivity for the species in the region. The similar habitat surrounding the Study Area is unlikely to become isolated or fragmented for Cumberland Plain Land Snail. iii. The small area of potential habitat to be removed is not likely to be important to the long-term survival of the Cumberland Plain Land Snail in the Locality.

d. *Likelihood of an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)*	A review of the Register of Declared Areas of Outstanding Biodiversity Value (AOBV) found that no AOBV have been declared for Cumberland Plain Land Snail.
e. *Whether the* Proposal *is or is part of a key threatening process or is likely to increase the impact of a key threatening process*	Of the key threatening processes listed in Part 4, Division 5 of the BC Act, two are relevant to the potential impacts of the Proposal on Cumberland Plain Land Snail: • Clearing of native vegetation – up to 1.20 hectares of native vegetation that contains potential breeding and foraging habitat for Cumberland Plain Land Snail would be cleared for the proposal. This does not represent a significant area of habitat for this species in the Locality.
Conclusion	The Proposal would require the removal of 1.20 hectares of potential habitat for the Cumberland Plain Land Snail. The removal of this vegetation is unlikely to significantly impact Cumberland Plain Land Snail as it would not fragment the local population, affect critical habitat or interfere with the recovery of the species.