

Kurnell Terminal SSD-5544 Modification 7

Appendix I – Updated Biodiversity Development Assessment Report (Rev 2)

FINAL REPORT

Prepared for AECOM

19 March 2026

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- Henri Liswoyo (mapping).
- Mitchell Palmer (quality assurance).

Biosis acknowledges the Aboriginal and Torres Strait Islander peoples as Traditional Custodians of the land on which we live and work.

We pay our respects to the Traditional Custodians and Elders past and present and honour their connection to Country and ongoing contribution to society.

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Certification and declarations

I certify that this report has been prepared based on the requirements of, and information provided under the Biodiversity Assessment Method (DPIE 2020a) and s6.15 of the *Biodiversity Conservation Act 2016*.

In preparing this assessment I have acted in accordance with the Accredited BAM Assessor Code of Conduct.

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest

Signature:

Mitchell Palmer

Date:

19/03/2026

**BAM Assessor Accreditation
Number:**

BAAS17051

Executive Summary

The proposed modification

The Kurnell Terminal ('the Site') is located on the southern side of Botany Bay, in Kurnell, New South Wales (NSW) (Figure 1-1). In 2012, Ampol Refineries (NSW) Pty Ltd (Ampol) decided that the oil refinery and fuel terminal would be converted to a finished product terminal (the approved project), ceasing refinery operations in 2014.

Development consent was received to complete the approved project under State Significant Development (SSD) application reference 5544 (SSD-5544). Ampol has modified SSD-5544 six times to facilitate the conversion and demolition works.

Currently, the operational infrastructure is primarily located in the northern part of the Site (Zones 1 and 1A, as shown in Figure 1-1). Other parts of Ampol's landholdings at Kurnell include largely vacant areas of previously developed land (Zones 2 and 3) and areas of undeveloped land containing extensive native vegetation (Zones 4 and 5).

Ampol intends to consolidate operational infrastructure, remove redundant assets, and undertake remediation. Completion of these works (the proposed modification, MOD-7) would continue the viable, safe, reliable, and sustainable operation of the Kurnell Terminal. The location within the Site that these works would occur is referred to as the Project Area.

A Modification Report was prepared to support a modification application to SSD-5544 and was placed on public exhibition for 23 days from Thursday 10 July 2025 until Friday 1 August 2025 in accordance with the EP&A Act.

The BDAR for the proposed modification was one of a number of technical documents that formed part of the Modification Report and was required in accordance with the NSW Biodiversity Assessment Method (BAM) and the NSW Biodiversity Conservation Act 2016 (BC Act). The BDAR was prepared by Accredited Assessor Mitchell Palmer of Biosis Pty Ltd (BAAS17051), to accompany the Modification Report and describes the outcome of the modification's development assessment case (00046963). The BDAR was originally set up and prepared by Matthew Hyde of Biosis Pty Ltd (BAAS22005). Due to the expiration of Matthew Hyde's accreditation part way through this BDAR, Mitch Palmer was added as a case party and subsequently finalised the BAM-C calculations and certified this report.

This Updated BDAR has been amended to address submissions received by the NSW Department of Planning, Housing, and Infrastructure (DPHI) and the Conservation Programs, Heritage and Regulation (CPHR) Group of the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) during the exhibition of the Modification Report and refinements to the proposed modification. It has been prepared to support the Submissions Report.

The Project Area

The subject land for the BDAR (Figure 1-5) is defined as the Project Area covered by the Modification Report. The development footprint (Figure 1-5) is the area of direct impact associated with the proposed modification, which is restricted to largely vacant areas of previously developed land (Zones 2 and 3), as well as several discrete locations in operational areas of the northern part of the Site (Zone 1 and Zone 1A) (Figure 1-2).

Included within Zone 1 is the firewater system (FWS) Relocation Area. Two indicative sites within the FWS Relocation Area have been considered for the relocation of the FWS storage tank and pumps (Option 1 and Option 2), with specific siting to be selected during detailed design.

A new pump station and emergency storage tank would be located in Zone 2. Two indicative sites have been considered in the south of Zone 2 (Option 1 and Option 2), with specific siting to be selected during detailed design.

Field investigation, undertaken in accordance with the BAM, recorded 5.23 hectares of native vegetation within the subject land. This vegetation was primarily present in low or regenerating conditions and was not consistent with any Threatened Ecological Communities (TECs) listed under the BC Act or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Beyond the subject land, the Kurnell Peninsula supports large tracts of intact native vegetation that comprise the Kamay Botany Bay National Park and the Towra Point Nature Reserve. The Towra Point Nature Reserve supports the largest wetlands of its type in the greater Sydney region which are also listed as a Ramsar site (Towra Point Estuarine Wetlands). These wetlands represent important habitat for migratory shorebirds. The Towra Point Nature Reserve is also connected to the Towra Point Aquatic Reserve, which is one of the largest in NSW, covering an area of approximately 1,400 hectares and divided into a marine refuge zone and a marine sanctuary zone.

Avoidance and minimisation of impacts

The proposed modification avoids impacts to the important biodiversity values located on the Kurnell Peninsula by restricting the proposed works to the footprint of the existing Kurnell Terminal, which was originally constructed in 1956. Vegetation within the development footprint primarily consists of exotic grass/turfed and exotic vegetation areas around the existing facilities, with highly modified wetland vegetation occurring within concreted 'pipeways' within the existing terminal infrastructure. One larger 3.13 hectare patch of regenerating and low condition Plant Community Type (PCT) 3545 Coastal Sand Bloodwood Low Forest would be impacted in the southern corner of the development footprint, within Zone 3 (Figure 1-2). This area has been historically cleared and, whilst regenerating, is highly impacted by exotic weeds, particularly Lantana *Lantana camara*. This regenerating vegetation is also the location of historic asbestos contamination. Ground remediation is proposed as part of the proposed modification. As such, the clearing of regenerating and low condition vegetation at this location is unavoidable.

Consideration has been given to avoiding and minimising impacts to biodiversity, where possible, during the assessment. Mitigation and management measures would be put in place to adequately address impacts associated with the proposed modification, including direct, indirect, and prescribed impacts.

Residual biodiversity impacts

Targeted surveys undertaken as part of the current assessment resulted in the detection of three threatened species. Species detected were:

- Latham's Snipe *Gallinago hardwickii* (Vulnerable, EPBC Act and BC Act)
- Southern Myotis *Myotis macropus* (Vulnerable, BC Act)
- Giant Dragonfly *Petalura gigantea* (Endangered, BC Act)

Giant Dragonfly is a species considered at risk of Serious and Irreversible Impact (SAIL). As such an assessment of potential SAIL for this species has been completed in accordance with Section 9.1 of the BAM and is detailed in Section 8 and included in Annexure E of this BDAR.

Species polygons for Southern Myotis and Giant Dragonfly have been created due to the presence of habitat for these species within the development footprint. Species credits are required to offset these areas. A species polygon for Latham's Snipe has not been generated as guidance for this species is not currently available in BioNet (profile not complete) and the species is not able to be added to the NSW BAM Calculator (BAM-C) as either an ecosystem credit species or species credit species. It is assumed that the species is likely to share similar habitat requirements to the other migratory species for which important habitat mapping has been identified under the BAM. A SIC assessment for Latham's Snipe has been conservatively completed for low-grade habitats associated with human-made features within the development footprint (i.e., pipeways) and is included in Annexure F. This assessment determined that a significant impact for this species would not occur as a result of the proposed works.

As the vegetation integrity (VI) score of the vegetation to be impacted was calculated as being ≥ 20 , in accordance with Section 10 of the BAM, ecosystem credit offsets are also required to be secured for the proposed modification. The calculated offset credit obligation is:

- 5 ecosystem credits for impacts to 0.35 ha of PCT 3545 in low condition.
- 62 ecosystem credits for impacts to 4.37 ha of PCT 3545 in regenerating condition.
- 8 ecosystem credits for impacts to 0.51 ha of PCT 3972 in modified condition.
- 90 species credits for impacts to 4.85 ha of Southern Myotis habitat.
- 97 species credits for impacts to 3.44 ha of Giant Dragonfly habitat.

The calculated credit obligation above would need to be satisfied prior to the proposed modification taking place. The proposed modification is seeking a staged approach to the retirement of the biodiversity credit liability. A breakdown of the proposed staging of the credit offset retirement is included in Section 9.1.3.

The proposed modification is not considered likely to result in a significant impact to species or communities listed under the EPBC Act, and as such, a referral to the Minister for the Environment and Water is not required.

Stage 1 – Biodiversity assessment

1 Introduction

1.1 Overview

The Kurnell Terminal (‘the Site’) is located on the southern side of Botany Bay, in Kurnell, New South Wales (NSW) (Figure 1-1). In 2012, Ampol Refineries (NSW) Pty Ltd (Ampol) decided that the oil refinery and fuel terminal would be converted to a finished product terminal (the approved project), ceasing refinery operations in 2014.

Development consent was received to complete the approved project under State Significant Development (SSD) application reference 5544 (SSD-5544). Ampol has modified SSD-5544 six times to facilitate the conversion and demolition works.

Currently, the operational infrastructure is primarily located in the northern part of the Site (Zones 1 and 1A, as shown in Figure 1-1). Other parts of Ampol’s landholdings at Kurnell include largely vacant areas of previously developed land (Zones 2 and 3) and areas of undeveloped land containing extensive native vegetation (Zones 4 and 5).

Ampol intends to consolidate operational infrastructure, remove redundant assets, and undertake remediation. Completion of these works (the proposed modification, MOD-7) would continue the viable, safe, reliable, and sustainable operation of the Kurnell Terminal. The location within the Site that these works would occur is referred to as the Project Area.

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This Updated Biodiversity Development Assessment Report (BDAR) was one of a number of technical documents that formed part of the Modification Report. This Updated BDAR has been amended to address submissions received by the NSW Department of Planning, Housing, and Infrastructure (DPHI) and the Conservation Programs, Heritage and Regulation (CPHR) Group of the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) during the exhibition of the Modification Report and refinements to the proposed modification. It has been prepared to support the Submissions Report.

This BDAR has been prepared in accordance with the NSW *Biodiversity Assessment Method* (BAM) and the NSW *Biodiversity Conservation Act 2016* (BC Act). This BDAR has been prepared by Accredited Assessor Mitchell Palmer of Biosis Pty Ltd (BAAS17051) and describes the outcome of the modification’s development assessment case (00046963). The BDAR was originally set up and prepared by Matthew Hyde of Biosis Pty Ltd (BAAS22005). Due to the expiration of Matthew Hyde’s accreditation part way through this BDAR, Mitch Palmer was added as a case party and subsequently finalised the BAM-C calculations and certified this report.



Legend

- Site Boundary
- Ampol Ownership
- Project Area
- Former Refinery Area
- Operational Fuel Terminal
- Undeveloped Land
- Watercourse
- Primary Road
- Local Road



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Figure 1-1 Ampol Kurnell Terminal (the Site)

1.2 The proposed modification

1.2.1 Key elements of the proposed modification

To support the viable, safe, reliable, and sustainable operation of the Kurnell Terminal, the proposed modification works involve:

- **Stage 1 – Preparation works:** Preparing the Project Area for proposed modification works.
- **Stage 2 – Removal, relocation and/or augmentation of infrastructure,** including:
 - Relocation and/ or augmentation of firewater systems (FWS) and oily water sewer (OWS) systems and construction of new operational facilities, including three replacement warehouses in Zone 1 and 1A.
 - Decommissioning and removal of non-operational assets, redundant structures and electrical assets.
- **Stage 3 – Remediation:** Addressing legacy ground contamination in specific locations across the Site.
- **Stage 4 – Demobilisation:** Demobilisation of construction and remediation equipment.

Depending on where different works are required across the Site, these stages may be completed sequentially or concurrently.

A summary of project elements requiring modification and how they relate to the approved project is provided in Table 1-1. Infrastructure to be removed is presented in Figure 1-2, whilst infrastructure to be relocated or upgraded is presented in Figure 1-3. The proposed modification works should be undertaken within the Project Area.

All activities would adhere to the Kurnell Terminal permit to work system to ensure compliance with environmental and safety protocols.

Table 1-1 Modified project summary table

Stage	Element	Approved project	Modified project
Stage 1	Project Area	Project Area delineation	<ul style="list-style-type: none"> • Prepare the Project Area for the proposed modification works required under Stages 2 and 3 and exclude other parts of the Site from workers involved in the works as required.
Stage 2	Oily water sewer (OWS)	Maintain location in Zones 2 and 3	<ul style="list-style-type: none"> • Divert surface water runoff from potentially contaminated areas in Zone 2 to OWS in Zone 1 via new OWS interception pits/ lines until Stage 3 remediation is complete. • Divert potential leachate from Asbestos Contaminated Soils (ACS) Containment Cell in Zone 2 to Zone 1 OWS system. • Install one new pump station and emergency storage tank adjacent to the ACS Containment Cell. Two indicative site options have been identified (refer to Figure 1-3) with specific siting to be selected during detailed design. • Once Stage 3 remediation is complete in each specified area, isolate and remove all redundant OWS infrastructure from identified areas in Zone 2 and

Stage	Element	Approved project	Modified project
			Zone 3. Where complete removal is not feasible, existing pipes would be left in-situ.
	Fire-water systems (FWS)	Maintain location in Zones 1, 2 and 3	<ul style="list-style-type: none"> • Augment FWS infrastructure in Zone 1 and the centre of Zone 2. • Excavate and install footings for the new firewater tank, pumphouse, and pipelines. • Construct a new firewater tank and pumphouse within the FWS Relocation Area. Two indicative site options have been identified (refer to Figure 1-3) (specific siting to be selected during detailed design). • Connect relocated firewater tank and pumphouse to existing FWS via new pipework. • Commission new firewater tank, pumphouse, and pipework to confirm operation of amended FWS. • Isolate and remove redundant FWS infrastructure from Zones 2 and 3 when appropriate.
	Electrical assets	Maintain location in Zone 2 and 3	<ul style="list-style-type: none"> • Isolate and remove redundant electrical assets in Zones 2 and 3, including five substations.
	Structures	Maintain location in Zone 2 and 3	<ul style="list-style-type: none"> • Construct new 'fit for purpose' warehouse to house maintenance supplies and activities in Zone 1. • Construct new Oil Spill Equipment Storeroom within Zone 1. • Construct new storage shed to house boats and emergency aquatic spill response equipment in Zone 1A. • Demolish identified structures in Zones 2 and 3.
Stage 3	Remediation	Removal of ACS from pipeways and either containment onsite or offsite disposal	<ul style="list-style-type: none"> • Remediate land in Zone 1 to reduce operational site safety risks (refer to Figure 1-4). • If required, remediate land in Zone 1 where infrastructure is proposed to be relocated or augmented. • Undertake targeted remediation in Zones 2 and 3 (refer to Figure 1-4). • Return excavated areas to existing ground levels, with the exception of RPIP Mountain, which would be regraded.
Stage 4	Demobilisation	Demobilisation of construction equipment.	<ul style="list-style-type: none"> • Demobilisation of construction and remediation equipment.

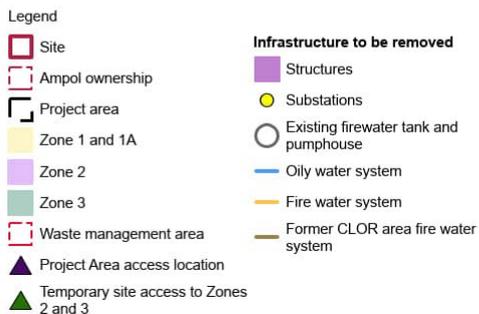


Figure 1-2 The proposed modification – Infrastructure to be removed (Stage 2)

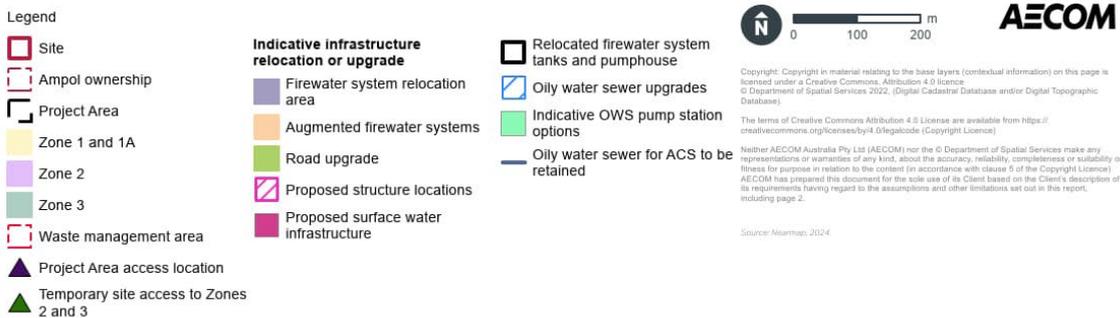
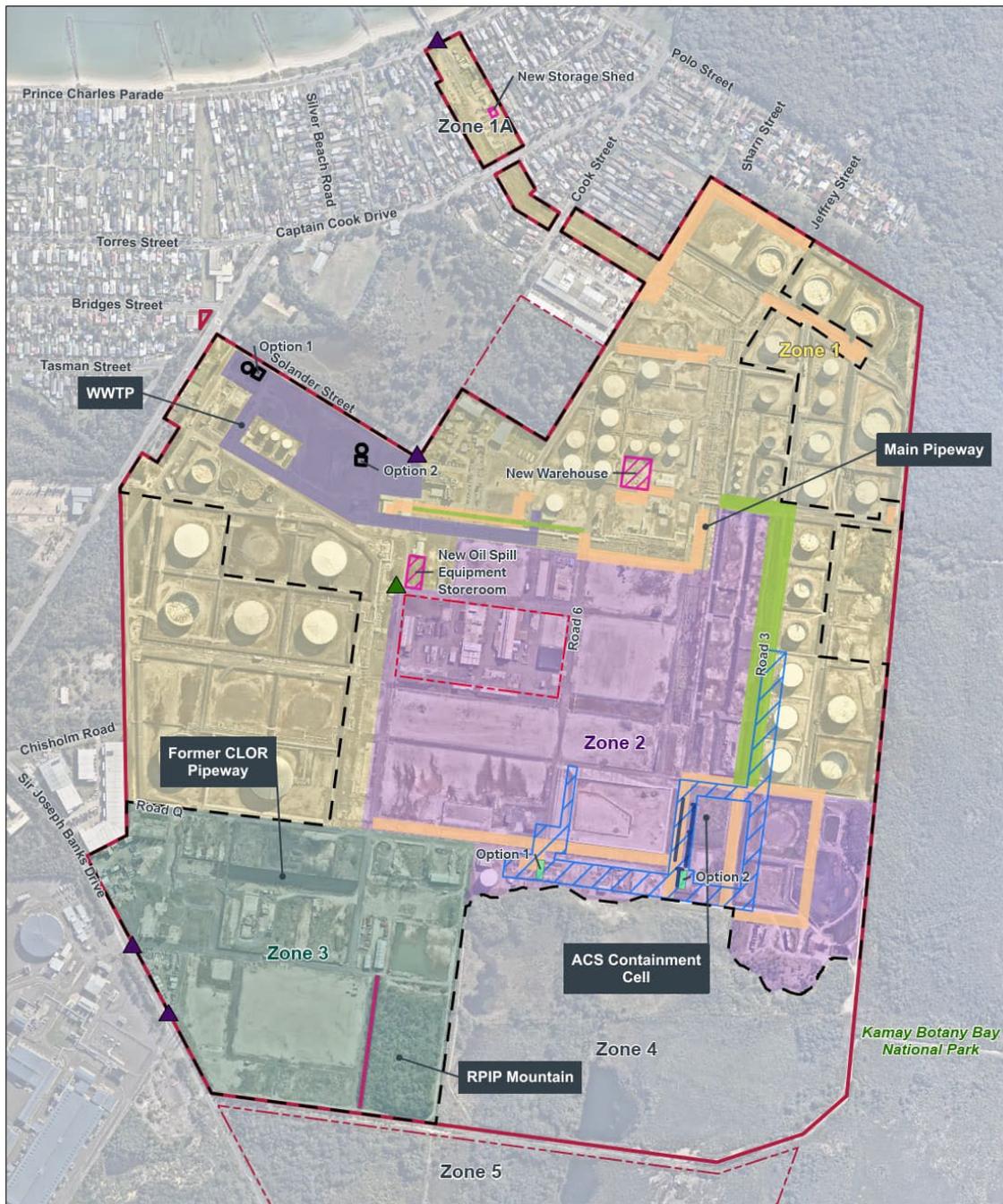


Figure 1-3 The proposed modification - Infrastructure to be relocated/ upgraded (Stage 2)

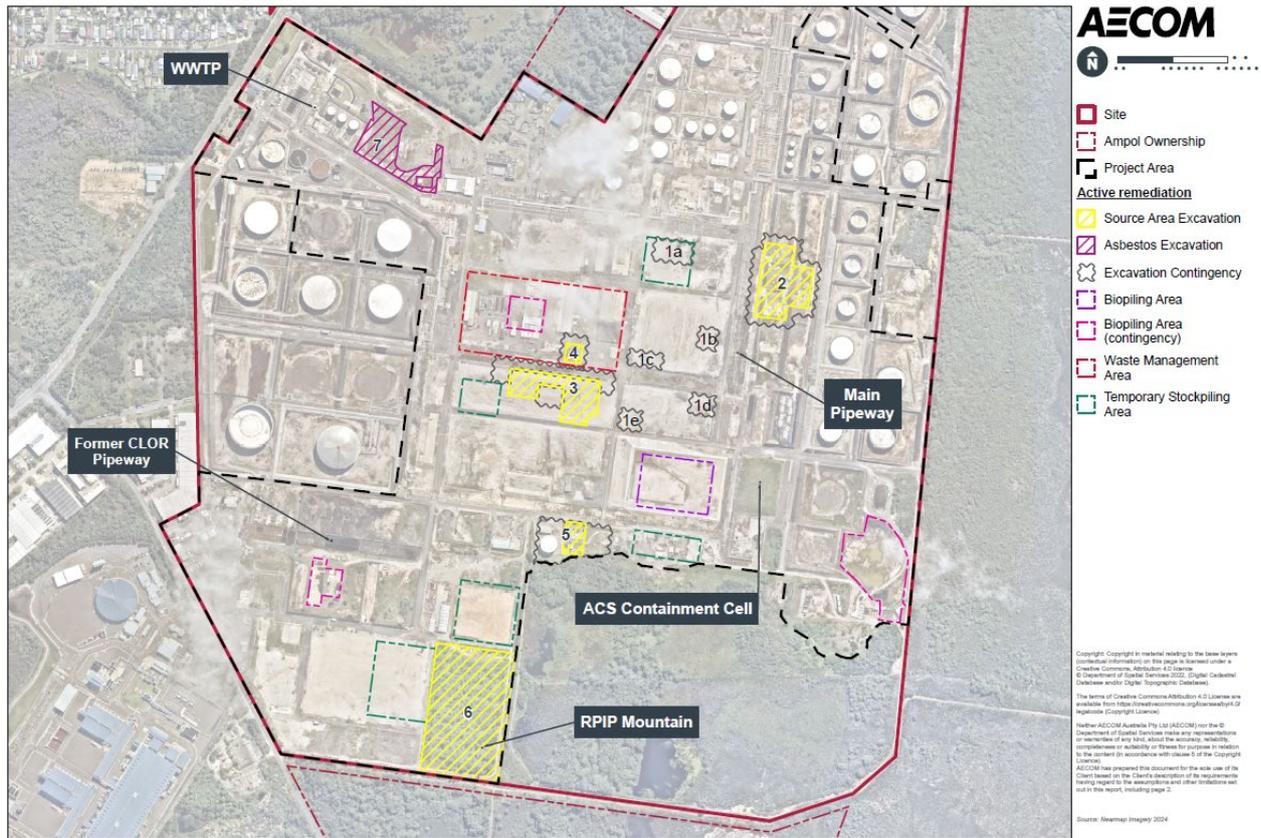


Figure 1-4 Targeted remediation activities (Stage 3)

Once the modification works are complete, the Site would continue to operate as described in the approval documentation for the approved project and would be consistent with the development consent for SSD-5544.

In line with Figure 1-3, relocated equipment would operate in the new locations.

1.2.2 Construction timeline and equipment

Works would be staged in accordance with the indicative program in Table 1-2. Construction and remediation are anticipated to commence in 2026 and be completed by 2030.

In line with the Interim Construction Noise Guideline (ICNG), construction works would comply with the following hours:

- Monday to Friday – 7 am to 6 pm.
- Saturday – 8 am to 1 pm.
- Sunday and public holidays – No work is permitted.

Construction works outside of the work hours identified above would only be undertaken in the following circumstances (in line with Condition C20):

- Works that are inaudible at nearest sensitive land receivers.
- Works that are consistent with Ampol's existing maintenance procedures and are in accordance with Environment Protection Licence (EPL) 837.
- Works agreed to in writing by the Environment Protection Authority (EPA) or the Department of Planning, Housing, and Infrastructure (DPHI).
- For the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons.
- Where it is required in an emergency to avoid the loss of lives, property and/ or to prevent environmental harm.

In addition, the following activities may be required on a 24-hour basis to support construction activities:

- Biopiling blowers in identified Biopiling and Stabilisation Areas (see Figure 1-4).
- Dewatering of excavations. Dewatering would only occur at night in locations where plant would not exceed night-time limits, i.e.:
 - Where it is located a minimum of at least 200 m within the Site boundary; or
 - Where it is located a minimum of 120 m within the Site boundary if temporary noise barriers are positioned as near as practicable to the pumps, and monitoring confirms that nighttime noise limits are not exceeded.

Plant and equipment that would be used to deliver the modification works is shown in Table 1-3.

Table 1-3 Indicative plant and equipment

Plant/ equipment	Maximum number of plant and equipment required per day		
	All stages except Stage 3		Stage 3 (Remediation) only
	Zones 1, 2, and 3	Zone 1A	
Front end loader	6	2	6
Excavator	-	2	6
Excavator (including large hydraulic hammer)	6	-	-
Dump truck	6	2	6
Grader (up to 7 m blade)	2	1	4
Large crane (60 t)	4	1	-
Elevated work platform	6	4	-
Franna crane (30 t)	6	1	-

Plant/ equipment	Maximum number of plant and equipment required per day		
	All stages except Stage 3		Stage 3 (Remediation) only
	Zones 1, 2, and 3	Zone 1A	
Cement truck	6	2	-
Bobcat	6	2	2
Water cart	6	2	6
Concrete crusher	1	-	-
Telehandler	6	-	-
Truck and dog (offsite disposal)	6	6	6
Truck and dog (imported fill)	-	6	12
Generator	2	1	2
Biopiling blower	-	-	8
Dewatering pump	6	-	6

1.3 Purpose of this report

This Updated BDAR is one of a number of technical documents that forms part of the Submissions Report. The purpose of this report is to apply the NSW Biodiversity Assessment Method (BAM) (DPIE 2020a) to the proposed modification, and assess the potential impacts on biodiversity. Specifically, the Updated BDAR will:

- Address the BAM (DPIE 2020a) and the Biodiversity Offset Scheme (BOS).
- Identify how the proponent has avoided and minimised impacts to biodiversity.
- Identify any potential impacts that could be characterised as serious and irreversible.
- Describe the offset obligations required to compensate for any unavoidable biodiversity impacts resulting from the proposed modification.
- Consider and assess the proposed modification in accordance with other relevant legislation such as the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW *Biodiversity Conservation Act 2016* (BC Act).

1.4 Response to submissions

The Modification Report and accompanying BDAR were exhibited from 10 July 2025 to 1 August 2025. Submissions were received by agencies, including the Conservation Programs, Heritage and Regulation (CPHR) Group of NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW). A summary of the BDAR specific responses is provided in Table 1-4, along with the actions undertaken to update this Updated BDAR to support the Submissions Report.

Table 1-4 Response to submissions – CPHR

Item	Agency	Summary of Agency comments	Updates requirement/s	Biosis' response
1	CPHR	<p>The proposed impact on Giant Dragonfly habitat within the Refining Process Improvement Project (RPIP) Mountain area, as shown in Figure 4-2 of the BDAR, is not supported as insufficient consideration has been given to genuinely avoiding impacts to habitat for this species.</p> <p>Section 7.5.3.11 of the RAP (AECOM, 12 May 2025) states that remediation works are not required for the site's current and approved use. Instead, these works aim to prepare the site for the future Kurnell Energy and Industry Precinct (SSD-86799993).</p> <p>CPHR advises that site preparation for future commercial/ industrial development within the RPIP Mountain area would be more appropriately assessed as part of SSD-86799993. This will ensure habitat for an endangered species is not pre-emptively cleared for a future development that is not proposed under this modification. The requirement for developments to avoid impacts is in accordance with:</p> <ul style="list-style-type: none"> • Sections 6.2 and 6.12 of the BC Act. • Section 7 of the BAM. • Chapter 39 Natural Resource Management (Greenweb) of the Sutherland Shire Development Control Plan 2015. 	<ul style="list-style-type: none"> • The modification is amended to avoid any impacts to the RPIP Mountain area shown in Figure 4-2 of the BDAR. Impacts to be avoided include, but are not limited to, excavation, capping, vegetation removal or construction of surface water infrastructure. • A 'no remediation' approach should be adopted for the RPIP Mountain area as outlined in Appendix E of the RAP. • Site preparation for future commercial/industrial development within the RPIP Mountain area is assessed as part of SSD86799993. • The BDAR, associated plans and relevant technical reports be updated accordingly. 	<p>The area colloquially known as RPIP Mountain (refer to Excavation 6 in Figure 1-4) is a former stockpile of asbestos contaminated soils (ACS) in Zone 3 which presents an asbestos mitigation risk to other parts of the Site due to the growth of vegetation across this area.</p> <p>The proposed modification includes removal of vegetation to allow for excavation and offsite disposal of soils. This is unchanged between the Modification Report and Submissions Report.</p> <p>Giant Dragonfly was incidentally detected by Biosis during the field investigations to support this BDAR (as detailed in Section 4.3.4), within an area of native vegetation (PCT 3546 Coastal Sands Littoral Scrub-Forest) which is not formally recognised as being associated with Giant Dragonfly in BioNet. Section 4.3.10 provides an explanation of the generation of the Giant Dragonfly species polygon which consequently includes areas of native vegetation not typically associated with the species (including areas within RPIP mountain) due to the detection of the species within areas of PCT 3546. The habitat afforded within RPIP Mountain is of poor quality and likely to be utilised as dispersal/perching habitat only.</p> <p>Giant Dragonfly is primarily associated with swamp type vegetation communities which they are dependent upon for their life cycle. As detailed in the Serious and Irreversible Impact (SAIL) assessment (Annexure E), impacts from the proposed modification works would be limited to native vegetation communities that are not consistent with swamp-type formations, which are currently edge effected and impacted by dense Lantana growth, and interface directly</p>

Item	Agency	Summary of Agency comments	Updates requirement/s	Biosis' response
				with the existing Kurnell Terminal. Core swamp habitat critical to the survival of Giant Dragonfly is not present in RPIP Mountain and would not be impacted by the proposed modification. The subpopulation of Giant Dragonfly that exists within the locality would still have access to viable habitat to allow for the dispersal to alternative swamps with no additional restriction in movement to be expected by the proposed modification.
2	CPHR	CPHR is unable to complete a review of this modification due to not having access to the BDAR case and digital files via the BOAMS.	<ul style="list-style-type: none"> The ecological consultant adds 'Greater Sydney – Compliance & Regulation' as a Case Party in BOAMS, uploads the required digital files (refer to Appendix L – Table 27 in BAM (2020) for what is required), and submits the case to 'Greater Sydney – Compliance & Regulation' as the 'consent authority'. 	<p>No action required. BAM-C was correctly submitted with Greater Sydney – Compliance & Regulation added as case party already. GIS files were also uploaded.</p> <p>The BAM-C case was originally set up and prepared by Matthew Hyde of Biosis Pty Ltd (BAAS22005). Due to the expiration of Matthew Hyde's accreditation part way through this BDAR, Mitch Palmer was added as a case party and subsequently finalised the BAM-C added Greater Sydney – Compliance & Regulation added as case party, uploaded the GIS files, and finalised the BAM-C for submission.</p>
3	CPHR	It is unclear whether any ecosystem credit species generated in the Biodiversity Assessment Method Calculator (BAM-C) were excluded from the BDAR.	<ul style="list-style-type: none"> Update the BDAR to clarify whether any ecosystem species were removed. If ecosystem species were removed, provide a justification. The ecological consultant provides access to BAM-C in the BOAMS by adding 'Greater Sydney – Compliance & Regulation' as a case party. 	<p>No ecosystem credit species generated by the BAM-C were subsequently discounted or removed from the assessment. Section 4.1 (Ecosystem credit species) has been updated to reflect this.</p> <p>'Greater Sydney – Compliance & Regulation' has already been previously added as a case party and therefore no action is required on this point.</p>
4	CPHR	Figure 3-1 of the BDAR ('native vegetation extent') may not have mapped all native vegetation in the north-eastern area of the Kurnell Peninsula.	<ul style="list-style-type: none"> The ecological consultant reviews the native vegetation mapping extent presented in Figure 3-1 of the BDAR and updates the 	<p>Area highlighted has been reviewed and Figure 3-1 has been updated. Calculations for native vegetation cover have been updated in this BDAR resulting in a change in native vegetation cover from 36% to 36.5%. Therefore, no change in cover class has occurred and updates to the BAM-C are not</p>

Item	Agency	Summary of Agency comments	Updates requirement/s	Biosis' response
			mapping and calculations if required.	required.
5	CPHR	<p>The BDAR and Modification Report request that credit offset requirements are staged in accordance with the modification's development stages. Tables 9-3 and 9-4 of the BDAR provides a summary of the number of credits to be offset for each stage. However, the BDAR does not explain how the split of credits for each stage has been calculated.</p>	<ul style="list-style-type: none"> Update the BDAR to provide justification and details on how the total number of credits to be retired is divided across each stage. 	<p>The indicative program included in Table 1-2 details the timing for each Zone of the proposed modification. Section 9.1.3 details how the staging of credits is to be split across Zones 1, 1A, 2 and 3. These zones are shown in Figure 1-1 and Figure 1-2 (colour-coded).</p> <p>There are no impacts in Zones 1 and 1A; therefore, all credits that are required are split across Zones 2 and Zones 3. The total number of credits required for each of these zones is shown in Table 9-3 (Ecosystem credit requirement) and Table 9-4 (Species credit requirement). Section 1.6 has been updated to qualify that the retiring of credits has been staged to match the staged approach and timing of the proposed modification works. Separate BAM-C cases have been set up to reflect each of these stages as relevant.</p>
6	CPHR	<p>The site the subject of the modification is adjacent to Towra Point Nature Reserve, which is identified as a coastal wetland under the <i>State Environmental Planning Policy (Resilience and Hazards) 2021</i> (Resilience and Hazards SEPP). It is also a declared Ramsar site under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i> (EPBC Act). The proposed stormwater discharge points are all located in the "proximity area for coastal wetlands" under the Resilience and Hazards SEPP with the northern proximity areas being adjacent to Towra Point Nature Reserve.</p> <p>The Modification Report acknowledges that works in this area may increase the</p>	<ul style="list-style-type: none"> Provide further details on the potential stormwater and overland flow impacts to Towra Point Nature Reserve and "proximity area for coastal wetlands" and identify suitable mitigation measures to minimise these impacts. 	<p>A groundwater assessment has been undertaken and included in Annexure A of Appendix F (Updated Soils, Groundwater, and Contamination Report) of the Submissions Report (AECOM 2025a). This has identified Groundwater Dependents Ecosystems (GDEs) within proximity to the development site that may be impacted by groundwater drawdown (due to dewatering of required excavations/trenches). Sections 6.3.3 and 6.5 (Impacts to Groundwater Dependents Ecosystems) have been updated with further details addressing impacts to GDEs. A Groundwater Management Plan is proposed which will manage the temporary impacts associated with groundwater drawdown. Given the temporary nature of the works and the proposed mitigations to be implemented, it is Biosis' opinion that it is unlikely that there would be a permanent, significant impact to the identified GDEs surrounding the development</p>

Item	Agency	Summary of Agency comments	Updates requirement/s	Biosis' response
		<p>dispersion of dust, soils, sediments and contaminants. The disturbance of contaminated soils during earthworks and remediation is concerning due to the proximity of downstream sensitive receiving environments. Preserving the ecological and hydrological integrity of coastal wetlands is important. Proposed management measures must form part of the risk assessment for the modification.</p> <p>The Modification Report, BDAR and SWWFR do not adequately assess the potential stormwater and overland flow impacts to Towra Point Nature Reserve and “proximity area for coastal wetlands” or provide suitable mitigation measures to minimise these impacts.</p>		<p>site. Any impacts can be appropriately monitored and managed through an approved Trigger Action Response Plan (TARP) and adaptive management actions would ensure that where temporary impacts related to drawdown do occur, they are minimised and not permanent.</p> <p><i>Kurnell Terminal SSD-5544 Mod-7 Appendix G – Updated Surface Water, Wastewater and Flooding Assessment (AECOM 2025b)</i> has been completed and details surface water safeguards for the proposed modification which ensure no impacts to flows, flooding, or water quality in receiving environments, including Towra Point Nature Reserve and coastal wetlands. Key management measures identified include:</p> <ul style="list-style-type: none"> • Retain landform, bunding, and surface water storage; reinstate excavations to pre-modification levels, with the exception of RPIP Mountain. • Redirect Catchments B and F runoff via low-flow pipes to existing SWS, preserving flows to southern basin/ wetlands. • Manage added flows in Catchment B detention systems to maintain pre-modification discharges to Quibray Bay (up to 1% Annual Exceedance Probability [AEP]). • Install two Catchment E OSD systems to sustain pre-modification rates to roadside channels, Ramsar site, and bay (up to 1% AEP). • Add permanent sediment controls at OSD ends, retaining existing treatments for low operational sediment loads. <p>No further assessment required due to effective mitigation.</p>

1.5 The subject land, development footprint, and assessment area

The terms subject land, development site, development footprint and assessment area are used throughout this BDAR and are defined below. The subject land, development site, development footprint and assessment area are shown on Figure 1-5.

- The subject land is located within the Sutherland Shire Local Government Area (LGA) and the Greater Sydney Local Land Services (LLS) Region and is zoned as E5 (Heavy Industrial) under the Sutherland Shire Local Environmental Plan 2015 (LEP). The subject land is the same as the “Project Area,” as defined in the Modification Report and shown on Figure 1-1. It includes the following lots detailed in Table 1-5 below.
- The development site is the same as the “Site,” as defined in the Modification Report, and encompasses the Kurnell Terminal and the fenced Rights of Way that pass through the Kurnell Township (Figure 1-5).
- The development footprint comprises the area of direct impact associated with the proposed modification, which is restricted to Zones 2 and 3, as well as several discrete areas in Zone 1 and Zone 1A which represent indicative infrastructure relocation areas (Figure 1-2).
- The assessment area includes the subject land and the area of land within a 1,500 m buffer zone surrounding the subject land, as required under the BAM.

Table 1-5 Allotments within the Project Area

Zone	Lots/ DP
Zone 1 (Operational fuel terminal)	<ul style="list-style-type: none"> • Lot 25 (DP 776328), • Lots 56, 57 and 62 (DP 908) • Lot 1 (DP 1044690) • Lots 283 and 570 (DP 752064) • Lot 1 (DP 132055).
Zone 1A (Eastern Right of Way)	<ul style="list-style-type: none"> • Lots H, J and K (DP 362655) • Lots D, F and G (DP 361103) • Lots 43-46, 77-79, and 122-125 (DP 8135) • Lot B (DP 338897).
Zone 2 (Former refinery process areas)	<ul style="list-style-type: none"> • Lot 25 (DP 776328) • Lots 56, 57 and 62 (DP 908) • Lot 283 (DP 752064).
Zone 3 (Former Caltex Lubrication Oil Refinery)	<ul style="list-style-type: none"> • Lot 1 (DP 215819) • Lots 1 and 2 (DP 126647) • Lot 2 (DP 215818).

1.6 Offset staging

The development footprint is split into four zones (Zone 1 and 1A, Zone 2 and Zone 3), as shown in Figure 1-2. The proposed modification is seeking staged retirements of the biodiversity credit liability across these zones. The staging of the credits has been undertaken to match the staged approach and timing to the proposed modification works. Separate BAM-C cases have been set up to reflect each of these stages as relevant. Prior to works commencing in each of these zones, the biodiversity offset associated with that zone would be secured. Further detail is provided in Section 9.1.3.

1.7 Sources of information

In order to provide a context for the assessment area, records of flora and fauna from within 5 kilometres (km) (the locality) were collated from the following databases and datasets:

- Australian Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW BioNet - the database for the Atlas of NSW Wildlife published by NSW DCCEEW, for species, populations and ecological communities listed under the BC Act.
- NSW BAM Calculator.
- Biodiversity values map (NSW DCCEEW 2025a).
- Native vegetation regulatory map (NSW DCCEEW 2025b).
- BAM Important Areas viewer (DPE 2023a).
- PlantNET (The Royal Botanic Gardens and Domain Trust) (RBGDT 2023).

Other sources of biodiversity information relevant to the assessment area were sourced from:

- The NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database (NSW DCCEEW 2025c).
- Relevant vegetation mapping including the NSW State Vegetation Type map (NSW DCCEEW 2024a).

Basemap data was obtained from NSW Land and property information (LPI) 1:25,000 digital topographic databases (DTDB), with cadastral data obtained from LPI digital cadastral database (DCDB).

The following spatial datasets were utilised during the development of this report:

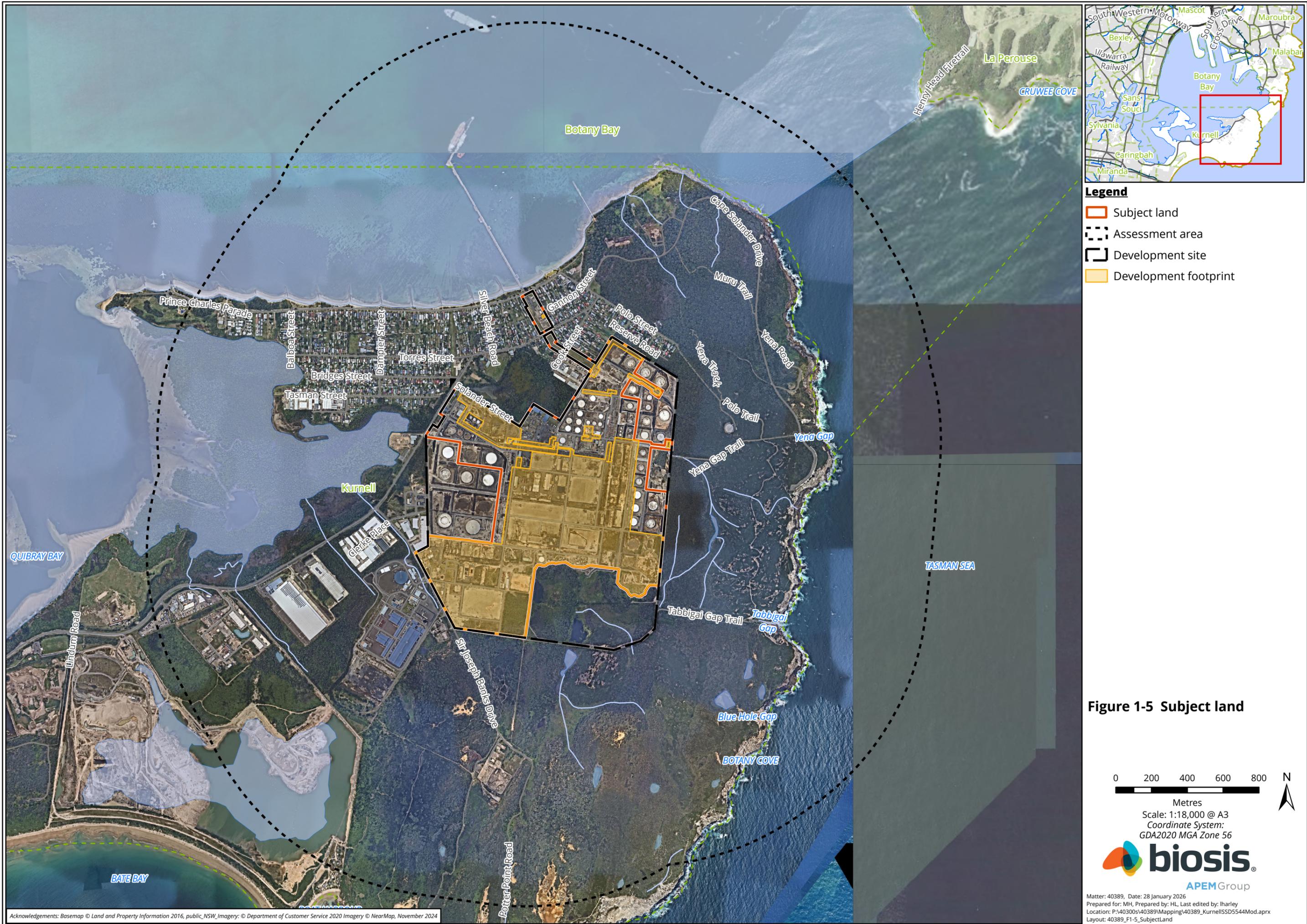
- Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.0.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DoIW) (Cth DCCEEW 2019).
- Mapping has been produced using a Geographic Information System (GIS). The following maps and data have been provided:
 - Digital mapping with aerial photography showing 1:1000 or finer.
 - Site map, as described in subsection 3.1.1 of the BAM (DPIE 2020a).
 - Location map, as described in subsection 3.1.2 of the BAM (DPIE 2020a).
 - Landscape map with features including 1,500 metre buffer, as described in section 3.1.3 of the BAM (DPIE 2020a).

1.8 Legislative requirements

The proposed modification has been assessed against relevant biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *Biodiversity Conservation Act 2016* (BC Act).

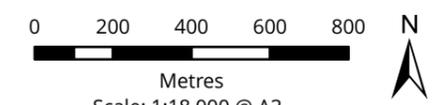
- *Fisheries Management Act 1994* (FM Act).
- *Water Management Act 2000* (WM Act).
- *Biosecurity Act 2015* (Biosecurity Act).
- Relevant State Environmental Planning Policies (SEPPs):
 - State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP).
 - State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP).
- *Sutherland Shire Development Control Plan 2015* (Sutherland Shire DCP).
- *Sutherland Shire Local Environmental Plan 2015* (Sutherland Shire LEP).



Legend

- Subject land
- Assessment area
- Development site
- Development footprint

Figure 1-5 Subject land



Metres
 Scale: 1:18,000 @ A3
 Coordinate System:
 GDA2020 MGA Zone 56



Matter: 40389, Date: 28 January 2026
 Prepared for: MH, Prepared by: HL, Last edited by: lharley
 Location: P:\40300s\40389\Mapping\40389_KurnellSSD5544Mod.aprx
 Layout: 40389_F1-5_SubjectLand

Acknowledgements: Basemap © Land and Property Information 2016, public_NSW_Imagery © Department of Customer Service 2020 Imagery © NearMap, November 2024

2 Landscape context

This chapter describes the landscape and site context; specifically, the landscape features present within the subject land and the assessment area, as required by the BAM (DPIE 2020a). Figure 1-5 shows the location of the subject land and landscape features within the assessment area.

2.1 Subject land description

The subject land is located on the Kurnell Peninsula within the Sutherland Shire LGA. As described in Section 1.4, the development site encompasses the Kurnell Terminal and the fenced Right of Way that passes through the Kurnell Township. Between 1956 and 2014, the Site was used as both an oil refinery and a fuel terminal; since the conversion works consented under SSD-5544, the development site operates as a bulk liquid fuel terminal.

Based on historical and existing land use, large parts of the subject land are heavily developed, consisting of access roads, storage tanks, and storage/ office facilities. Areas of native vegetation occur primarily in the southern portion of the subject land, which is connected to large areas of conserved vegetation residing in the neighbouring Kamay Botany Bay National Park (directly adjacent to the eastern side of the subject land) and Towra Point Nature Reserve (approximately 500 m to the west). The Towra Point Nature Reserve includes the important Towra Point Estuarine Wetlands, which are recognised as a Ramsar site and include areas of significant habitat for migratory shorebirds. In addition to these two reserves, Botany Bay occurs to the north of the subject land, which is used for a variety of recreational activities and serves as Greater Sydney's main seaport.

Limited native vegetation is present within the subject land and development footprint, and the vegetation that is present is primarily heavily degraded due to historic clearing and current land uses. Field investigations have been undertaken to support this BDAR in relation to this vegetation as well as the potential threatened species habitat within areas to be impacted. Vegetation and associated field investigations are detailed further in Section 3.

The subject land lies within the:

- Sydney Basin Bioregion.
- Sydney Coast-Georges River Basin (Georges River catchment).
- Greater Sydney Local Land Services Management Area.

2.1.1 Native vegetation cover

Vegetation within the assessment area was assessed using aerial photographic interpretation, field survey results and existing vegetation mapping (i.e., the *NSW State Vegetation Type Map* (NSW DCCEEW 2024a)). This vegetation is shown on Figure 3-1.

The total assessment area is 1,718 hectares (ha), with the area of native vegetation mapped within the buffer being 628 ha. This gives a native vegetation cover of 36.5% (>30–70% class as defined in Section 3.2.3 of the BAM (DPIE 2020a)), which is the value that was entered into the BAM-C.

Cleared areas and areas of non-native vegetation within the assessment area cover 1,098 ha.

Table 2-1 Native vegetation mapped within the assessment area

PCT number	PCT name	Area within assessment area (ha)
3410	Spinifex Strandline Grassland	2.66
3545	Coastal Sands Bloodwood Low Forest	79.93
3546	Coastal Sands Littoral Scrub-Forest	76.13
3594	Sydney Coastal Sandstone Foreshores Forest	13.26
3638	South Coast Sands Bangalay Forest	0.51
3640	South Coast Sands Littoral Scrub	0.15
3788	Coastal Foredune Wattle Scrub	0.80
3805	Southern Sandplain Heath	135.16
3810	Southern Sydney Rockplate Heath	10.45
3811	Sydney Coastal Headland Cliff Scrub	31.10
3812	Sydney Coastal Sandstone Headland Heath	75.29
3921	Coastal Sydney Sand Saw-sedge Wet Shrubland	3.95
3922	Sydney Coastal Sand Swamp Scrub	29.57
3924	Sydney Coastal Upland Swamp Heath	8.29
3963	Estuarine Reedland	0.49
3972	Sydney Creekflat Wetland	14.26
3977	Sydney Coastal Headland Lagoon Sedgeland	0.32
3986	Coastal Sands Swamp Mahogany Rush Forest	7.08
4000	Northern Estuarine Paperbark Sedge Forest	0.90
4028	Estuarine Swamp Oak Twig-rush Forest	25.31
4056	Southern Estuarine Swamp Paperbark Creekflat Scrub	0.88
4091	Grey Mangrove-River Mangrove Forest	87.57
4097	Samphire Saltmarsh	15.82

Section 3.1.6 provides the details of the PCTs identified from existing vegetation mapping, and the current assessment, as occurring within the subject land. The conservation status of the communities is also provided.

2.1.2 IBRA Bioregions and subregions

The assessment area occurs within the Sydney Basin IBRA bioregion and the Pittwater IBRA subregion. The Sydney Basin Bioregion lies on the central east coast of NSW and covers an area of approximately 3,624,008 ha. It occupies about 4.53% of NSW and is one of two bioregions contained wholly within the state. The bioregion extends from just north of Batemans Bay to Nelson Bay on the central coast, and almost as far west as Mudgee. The bioregion is bordered to the north by the North Coast and Brigalow Belt South bioregions, to the south by the South East Corner Bioregion and to the west by the South Eastern Highlands and South Western Slopes bioregions. The Sydney Basin Bioregion is one of the most species diverse in Australia. This is a result of the variety of rock types, topography and climates in the bioregion (OEH 2016).

2.1.3 Waterways

The subject land is located within the Greater Sydney Local Land Services Region and the Georges River catchment. The sea inlet of Botany Bay is directly to the north of the subject land. No mapped waterways are present within the subject land, but there are numerous sunken concrete lined 'pipeways'. These pipeways flood with water following rain events and temporarily contain extensive areas of shallow (<5 centimetres [cm] deep) water and some smaller areas of deeper (0.5 to 1 m deep) water. In some locations, these areas contain patches of aquatic vegetation.

Considering the coastal location of the subject land and close proximity to the open ocean, Key Fish Habitat is considered present within the surrounding locality (DPI 2013) and is also included on the *Fisheries NSW Spatial Data Portal* (DPI 2025). However, no such habitats occur directly within the subject land.

2.1.4 Wetlands

The Towra Point Nature Reserve, which contains the Towra Point Estuarine Wetlands, is located within 500 m of the subject land (Figure 2-1 and Figure 2-2). This wetland is included in the DoIW of Australia (Cth DCCEEW 2019) for the following reasons:

- It is a good example of a wetland type occurring within a biogeographic region in Australia.
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles or provides a refuge when adverse conditions such as drought prevail.
- The wetland supports 1% or more of the national populations of any native plant or animal taxa.
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
- The wetland is of outstanding historical or cultural significance.

Towra Point Estuarine Wetlands is also considered a Ramsar wetland. Ramsar wetlands are representative, rare, or unique wetlands, or are important for conserving biological diversity. The site is included on the List of Wetlands of International Importance developed under the Ramsar Convention. The Towra Point Estuarine Wetlands was listed for the following reasons:

- Criterion 2: Threatened species or ecological communities.
- Criterion 3: Populations of plants and/or animals important for maintaining biodiversity of a particular bioregion.
- Criterion 4: Supports species at a critical stage of their life cycle or provides refuge in adverse conditions.
- Criterion 8: Food source, nursery, or migration path for fish.

Vegetation mapped as part of the Towra Point Estuarine Wetlands on the DoIW mapping occurs directly adjacent to the subject land. The mapping does extend into a small portion of the development footprint in the south-west; however, these mapped areas include concreted land as part of the existing Kurnell Terminal and as such do not represent habitat values (Figure 2-1 and Figure 2-2).

2.1.5 Connectivity

The development site operates as a bulk liquid fuel terminal. Therefore, large parts of the subject land are heavily developed through historical and existing land uses, consisting of access roads, storage tanks, and

storage/office facilities. Native vegetation is restricted to a small degraded patch in the southern portion of the subject land within Zone 3 (see Figure 1-1). This area is connected to large areas of conserved vegetation residing in the neighbouring Kamay Botany Bay National Park (Figure 2-2). These adjacent areas of vegetation contain high-quality intact vegetation and likely provide suitable habitat for threatened fauna and flora.

The subject land also contains scattered patches of planted native vegetation and numerous sunken concrete lined pipeways with patches of aquatic vegetation. Therefore, mobile species that are able to traverse roads or small cleared areas would likely be able to disperse via these fragmented patches. There are also numerous areas of exotic grass/ turf throughout the subject land, surrounding the existing facilities.

2.1.6 Geological features of significance

There were no recorded karst, caves, crevices, cliffs, or other areas of geological significance within the development site or subject land.

2.1.7 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value (AOBV) mapped within the development site (NSW DCCEE 2024b). The closest AOBV is the '*Endangered Population of Little Penguins at Manly*' that occurs approximately 22 km north of the subject land, in the coastal areas of Manly (Canna Point).

Given the proximity of the subject land to the coastline, indirect impacts, such as light or runoff pollution, should be managed accordingly as to not hinder the movement of any Little Penguin individuals that may be traversing the coastline. However, as the Kurnell Terminal (previously refinery) facility was constructed in 1956 and has operated thereafter, any increase in lighting pollution from the proposed development is expected to have negligible impacts on Little Penguin. Nonetheless, details on how light spill will be mitigated are provided in Section 6.2. With this in consideration, development within the subject land is not expected to result in any impacts on this population.

2.1.8 NSW (Mitchell) Landscape

The subject land primarily occurs within the *Sydney – Newcastle Barriers and Beaches* Mitchell Landscape. This coastal landscape comprises long, curved quartz sand beaches flanked by rocky headlands, with a network of sand dunes and intermittent lagoons. These dunes range from frontal dunes near the beach to stabilized dunes further inland, forming natural barriers against coastal erosion. Vegetation varies across this gradient, reflecting soil conditions and exposure levels. Additionally, freshwater sedge swamps and mangroves contribute to the landscape's biodiversity, enhancing its ecological significance (Mitchell 2002).

A small corner of the subject land (in the south east) occurs within the Woronora Plateau. Given the extensive land modification that has occurred within this small section of the subject land (due to the existing Kurnell Terminal facility), this landscape is not considered further.

Sydney – Newcastle Barriers and Beaches is the Mitchell Landscape that has been entered into the BAM-C for this assessment.

2.1.9 Additional landscape features

No additional landscape features were identified within the subject land.

2.1.10 Hydrology

The subject land is mapped as being located within Environmentally Sensitive Land on the Groundwater Vulnerability Map of the Sutherland Shire LEP. In deciding whether to grant development consent for development on land to which this clause applies, the consent authority must consider the following (as detailed in Section 6.6 of the LEP):

- The likelihood of groundwater contamination from the development (including from any onsite storage or disposal of solid or liquid waste and chemicals).
- Any adverse impacts the development may have on groundwater dependent ecosystems (GDEs).
- The cumulative impact the development may have on groundwater (including impacts on nearby groundwater extraction for a potable water supply or stock water supply).
- Any appropriate measures proposed to avoid, minimise, or mitigate the impacts of the development.

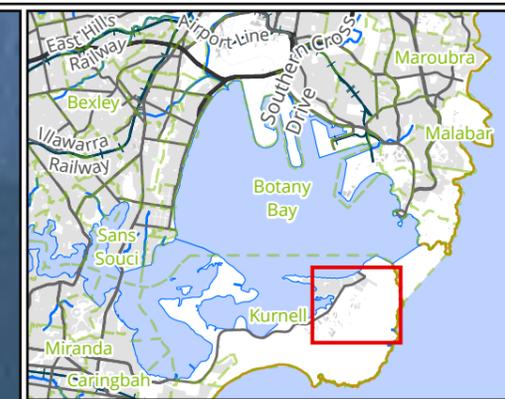
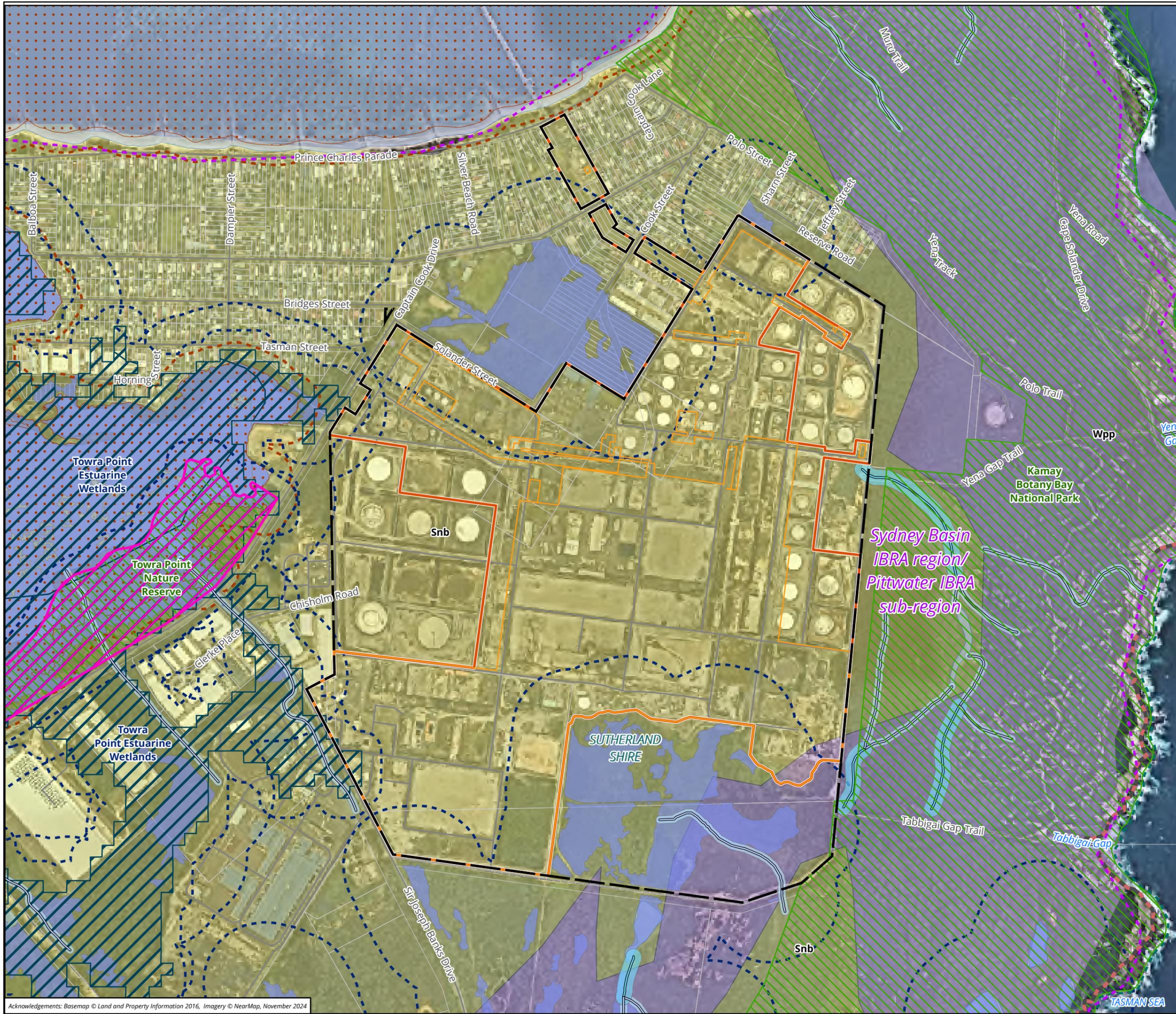
Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

- The development is designed, sited, and will be managed to avoid any significant adverse environmental impact, or
- If that impact cannot be reasonably avoided—the development is designed, sited, and will be managed to minimise that impact, or
- If that impact cannot be minimised—the development will be managed to mitigate that impact.

Impacts to hydrology assessed as part of this BDAR extend to prescribed impacts to water bodies, water quality, and hydrological processes, as well as GDEs. These impacts are detailed in Section 6.3.3 (water bodies, water quality and hydrological processes) and Section 6.5 (GDEs).

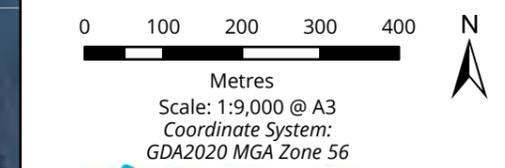
2.1.11 Mapped Important Area

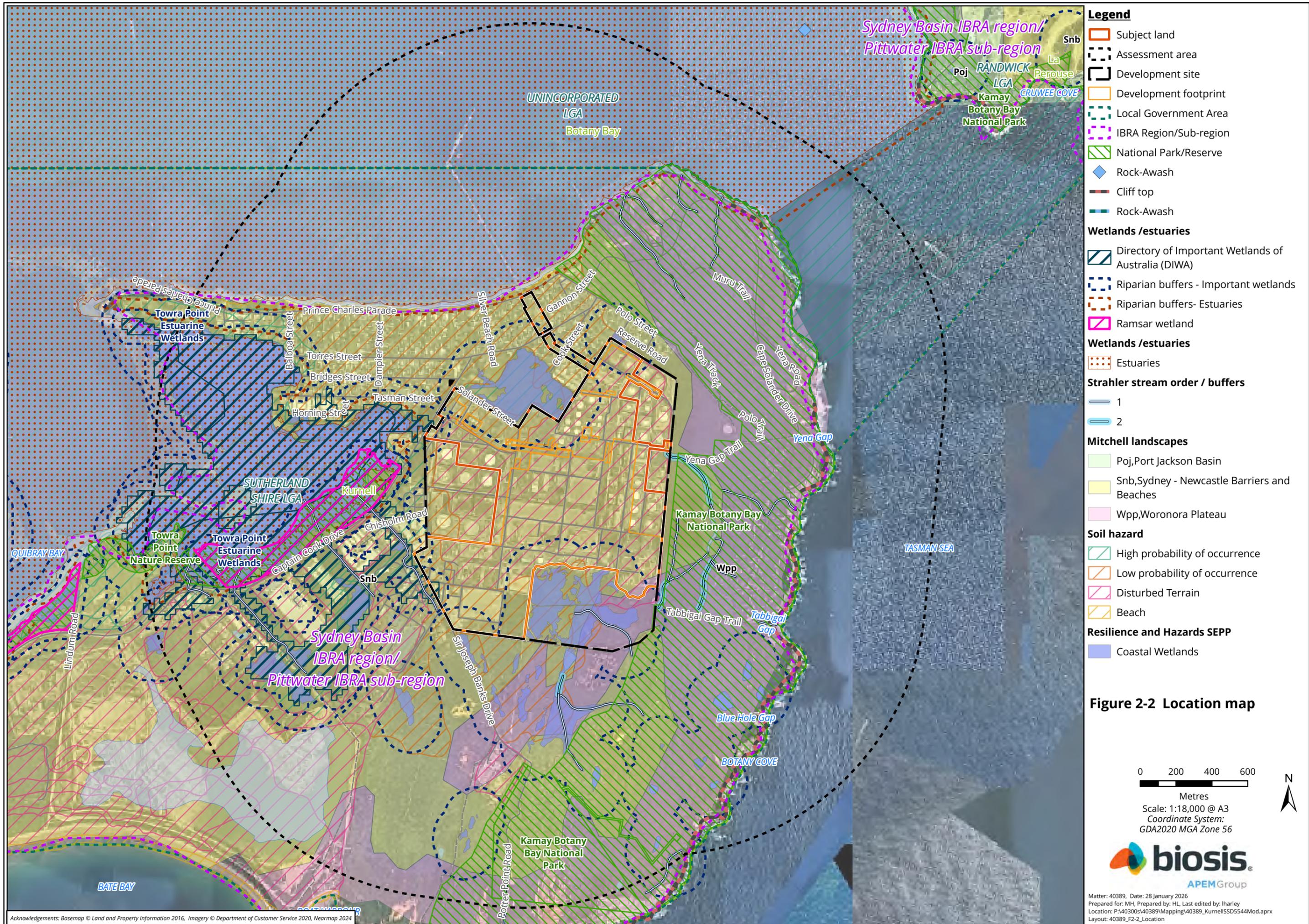
The subject land is not within a mapped Important Area (DPE 2023a). However, Migratory Shorebird Important Areas are mapped approximately 500 m to the west of the subject land, associated with the Towra Point Nature Reserve.



- Legend**
- Subject land
 - Development site
 - Development footprint
 - Lot
 - Local Government Area
 - IBRA Region/Sub-region
 - National Park/Reserve
- Strahler stream order / buffers**
- 1
 - 2
- Wetlands / estuaries**
- Directory of Important Wetlands of Australia (DIWA)
 - Riparian buffers - Important wetlands
 - Riparian buffers- Estuaries
 - Ramsar wetland
- Wetlands / estuaries**
- Estuaries
- Mitchell landscapes**
- Snb, Sydney - Newcastle Barriers and Beaches
 - Wpp, Woronora Plateau
- Distinctive Land Surface**
- Cliff top
- Resilience and Hazards SEPP**
- Coastal Wetlands

Figure 2-1 Site map





- Legend**
- Subject land
 - Assessment area
 - Development site
 - Development footprint
 - Local Government Area
 - IBRA Region/Sub-region
 - National Park/Reserve
 - ◆ Rock-Awash
 - Cliff top
 - Rock-Awash
- Wetlands /estuaries**
- Directory of Important Wetlands of Australia (DIWA)
 - Riparian buffers - Important wetlands
 - Riparian buffers- Estuaries
 - Ramsar wetland
- Wetlands /estuaries**
- Estuaries
- Strahler stream order / buffers**
- 1
 - 2
- Mitchell landscapes**
- Poj,Port Jackson Basin
 - Snb,Sydney - Newcastle Barriers and Beaches
 - Wpp,Woronora Plateau
- Soil hazard**
- High probability of occurrence
 - Low probability of occurrence
 - Disturbed Terrain
 - Beach
- Resilience and Hazards SEPP**
- Coastal Wetlands

Figure 2-2 Location map



Scale: 1:18,000 @ A3
 Coordinate System:
 GDA2020 MGA Zone 56



Matter: 40389, Date: 28 January 2026
 Prepared for: MH, Prepared by: HL, Last edited by: lharley
 Location: P:\40300s\40389\Mapping\40389_Kurnell\SSD544Mod.aprx
 Layout: 40389_F2-2_Location

Acknowledgements: Basemap © Land and Property Information 2016, Imagery © Department of Customer Service 2020, Nearmap 2024

3 Native vegetation

The subject land supports native vegetation with varying ranges of disturbance, and exotic vegetation in the form of exotic grass/ turf areas and areas with planted exotic canopy trees. Patches of planted native trees are also present. The patches of native vegetation are relatively small and subject to high levels of modification as a result of historical ground disturbances.

3.1 Native vegetation and habitat assessment

3.1.1 Native vegetation extent

The extent of native vegetation, threatened ecological communities, and vegetation integrity within the subject land was determined using the results of site investigations, previous studies undertaken at the site (Biosis 2023), and Section 4 of the BAM (DPIE 2020a).

Figure 3-1 provides a map of the native vegetation extent (native ground cover and areas with canopy) recorded within the subject land, as assessed during field investigations undertaken in February, April, November and December 2024, and January 2025. Areas not shown as native vegetation cover within Figure 3-1, are considered cleared/ non-native vegetation, and are addressed further below.

3.1.2 Review of existing information

Existing information regarding native vegetation was reviewed to inform field investigations including:

- *Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands* (Tozer et al. 2010).
- *NSW State Vegetation Type Map* (NSW DCCEEW 2024a).
- Existing site reports including, '*Project Columbus Biodiversity Constraints*' (Biosis 2023).

Based on the results of the background review and the requirements of the BAM with respect to this BDAR, appropriate surveys were designed for the subject land and development footprint.

3.1.3 Field investigation of biodiversity values

A systematic biodiversity assessment was conducted on and 19-20 February 2024 (vegetation mapping) with additional surveys conducted on 10-11 April 2024, 29 November 2024 and 13 January 2025 (collection of BAM vegetation plots). Assessments were completed under the terms of Biosis' Scientific Licence issued by NSW DCCEEW under Part 2 of the BC Act (SL100758, expiry date 30 June 2026). Fauna survey was conducted under approval CSB 17/892 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2028). Details regarding nomenclature, permits and licenses, and general survey limitations are provided in Annexure A.

Assessment in accordance with the BAM was overseen by Mitchell Palmer of Biosis (BAAS17051).

The subject land was surveyed in accordance with the BAM (DPIE 2020a), which involved:

- The identification and mapping of PCTs according to the structural definitions held in the BioNet Vegetation Classification database, with reference to information provided in the NSW *State Vegetation Type Map* (NSW DCCEEW 2024a).
- Undertaking floristic plots within each vegetation zone in accordance with Section 4 of the BAM (DPIE 2020a), considering varying condition states and avoidance of ecotones, areas of disturbance, and edges.
- The identification of native and exotic plant species, according to the Flora of NSW (Harden 2002, 1993, 2000, 2002) with reference to recent taxonomic changes.
- Targeted searches for plant species of conservation significance according to *Surveying Threatened Plants and their Habitats* (DPIE 2020b).
- Incidental observations using the “random meander” method (Cropper 1993).
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the subject land.
- An assessment of the natural resilience of the vegetation of the subject land.
- Identifying and mapping fauna habitats (e.g., hollow-bearing trees, rock outcropping etc.), assessing their condition and value to threatened fauna species, and considering threatened species’ habitat constraints.
- Observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches, and diggings).
- Targeted surveys for threatened fauna species.

The conservation significance of plant species and plant communities was determined according to:

- BC Act for significance within NSW
- EPBC Act for significance within Australia.

Detailed field mapping and collection of GPS point locations were conducted using hand-held (uncorrected) tablet units (Samsung Galaxy Tab X) running the ArcGIS Field Maps application, using the inbuilt GPS, and aerial photo interpretation. Spatial locations are therefore considered to have an accuracy of generally ± 5 metres.

Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition determined and assigned (Figure 3-2). Identification of PCTs within the subject land was confirmed with reference to the community profile descriptors (and diagnostic species tests) held within the NSW *State Vegetation Type Map* (NSW DCCEEW 2024a) and NSW BioNet Vegetation Classification database (NSW DCCEEW 2025c). Locations of floristic plots surveyed are shown on Figure 3-3.

Further details of targeted survey for threatened flora and fauna species are provided in Section 4.3 below.

3.1.4 More appropriate local data

Under Section 1.4.2 of the BAM (DPIE 2020a), an assessor may use local appropriate data from relevant published sources or appropriate local reference site to develop a benchmark for a PCT. The assessor may also use more appropriate local data (instead of data from the Threatened Biodiversity Data Collection [TBDC]) when assessing the habitat suitability for threatened species, as detailed in Section 5 of the BAM. No

local appropriate data has been used for either the benchmarking of PCTs or the threatened species assessment.

3.1.5 Non-native vegetation

A total of 9.02 ha of the subject land was mapped as exotic grass/ turf vegetation or exotic vegetation (with planted exotic canopy species), which had no native over-storey or midstorey component, and met the definition of non-native vegetation. A further 0.08 ha of planted native vegetation was also included as non-native vegetation, due to the heavily modified nature of the vegetation consisting of evenly space planted Broad-leaved Paperbark *Melaleuca quinquenervia* trees over a maintained exotic turf understorey of Common Couch. Whilst planted native trees were present in this vegetation area, it could not be prescribed a PCT due to the heavily modified nature of the patch.

Areas not shown as native vegetation cover (Figure 3-2), and which do not provide habitat for threatened species, are not included for further assessment in accordance with Section 4.1.2 of the BAM (DPIE 2020a). A description of non-native vegetation areas within the subject land are provided in Table 3-1 (Exotic grass/ turf) Table 3-2 (Planted exotic) and Table 3-3 (Planted native) below.

Table 3-1 Exotic grass/ turf vegetation

Exotic grass/ turf vegetation	
Extent within subject land	6.04 ha
Description	<p>This vegetation type was entirely represented by areas of turf and exotic grass. Dominant grass species present included Couch Grass <i>Cynodon dactylon</i>, Kikuyu <i>Cenchrus clandestinus</i>, Whisky Grass <i>Andropogon virginicus</i> and Crab Grass <i>Digitaria sanguinalis</i>. Sporadic occurrences of native grass species were sometimes present; however, they were not in high enough abundance for these areas to be referred to as 'derived' grasslands. Native species present included Kangaroo Grass <i>Themeda triandra</i>, Red Grass <i>Bothriochloa macra</i> and Windmill Grass <i>Chloris truncata</i>.</p> <p>Some exotic herbaceous and woody weeds were also present in these areas, including Largeleaf Pennywort <i>Hydrocotyle bonariensis</i>, Cobblers Pegs <i>Bidens pilosa</i>, Purpletop <i>Verbena bonariensis</i> and Common Sowthistle <i>Sonchus oleraceus</i>.</p>
Survey effort	Four BAM plots (B02,B03, B09 and B10) were collected over the course of the field assessment (Figure 3-3).

Exotic grass/ turf vegetation

Photos



Photo 3-1 Exotic grass/ turf areas in BAM plot B02



Photo 3-2 Exotic grass/ turf areas in BAM plot B03



Photo 3-3 Exotic grass/ turf areas in BAM plot B09

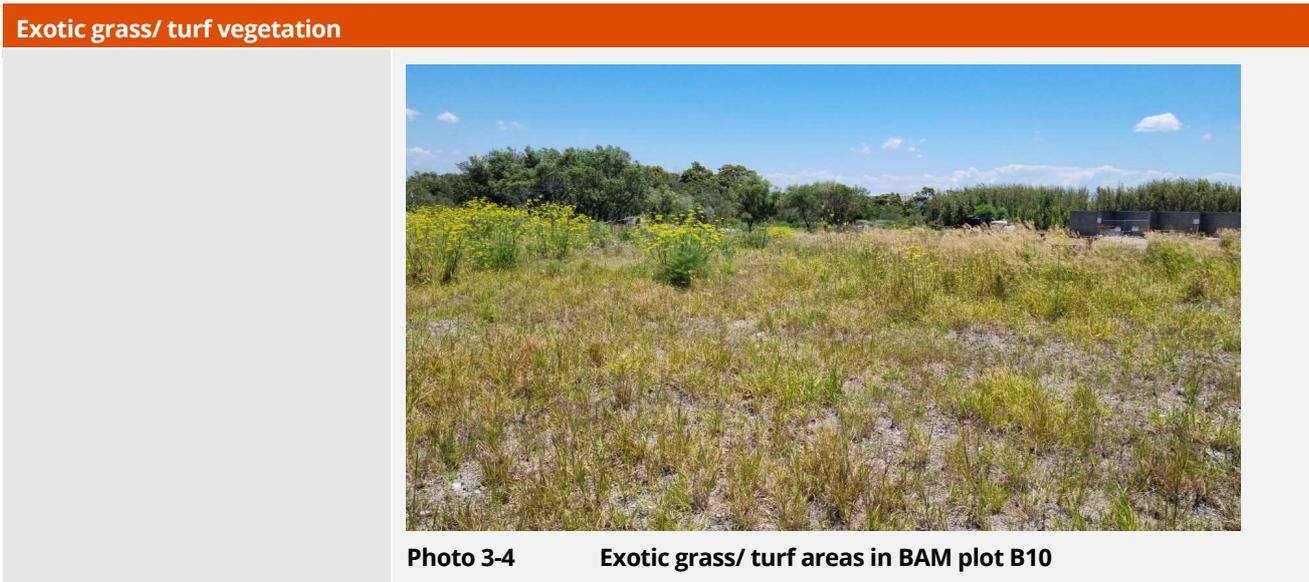


Table 3-2 Planted exotic vegetation

Planted exotic vegetation	
Extent within subject land	2.98 ha
Description	This vegetation type consisted primarily of areas of exotic grass/ turf, with planted exotic canopy trees, such as Radiata Pine <i>Pinus radiata</i> trees or Poplar <i>Populus</i> sp. trees. The exotic grass/ turf understorey frequently consisted of Couch Grass or Kikuyu Grass, however a range of other understorey species were present, the most abundant of which included Lamb's Tongue <i>Plantago lanceolata</i> , Rhodes Grass <i>Chloris gayana</i> , Paspalum <i>Paspalum dilatatum</i> , Weeping Gass <i>Microlaena stipoides</i> , Kidney Weed <i>Dichondra repens</i> and Common Sowthistle.
Survey effort	Two BAM plots (B07 and B12) were collected over the course of the field assessment (Figure 3-3). Plot B07 occur directly adjacent to the subject land, but the vegetation within is representative of the planted exotic vegetation located across the subject land.
Photo	 <p>Photo 3-5 Planted exotic vegetation in BAM plot B07</p>

Planted exotic vegetation



Photo 3-6 Exotic vegetation in BAM plot B12

Table 3-3 Planted native vegetation

Planted native vegetation	
Extent within subject land	0.08 ha
Description	This vegetation type was entirely represented by a row of planted native Broad-leaved Paperbark <i>Melaleuca quinquenervia</i> trees over a maintained exotic turf understorey of Couch Grass. A range of other understorey species were present, the most abundant of which included Lamb’s Tongue, Paspalum and African Love Grass <i>Eragrostis curvula</i> . Native shrub species <i>Acacia longifolia</i> and exotic shrub species African Olive <i>Olea europaea</i> subsp. <i>cuspidata</i> were also present in low abundance.
Survey effort	One BAM plot (B08) was collected over the course of the field assessment (Figure 3-3). This plot occurs directly adjacent to the subject land, but the vegetation within is representative of the planted native vegetation located across the subject land.
Photo	
	Photo 3-7 Planted native vegetation in BAM plot B08

3.1.6 Plant community types

Two PCTs were recorded within the subject land:

- PCT 3545 Coastal Sands Bloodwood Low Forest (Table 3-4)
- PCT 3972 Sydney Creekflat Wetland (Table 3-5).

PCT 3972 was restricted to sunken concrete lined pipeways that in some instances contained dense patches of fringing aquatic vegetation. These areas did not contain all levels of strata and as such were not consistent with any PCT. Instead, these areas were assigned to this 'best-fit' PCT based on the species present and PCTs known to occur in the same IBRA subregion.

The tables below provide detailed descriptions of the PCTs recorded within the subject land. PCTs recorded within the subject land are shown in Figure 3-2.

Table 3-4 PCT 3545 within the subject land

PCT 3545 Coastal Sands Bloodwood Low Forest	
Common name	Coastal Sands Bloodwood Low Forest
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Coastal Dune Dry Sclerophyll Forests
Extent within subject land	4.72 ha
Condition	<p>This community at the subject land was recorded in two condition states:</p> <ul style="list-style-type: none"> • Low (0.35 ha) • Regenerating (4.37 ha) <p>Low condition vegetation contained all levels of strata (canopy, midstorey, groundcover); however, it is not considered to be in moderate or high condition as it occurs on areas of disturbed soil and contains a high abundance of exotic weed species. Regenerating condition has been assigned to areas that were historically devoid of vegetation and where subsequent natural regeneration has taken place. These areas are generally considered to be 'young' where regeneration has likely occurred within the last 5-10 years.</p>
Description	<p>PCT 3545 present in a low condition vegetation was attributed to patches containing a very high weed cover, also missing a native middle strata. The canopy was represented by a sparse cover of Sydney Red Gum <i>Angophora costata</i> and Swamp Mahogany <i>Eucalyptus robusta</i>. The midstorey was mostly absent and dominated by Lantana, but contained occasional occurrences of Old Man Banksia <i>Banksia serrata</i>, Coast Banksia <i>Banksia integrifolia</i> and Cheesewood <i>Pittosporum undulatum</i>. Other abundant exotic weeds included Cobblers Pegs <i>Bidens pilosa</i>, Paspalum, Bitou Bush <i>Osteospermum moniliferum</i>, Fleabane <i>Conyza bonariensis</i>, Crofton Weed <i>Ageratina adenophora</i>, and Largeleaf Pennywort <i>Hydrocotyle bonariensis</i>.</p> <p>Areas in a regenerating condition were generally limited to patches of naturally regenerating shrubs, with sporadically occurring juvenile Sydney Red Gum. Shrub species recorded included Coast Tea Tree <i>Gaudium laevigatum</i>, Clustered Darwinia <i>Darwinia fascicularis</i>, Sydney Golden Wattle <i>Acacia longifolia</i>, Bracken Fern <i>Pteridium esculentum</i>, Coast Banksia, Slender Rice Flower <i>Pimelea linifolia</i>, Variable Sword Sedge <i>Lepidosperma laterale</i>, Bleeding Heart <i>Homalanthus populifolius</i>, Hop Bush <i>Dodonaea triquetra</i>, and Tick Bush <i>Kunzea ambigua</i>. These areas also contained a</p>

PCT 3545 Coastal Sands Bloodwood Low Forest

	high abundance of the weed species listed above for low condition areas.
Survey effort	Three BAM plots (B04, B05 and B06) were collected over the course of the field assessment (Figure 3-3).
Justification of PCT	<p>PCT 3545 within the subject land meets the PCT description (NSW DCCEEW 2025c) via the following:</p> <ul style="list-style-type: none"> • Structure – A mid-high to tall, dry shrubby sclerophyll open forest found on large transgressive sand dunes. • Dominant species – Canopy dominated by Sydney Red Gum and Red Bloodwood with a midstorey of heath and dry shrub species • IBRA region and subregion – Sydney Basin region and Pittwater subregion. <p>This PCT contains a few ‘crossover’ species similar to PCT 3546 Coastal Sands Littoral Scrub-Forest (which is associated with numerous Threatened Ecological Communities [TECs]). However, PCT 3545 is distinguished based on a slight difference in species composition as PCT 3546 contains more mesic species.</p>
TEC status	Not applicable. This PCT is not associated with any state or Commonwealth listed TECs.
Estimate % cleared value of PCT (BioNet)	38% (NSW DCCEEW 2025c).

Photos



Photo 3-8 Regenerating PCT 3545 in BAM plot B04

PCT 3545 Coastal Sands Bloodwood Low Forest



Photo 3-9 Low condition PCT 3545 in BAM plot B05



Photo 3-10 Regenerating condition PCT 3545 in BAM plot B06

Table 3-5 PCT 3972 within the subject land

PCT 3972 Sydney Creekflat Wetland

Common name	Sydney Creekflat Wetland
Vegetation formation	Freshwater Wetlands
Vegetation class	Coastal Freshwater Lagoons
Extent within subject land	0.51 ha
Condition	This artificial community was recorded in a highly modified condition, attributed to areas within sunken concrete lined pipeways that contain patches of aquatic vegetation. These areas are generally dominated by one to two aquatic sedge species with numerous exotic weeds scattered throughout.
Description	This vegetation is considered to be a modified form of PCT 3972 and was present in areas prone to fluctuating levels of standing water, which has resulted in the regeneration of numerous native aquatic sedges. Dominant aquatic species present included Cumbungi <i>Typha orientalis</i> , Common Rush <i>Juncus usitatus</i> , Slender Knot-weed <i>Persicaria decipiens</i> , Umbrella Sedge <i>Cyperus eragrostis</i> , Water Primrose <i>Ludwigia peploides</i> subsp. <i>montevidensis</i> , and Tall

PCT 3972 Sydney Creekflat Wetland	
	Spikerush <i>Eleocharis sphacelata</i> . Numerous exotic weed species were also present, such as Fleabane, Couch Grass, and Common Sowthistle.
Survey effort	One BAM plot (B01) was collected over the course of the field assessment (Figure 3-3).
Justification of PCT	Vegetation within this community does not wholly meet the requirement of any known PCT. However, based on the species present, and the occurrence of PCT 3972 nearby and within the same IBRA subregion, PCT 3972 was considered as a 'best-fit.' This was based on: Structure – Vegetation contains a range of sedges, rushes, and aquatic herbs Occurs in close proximity to wetlands in an area prone to fluctuating levels of standing water. IBRA region and subregion – Sydney Basin region and Pittwater subregion.
TEC status	Not applicable. Whilst PCT 3972 is associated with TECs under the BC Act, in this instance the PCT has been selected as a 'best-fit' PCT only. The vegetation is present in a highly modified form within human-made concrete pipeways. As such the vegetation is not associated with any state or Commonwealth listed TECs.
Estimate % cleared value of PCT (BioNet)	84 % (NSW DCCEEW 2025c).
Photo	
	Photo 3-11 Modified PCT 3972 in BAM plot B01

3.1.7 Threatened ecological communities

Vegetation within the subject land does not represent any listed TECs under the NSW BC Act or the Commonwealth EPBC Act.

3.2 Vegetation integrity assessment

3.2.1 Vegetation zones and patch size class

PCTs within the subject land were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM, and as described in the PCT description tables above. This resulted in three native vegetation zones identified within the subject land. Table 3-6 describes each of the

zones and provides details on the number of BAM floristic plots undertaken in each zone. In addition to these three native vegetation zones, additional areas of vegetation (being exotic grass/ turf, planted exotic vegetation and planted native vegetation) were also identified.

Patch size classes for each vegetation zone present within the subject land were assessed as per Section 4.3.2 of the BAM (DPIE 2020a) using a select process in ArcGIS. All native vegetation with a gap of less than 100 m from the next area of native vegetation (or ≤ 30 m for non-woody ecosystems), is considered a single patch, with a patch able to extend onto adjoining land.

PCT 3545 within the subject land was mapped sequentially with patches of native vegetation in the broader assessment area and were found to form part of a very large patch of connecting vegetation with an area of approximately 481 ha. The connected vegetation comprises intact native vegetation associated with the Kamay Botany Bay National Park and Towra Point Nature Reserve. The modified PCT 3972 vegetation within the subject land was found to form a very small vegetation patch, with a maximum patch size of 0.39 ha (a patch size of 1 ha has been entered into the BAM-C as only whole numbers are accepted).

Patch size classes for each vegetation zone are also outlined in Table 3-6 below.

Table 3-6 Vegetation zones within the development footprint

Vegetation zone	PCT	Condition	BAM plots completed	Area (ha)	Max. patch size development footprint
3545_Low	3545 Coastal Sands Bloodwood Low Forest	Low	1	0.35	>100 ha
3545_Regenerating	3545 Coastal Sands Bloodwood Low Forest	Regenerating	2	4.37	>100 ha
3972_Modified	3972 Sydney Creekflat Wetland	Modified	1	0.51	<5 ha

3.2.2 Vegetation integrity

Vegetation integrity, or condition, was assessed using data obtained from undertaking BAM plots within the vegetation zones, as per Section 4.3.4 of the BAM (DPIE 2020a). Plot data was collected via:

- A 20 m x 50 m quadrat and 50 m transect for assessment of site attributes and function.
- A 20 m x 20 m quadrat, nested within the larger quadrat for full floristic survey to determine composition and structure of the PCT.

The minimum number of BAM plots per vegetation zone was determined using Table 3 of the BAM (DPIE 2020a). In total, four BAM plots were completed within the native vegetation zones present within the development footprint, and a further seven BAM plots have been completed in areas of non-native or planted vegetation that did not comprise a PCT. Details of all 11 BAM plots are provided in Table 3-7 and shown on Figure 3-3. Two BAM plots (B06 and B08) were not located within the final development footprint for the proposed modification. These plots are all located adjacent to the subject land and were located in these areas such as to accurately represent the PCTs present (i.e., placement was such to avoid placing plots on the edge of vegetation patches or in ecotones that would be given inaccurate vegetation integrity scores).

Table 3-7 BAM plots completed within the subject land

BAM plot reference	Vegetation zone	BAM plot reference	Vegetation zone
B01	3972_Modified	B07	Planted exotic
B02	Exotic grass/turf	B08	Planted natives
B03	Exotic grass/turf	B09	Exotic grass/turf
B04	3545_Regenerating	B10	Exotic grass/turf
B05	3545_Low	B12	Planted exotic
B06	3545_Regenerating		

Assessment of vegetation integrity was undertaken using standard benchmark data as outlined in the BAM and held in the BioNet Vegetation Classification database for BAM plots B01, B04, B05 and B06. As BAM plots B02, B03, B07, B08, B09, B10 and B12 did not conform to any PCTs, no further assessment of these plots is required. A list of flora species was compiled for each BAM plot completed and is included in Annexure C. Records of all flora species will be submitted to NSW DCCEEW for incorporation into the Atlas of NSW Wildlife.

3.2.3 Vegetation integrity score

Plot data was entered into the BAM calculator to determine vegetation integrity score. Plot data are presented in Annexure C, with vegetation integrity scores for each vegetation zones provided in Table 3-8.

Table 3-8 Vegetation zone integrity scores

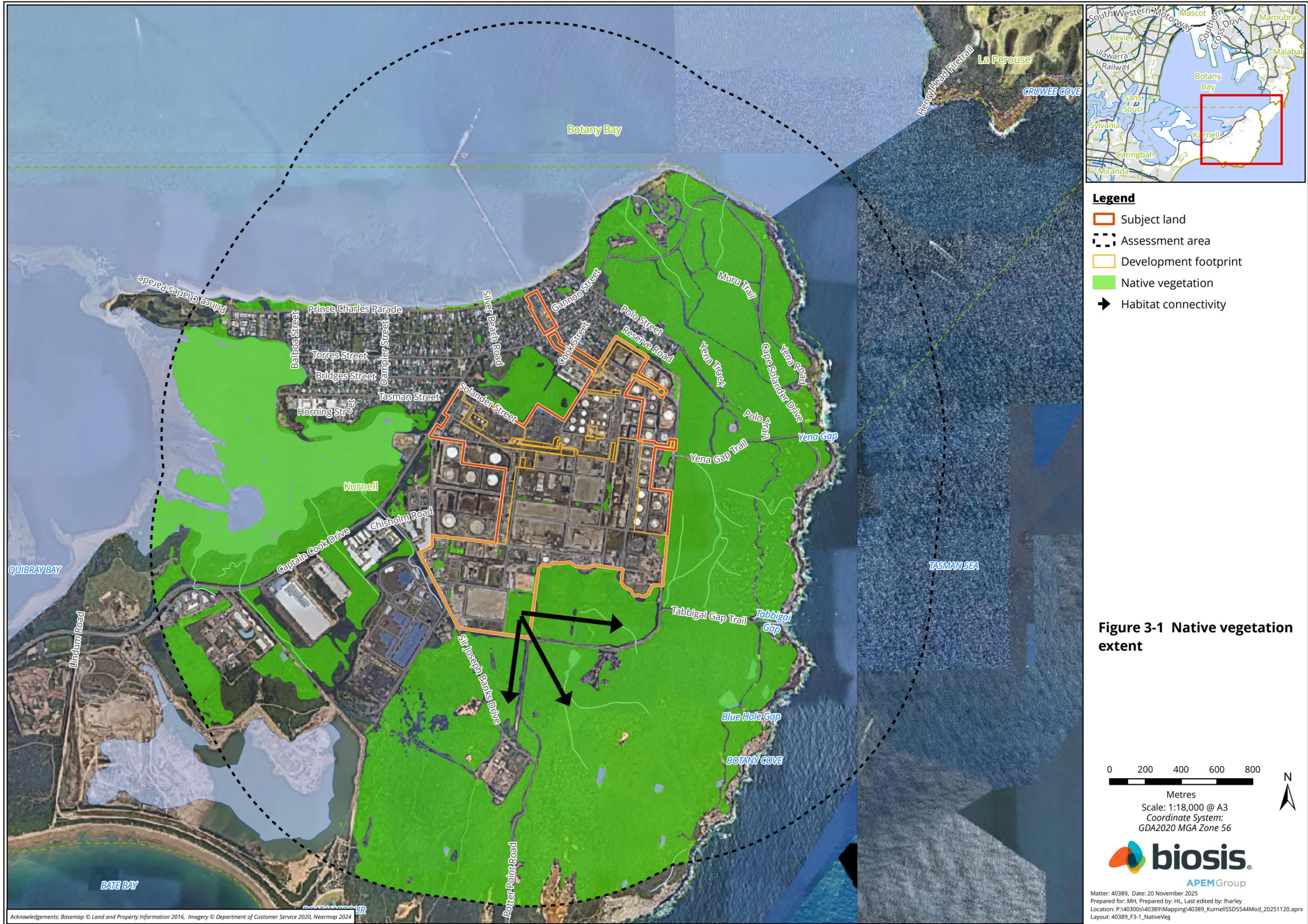
Vegetation zone	Composition score	Structure score	Function score	VI score*	Hollow-bearing Trees present
3545_Low	45.7	22.1	54.7	38.1	1
3545_Regenerating	45.3	30.5	38.9	37.7	0
3972_Modified	50	18.2	-	30.1	0

*Vegetation integrity (VI). Benchmark (pristine) condition vegetation would receive a VI score of 100.

As outlined in Section 9.2.1 of the BAM (DPIE 2020a), an offset is required for impacts on native vegetation where the vegetation integrity score is:

- ≥ 15 where the PCT is representative of an endangered or critically endangered ecological community.
- ≥ 17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or is representative of a vulnerable ecological community.
- ≥ 20 where the PCT is not representative of a TEC or associated with threatened species habitat.

As such, ecosystem credit offsets are required for all vegetation zones.



Legend

- Subject land
- Assessment area
- Development footprint
- Native vegetation
- ➔ Habitat connectivity

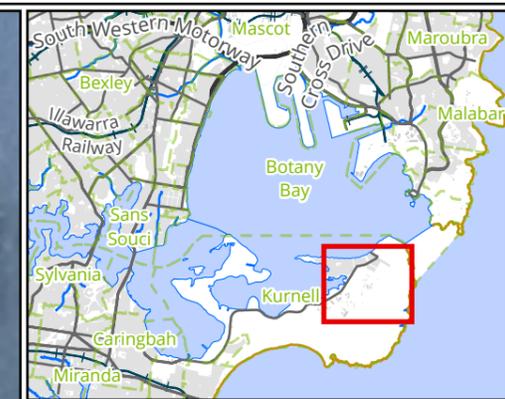
Figure 3-1 Native vegetation extent

0 200 400 600 800
 Metres
 Scale: 1:18,000 @ A3
 Coordinate System:
 GDA2020 MGA Zone 56



Matter: 40389, Date: 20 November 2025
 Prepared for: MH, Prepared by: HL, Last edited by: Iharley
 Location: P:\40300s\40389\Mapping\40389_Kurnell\SSD5544Mod_20251120.aprx
 Layout: 40389_F3-1_NativeVeg

Acknowledgements: Basemap © Land and Property Information 2016, Imagery © Department of Customer Service 2020, Nearmap 2024



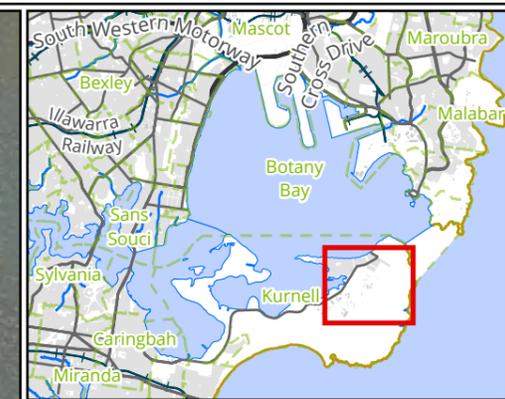
- Legend**
- Subject land
 - Development site
 - Development footprint
 - + Hollow-bearing tree
- Native vegetation - Biosis**
- 3545 - Coastal Sands Bloodwood Low Forest (Regenerating)
 - 3545 - Coastal Sands Bloodwood Low Forest (Low)
 - 3972 - Sydney Creekflat Wetland (Modified)
- Non-native vegetation - Biosis**
- Planted natives
 - Planted exotics
 - Exotic grass / turf

Figure 3-2 Vegetation within the subject land

0 100 200 300 400
Metres
Scale: 1:9,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56



Matter: 40389, Date: 20 November 2025
Prepared for: MH, Prepared by: HL, Last edited by: Iharley
Location: P:\40300s\40389\Mapping\40389_KurnellSSD5544Mod_20251120.aprx
Layout: 40389_F3-2_BiosisVeg



- Legend**
- Subject land
 - Development site
 - Development footprint
 - BAM plot
- Native vegetation - Biosis**
- 3545_Regenerating
 - 3545_Low
 - 3972_Modified
- Non-native vegetation - Biosis**
- Planted natives
 - Planted exotics
 - Grass / turf

Figure 3-3 Vegetation zones and plot locations

0 100 200 300 400
 Metres
 Scale: 1:9,000 @ A3
 Coordinate System:
 GDA2020 MGA Zone 56



Matter: 40389, Date: 20 November 2025
 Prepared for: MH, Prepared by: HL, Last edited by: Iharley
 Location: P:\40300s\40389\Mapping\40389_Kurnell\SSD5544Mod_20251120.aprx
 Layout: 40389_F3-3_VegZones

Acknowledgements: Basemap © Land and Property Information 2016, Imagery © NearMap, June 2024

4 Threatened species

4.1 Ecosystem credit species

A list of predicted species (ecosystem credit species) expected to occur within the subject land was generated as per Section 5 of the BAM (DPIE 2020a). Impacts to these species require assessment; however, targeted survey is not required as these species are assumed to occur, based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape and calculated patch sizes. These species are identified as ecosystem credit species in the TBDC. Table 4-1 lists the ecosystem credit species that were generated by the BAM-C as having potential to occur. No generated ecosystem credit species were able to be discounted, based on geographical restrictions or a lack of suitable habitat, from using the subject land on occasion.

These species were considered when prescribing management and mitigation measures for the proposed modification.

Table 4-1 Ecosystem credit species (predicted species) with potential to occur

Species name	Common name
<i>Botaurus poiciloptilus</i>	Australasian Bittern
<i>Rostratula australis</i>	Australian Painted Snipe
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit (baueri)
<i>Ixobrychus flavicollis</i>	Black Bittern
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)
<i>Limosa limosa</i>	Black-tailed Godwit
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Calidris ferruginea</i>	Curlew Sandpiper
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat
<i>Numenius madagascariensis</i>	Eastern Curlew
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle
<i>Pandion cristatus</i>	Eastern Osprey
<i>Petroica phoenicea</i>	Flame Robin
<i>Stictonetta naevosa</i>	Freckled Duck
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo
<i>Phoniscus papuensis</i>	Golden-tipped Bat
<i>Calidris tenuirostris</i>	Great Knot
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat
<i>Charadrius leschenaultii</i>	Greater Sand-plover
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat
<i>Charadrius mongolus</i>	Lesser Sand-plover

Species name	Common name
<i>Miniopterus australis</i>	Little Bent-winged Bat
<i>Hieraaetus morphnoides</i>	Little Eagle
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Pseudomys novaehollandiae</i>	New Holland Mouse
<i>Calidris canutus</i>	Red Knot
<i>Anthochaera phrygia</i>	Regent Honeyeater
<i>Varanus rosenbergi</i>	Rosenberg's Goanna
<i>Calidris alba</i>	Sanderling
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo
<i>Circus assimilis</i>	Spotted Harrier
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Lathamus discolor</i>	Swift Parrot
<i>Xenus cinereus</i>	Terek Sandpiper
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle
<i>Hirundapus caudacutus</i>	White-throated Needle-tail
<i>Petaurus australis</i>	Yellow-bellied Glider
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat

4.2 Species credit species

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence, or components of their habitat. These candidate species are identified as species credit species in the TBDC. A targeted survey or an expert report is required to confirm the presence of these species on the subject land, or alternatively the species can be assumed to be present (DPIE 2020a).

Annexure B provides the lists of species credit species predicted to occur within the subject land based on the IBRA subregion within which the proposed modification occurs, the native vegetation cover present within the 1,500 metre buffer assessment area, the PCTs present within the subject land, and the patch sizes listed in Table 3-6.

The potential for a species to occur within the subject land was assessed in accordance with Section 5.2 of the BAM (DPIE 2020a) and species with geographical restrictions, or habitat constraints not present, were not required to be assessed. A total of 44 predicted species credit species have been excluded from occurring within the subject land based on habitat constraints detailed within the BAM-C (such as lack of important area mapping within the subject land or lack of suitable hollow-bearing trees), geographic limitations, or substantial degradation of potential habitat. A summary of excluded species is provided in Table 4-2. Further rationale for all excluded candidate species is included in Annexure B.

Table 4-2 Excluded candidate species credit species

Species name	Common name	Exclusion rationale
Flora		
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	Habitat degraded
<i>Chamaesyce psammogeton</i>	Sand Spurge	Habitat degraded
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	Habitat degraded
<i>Galium australe</i>	Tangled Bedstraw	Habitat degraded
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	Habitat degraded
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	Habitat degraded
<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	Habitat degraded
Birds		
<i>Anthochaera phrygia</i>	Regent Honeyeater (Breeding)	Habitat constraints (important area mapping)
<i>Burhinus grallarius</i>	Bush Stone-curlew	Habitat constraints (lack of fallen or standing dead timber).
<i>Calidris alba</i>	Sanderling (Breeding)	Habitat constraints (important area mapping)
<i>Calidris canutus</i>	Red Knot (Breeding)	Habitat constraints (important area mapping)
<i>Calidris ferruginea</i>	Curlew Sandpiper (Breeding)	Habitat constraints (important area mapping)
<i>Calidris tenuirostris</i>	Great Knot (Breeding)	Habitat constraints (important area mapping)
<i>Collocephalon fimbriatum</i>	Gang-gang Cockatoo (Breeding)	Habitat constraints (lack of suitable hollows)
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo (Breeding)	Habitat constraints (lack of suitable hollows)
<i>Charadrius leschenaultii</i>	Greater Sand-plover (Breeding)	Habitat constraints (important area mapping)
<i>Charadrius mongolus</i>	Lesser Sand-plover (Breeding)	Habitat constraints (important area mapping)
<i>Eudyptula minor</i>	Little Penguin (endangered population)	Habitat degraded
<i>Haematopus longirostris</i>	Pied Oystercatcher	Habitat constraints (not within 100 metres of estuarine areas or the ocean)
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (Breeding)	Habitat degraded
<i>Hieraaetus morphnoides</i>	Little Eagle	Habitat degraded
<i>Lathamus discolor</i>	Swift Parrot (Breeding)	Habitat constraints (important area mapping)
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit (baueri) (Breeding)	Habitat constraints (important area mapping)
<i>Limosa limosa</i>	Black-tailed Godwit (Breeding)	Habitat constraints (important area mapping)
<i>Lophoictinia isura</i>	Square-tailed Kite (Breeding)	Habitat degraded
<i>Neophema chrysogaster</i>	Orange-bellied Parrot	Habitat degraded
<i>Nettapus coromandelianus</i>	Cotton Pygmy-Goose	Habitat constraints (lack of deep, permanent freshwater)
<i>Ninox connivens</i>	Barking Owl	Habitat constraints (lack of suitable hollows)
<i>Ninox strenua</i>	Powerful Owl	Habitat constraints (lack of suitable hollows)
<i>Numenius madagascariensis</i>	Eastern Curlew (Breeding)	Habitat constraints (important area mapping)
<i>Pandion cristatus</i>	Eastern Osprey (Breeding)	Habitat constraints (lack of stick nests)

Species name	Common name	Exclusion rationale
<i>Tyto novaehollandiae</i>	Masked Owl	Habitat degraded
<i>Xenus cinereus</i>	Terek Sandpiper (Breeding)	Habitat constraints (important area mapping)
Mammals		
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	Habitat constraints (lack of dense ground cover)
<i>Miniopterus australis</i>	Little Bent-winged Bat (Breeding)	Habitat constraints (lack of suitable breeding caves/structures)
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat (Breeding)	Habitat constraints (lack of suitable breeding caves/structures)
<i>Perameles nasuta</i>	Long-nosed Bandicoot (endangered population)	Geographic limitations (the subject land is not located on North Head or Sydney Harbour National Park)
<i>Petaurus norfolcensis</i>	Squirrel Glider	Habitat degraded
<i>Petaurus norfolcensis</i> (Endangered population)	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	Geographic limitations (the subject land is not located on Barrenjoey Peninsula)
<i>Petauroides volans</i>	Southern Greater Glider	Habitat degraded
<i>Phascolarctos cinereus</i>	Koala	Habitat degraded
<i>Potorous tridactylus</i>	Long-nosed Potoroo	Habitat constraints (lack of dense shrub/canopy layers required to support species)
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (Breeding)	Habitat constraints (lack of breeding camps)
Frogs		
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Habitat degraded

A detailed assessment of potential for occurrence, and potential for impact, for all species credit species predicted to occur within the subject land is provided in Annexure B. Species credit species considered to potentially occur within the subject land, and thus considered 'candidate species credit species' have been either assumed present, subject to an expert report, or the subject of the target of threatened species surveys.

No additional species credit species were added to the assessment that were not predicted by the BAM-C or BioNet to occur within the subject land.

All candidate species credit species considered as part of this assessment, and their associated method of assessment, are listed in Table 4-3 (flora species) and Table 4-4 (fauna species).

4.2.1 Threatened flora

Habitats for threatened flora species within the subject land are largely considered degraded due to the high degree of development, past vegetation clearing, and current land use. As such, many of the vegetated areas within the development footprint are comprised of exotic grass/ turf, urban exotic, and urban planted native vegetation, with the remaining patches of native vegetation primarily consisting of low and modified condition communities. The vegetation across the subject land was largely disturbed, containing a moderate to high cover of exotic species, predominantly in the understorey and midstorey. Overall, most of the vegetation within the subject land is highly fragmented and subject to edge effects and other disturbance.

Table 4-3 provides a list of candidate flora species credit species considered in this assessment, each species' required survey period and the relevant method of assessment. Further detail of the targeted surveys undertaken are provided below.

Table 4-3 Candidate flora species credit species

Species name	Common name	Survey period	Method of assessment
<i>Acacia terminalis</i> subsp. <i>Eastern Sydney</i>	Sunshine Wattle	May-July	Straight line parallel transects 10 m apart
<i>Callistemon linearifolius</i>	Netted Bottle Brush	October-January	Straight line parallel transects 10 m apart
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	All year	Straight line parallel transects 10 m apart
<i>Melaleuca groveana</i>	Grove's Paperbark	All year	Straight line parallel transects 10 m apart
<i>Senecio spathulatus</i>	Coast Groundsel	All year	Straight line parallel transects 10 m apart
<i>Syzygium paniculatum</i>	Magenta Lily Pilly	April-June	Straight line parallel transects 10 m apart

4.2.2 Threatened fauna

Fauna habitat assessment was undertaken to determine whether the vegetation to be impacted by the proposed modification contained microhabitats suitable to support the candidate fauna species credit species, as outlined in Annexure B.

Similar to threatened flora, habitats for threatened fauna species within the subject land are largely considered degraded due to the high degree of development, past vegetation clearing, and current land use. As such, much of the vegetated areas within the development footprint are comprised of exotic grass/ turf, planted exotic, and planted native vegetation, with the remaining patches of native vegetation consisting of highly modified communities in a relatively poor condition.

The main areas of potential fauna habitat were represented by the patch of regenerating and low condition PCT 3545 within Zone 3 (Figure 3-2), as well as the scattered patches of modified PCT 3972 that were growing in the concreted pipeways across the development site. These scattered patches of aquatic vegetation represented potential habitat for threatened frogs, microbats, and aquatic birds, whilst the remaining areas of native vegetation represented potential habitat for threatened frog, bird, mammal, and invertebrate species. Finally, human-made structures, including warehouses and substations (Figure 1-2), are present throughout Zones 2 and 3 and would be demolished. Given that buildings can often provide suitable roosting habitat for microbat species, these structures were subject to survey to assess their potential as roosting sites.

Table 4-4 provides a list of candidate fauna species credit species considered in this assessment, each species' required survey period and the relevant method of assessment. Further detail of the targeted surveys undertaken are provided below.

Table 4-4 Candidate fauna species credit species

Species name	Common name	Survey period	Method of assessment
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	October-March	<ul style="list-style-type: none"> • Camera trapping. • Spotlighting surveys (supported with thermal camera for spotting).
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	November to January	<ul style="list-style-type: none"> • Harp trapping surveys. • Roost searches (human-made buildings).
<i>Crinia tinnula</i>	Wallum Froglet	All year after flooding rains	<ul style="list-style-type: none"> • Aural-visual surveys • Call playback surveys
<i>Litoria aurea</i>	Green and Golden Bell Frog	November-March	<ul style="list-style-type: none"> • Aural-visual surveys • Call playback surveys
<i>Meridolum maryae</i>	Maroubra Woodland Snail	All year	<ul style="list-style-type: none"> • Modified Spot Assessment Technique (SAT) surveys. • Spotlighting surveys.
<i>Myotis macropus</i>	Southern Myotis	October-March	<ul style="list-style-type: none"> • Harp trapping surveys. • Thermal surveys. • Echometer surveys. • Roost searches (human-made buildings).

4.3 Threatened species survey details

Targeted threatened species surveys of the subject land were undertaken from February 2024 to January 2025. Weather observations for each survey date are shown in Table 4-5, using information from the Australia Government Bureau of Meteorology website.

Table 4-5 Weather observations during targeted flora and fauna surveys (Sydney, NSW)

Survey undertaken	Survey date	Temperature (°C)		Rain (mm)
		Min.	Max.	
Amphibian surveys Squirrel Glider surveys	12/02/2024	21.4	29.9	2
Amphibian surveys Squirrel Glider surveys	13/02/2024	22.6	31.7	0
Amphibian surveys Squirrel Glider surveys	26/02/2024	19.7	27.6	0
Amphibian surveys Squirrel Glider surveys	27/02/2024	21.5	26.7	1
Diurnal microbat roost surveys	11/04/2024	12.1	22.4	0
Maroubra Woodland Snail surveys Microbat dusk emergence surveys	21/05/2024	11.5	18.7	0.8
Targeted flora survey Microbat dusk emergence surveys	22/05/2024	9.2	20.7	0.2
Microbat harp trapping	09/12/2024	17.9	24.8	0
Microbat harp trapping	10/12/2024	18.9	25.1	0

Survey undertaken	Survey date	Temperature (°C)		Rain (mm)
		Min.	Max.	
Microbat harp trapping	11/12/2024	19.8	26.2	0
Microbat harp trapping	12/12/2024		29.1	0
Microbat harp trapping	13/12/2024	18.1	31.9	0
Deploy arboreal remote cameras	19/12/2024	20.2	23.5	0
Collect arboreal remote cameras	7/01/2025	19.0	23.3	0
Targeted flora survey	13/01/2025	21.1	30.7	0
Maroubra Woodland Snail nocturnal surveys				
Eastern Pygmy-possum spotlight surveys				
Maroubra Woodland Snail nocturnal surveys	14/01/2025	21.8	30.3	0
Eastern Pygmy-possum spotlight surveys				

Details of surveys undertaken as part of the current assessment are provided below.

4.3.1 Threatened Flora

Targeted surveys for threatened species were undertaken by qualified ecologists Jake Schwebel, Bret Stewart, Todd Horton and Julia Hutton on 22 May 2024 and 13 January 2025 over a total of 20 person hours.

Survey method and effort

Targeted surveys for threatened flora were undertaken over two days and included 10 metre separated transect searches in areas of potential habitat. Due to logistical complications, the widths of survey transect lines were adjusted where necessary. Logistical complications included:

- Physical barriers such as dense vegetation or rugged terrain.
- Areas of large, dense weed plumes (particularly Lantana).

Justification of survey method and effort

Survey guidelines followed included:

- Section 5 of the BAM to determine the potential for threatened species identified under the BAM as 'ecosystem credit species' and 'species credit species' to occur (DPIE 2020a).
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004b).
- *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020b).

Timing of survey

The survey was conducted accordance with the seasonal requirements detailed in the TBDC survey notes for all candidate flora species except for Netted Bottle Brush. As no *Callistemon* spp. were identified during the targeted flora surveys, the species can be safely considered to be absent from the subject land. The required survey period and survey methodology for all flora candidate species credit species is described in Table 4-3.

Survey personnel and relevant experience

Targeted flora surveys were undertaken by the Biosis ecologists listed in Table 4-6.

Table 4-6 Targeted flora survey personnel and relevant experience

Staff member	Role	Relevant experience
Jake Schwebel	Botanist	Over 3 years' experience in ecological consulting. Experience includes vegetation mapping, habitat assessments for threatened species and targeted flora surveys in NSW, with particular focus on surveys within the Sydney and western Sydney regions.
Todd Horton	Botanist	Over 2 years' experience in ecological consulting. Experience includes vegetation mapping, habitat assessments for threatened species and targeted flora surveys in NSW, with particular focus on surveys within the Sydney, south coast, and western Sydney regions.
Bret Stewart	Senior Ecologist	Over 15 years' experience in ecological consulting. Experience in a wide a variety of ecological survey, including detailed habitat assessments and targeted flora surveys in NSW.
Julia Hutton	Graduate Ecologist	Over 1 years' experience in ecological consulting, including undertaking targeted flora surveys in NSW.

Results

Table 4-7 provides a summary of the results of the targeted flora surveys completed.

Table 4-7 Summary of targeted flora survey method and results

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Acacia terminalis</i> subsp. <i>Eastern Sydney</i>	Sunshine Wattle	Straight line parallel transects 10 m apart	Not recorded during surveys	Not required
<i>Callistemon linearifolius</i>	Netted Bottle Brush	Straight line parallel transects 10 m apart	Not recorded during surveys	Not required
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	Straight line parallel transects 10 m apart	Not recorded during surveys	Not required
<i>Melaleuca groveana</i>	Grove's Paperbark	Straight line parallel transects 10 m apart	Not recorded during surveys	Not required
<i>Senecio spathulatus</i>	Coast Groundsel	Straight line parallel transects 10 m apart	Not recorded during surveys	Not required
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	Straight line parallel transects 10 m apart	Not recorded during surveys	Not required

4.3.2 Fauna habitat assessments

Fauna habitat assessment was undertaken to determine the presence of microhabitats and other critical habitat components (habitat constraints) suitable for all fauna species outlined in Table 4-4 and Annexure B. Habitat assessments focussed on the presence of the following features within the subject land:

- Habitat trees including large and/or hollow-bearing trees, stick nests, availability of flowering shrubs, and canopy/ understorey feed tree species.

- Condition and type of native vegetation and the presence of exotic species.
- Presence and condition of pools and waterways.
- Quantity of ground litter and woody debris.
- Searches for indirect evidence of fauna (i.e. feathers, tracks, and scats).
- General degradation of the development site as a result of past and current disturbances such as vegetation clearing and industrial land management practices.
- Topography and landscape morphology.

Several habitat features with potential to support threatened species credit species were identified during these habitat assessments. These features have been summarised in Table 4-8.

Table 4-8 Habitat features with potential to support threatened species credit species

Habitat feature	Presence within the development footprint
Hollow-bearing trees	There was one hollow-bearing trees within the subject land, located within the patch of low quality PCT 3545 (Figure 3-2). This tree contained one medium sized hollow (50-149 mm) in its trunk, however this was close to the ground (1 m off the ground) and is therefore unsuitable for the candidate species credit species (i.e., cockatoos and owls).
Feed tree species	Native tree species within the subject land were found to have potential to provide suitable foraging resources for mobile species known to occur in urban environments. Trees and shrubs providing food resources for smaller mammals were also recorded, but in low abundance throughout the development footprint.
Caves and rocky overhangs	There were no caves or rocky overhangs within the subject land. A total of 14 structures would be removed as part of the proposed modification, which represent potential roosting sites. No roosts were detected during surveys. No other suitable roosting habitat for cave-roosting bats (such as culverts, mine shafts etc.) were recorded.
Rocky outcrops and sandstone crevices	There were no rocky outcrops or sandstone crevices within the subject land.
Major and minor watercourses and waterbodies (i.e. dams)	There were no waterbodies within the subject land. However, there were numerous sunken concrete lined pipeways containing aboveground petroleum pipelines. These pipeways temporarily flood with water following rain events and can contain extensive areas of shallow (<5 cm deep) water and some smaller areas of deeper (0.5 to 1 m deep) water. In some locations, these areas contained dense patches of fringing aquatic vegetation
Woody debris and leaf litter	No woody debris and limited leaf litter were found within the subject land. Small patches associated with regenerating native vegetation occurred, however, due to historical ground disturbance and the highly modified nature of the vegetation present, woody debris and leaf litter are considered unsuitable for providing habitat for threatened species.
Soft sandy soil	While the majority of the subject land consisted of modified landscapes, including pavement, concrete, compacted soils, and crushed rock or concrete rubble, patches of native vegetation were found to occur on soft aeolian sands which were suitable for burrowing for small mammals and some reptiles and amphibians.

Field capture of detailed fauna habitat information allowed for confirmation of habitat features and microhabitats for a range of candidate threatened species across surveyed portions of the development footprint. Fauna habitat assessments were captured using ArcGIS polygons attributed with specific habitat

criteria that allowed for planning of further targeted survey for select species, or the exclusion of the potential for occurrence of various candidate species from the subject land.

4.3.3 Amphibians

Targeted surveys for the following candidate species were undertaken:

- Green and Golden Bell Frog.
- Wallum Froglet.

Targeted surveys were undertaken by two ecologists across four evenings (12-13 February 2024 and 26-27 February 2024) from sunset. Survey method involved undertaking aural-visual transects within areas of suitable habitat (cumulatively up to 1,200 m length) by two ecologists. Calls were played at regular intervals (every 50 m) along each transect. Approximately six person hours were spent surveying each evening for a total of 24 person hours of survey effort.

Survey method and effort

Survey method and effort conformed to the BAM survey guideline *NSW Survey Guide for Threatened Frogs* (DPIE 2020c).

Justification of survey method and effort

The TBDC and *NSW Survey Guide for Threatened Frogs* (DPIE 2020c) specify that targeted survey for Green and Golden Bell Frog and Wallum Froglet should be undertaken between November and March. Surveys were undertaken in February, satisfying this requirement. Surveys were undertaken following an extended period of high rainfall in January and February 2024, with 65.8 millimetres (mm) of rain recorded at Sydney Airport in January and 147 mm recorded in February, of which 22.6 mm was recorded on 6 February and 9 mm recorded on 10 February prior to the first survey period, and a further 114 mm was recorded in between the first and second survey period. This included a period of heavy falls totalling 41.4 mm and 34.2 mm on 20 and 21 February respectively. Many shallow depressions were observed to be flooded with water at the time of survey. It is therefore considered that the requirement for 'flooding rains'¹ preceding survey for Wallum Froglet has been met.

Survey personnel and relevant experience

Frog surveys were undertaken by the Biosis ecologists outlined in Table 4-9.

¹ 'Flooding rains' refers to the specific survey requirement for the Wallum Froglet, which specifies that surveys should be conducted following significant rainfall events that result in flooded conditions. In this case, the rainfall data provided indicates that there was a sufficient amount of rain. This meets the *NSW Survey Guide for Threatened Frogs* (DPIE 2020c) for 'flooding rains' prior to conducting the survey for Wallum Froglet.

Table 4-9 Targeted frog survey personnel and relevant experience

Staff member	Role	Relevant experience
Bret Stewart	Senior Zoologist	BSc. Evolution and Ecology Accredited BAM assessor (BAAS22033) Over 10 years' experience undertaking impact assessment, project management and threatened fauna surveys across new South Wales and the Sydney Basin Bioregion. Experience includes targeted survey and successful detections of both Green and Golden Bell Frog (at Nowra, Kooragang Island, Crescent Head, and Sydney Olympic Park) and Wallum Froglet (at Gwandalan).
Julia Hutton	Graduate Zoologist	BSc. Ecology and Conservation Over 2-years' experience completing fauna surveys, including assisting with multiple call/playback frog surveys for Green and Golden Bell Frog (and other candidate frog species). Experience includes successful detections of Green and Golden Bell Frogs at reference sites (Nowra).

Results

No Green and Golden Bell Frogs or Wallum Froglets were recorded during targeted surveys, nor were any other threatened amphibian species. The following non-threatened species were recorded:

- Common Eastern Froglet *Crinia signifera*.
- Peron's Tree Frog *Litoria peronii*.
- Brown-striped Frog *Limnodynastes peronii*.
- Eastern Dwarf Tree Frog *Litoria fallax*.

Limitations

A reference site check involves surveys nearby populations of the target species to confirm that they are actively calling, which helps assess the suitability of the survey conditions. Reference sites were not checked for either target species. Despite this, Green and Golden Bell Frog were known to be calling in the Sydney Region on 16 January 2024. In addition, the weather conditions during survey were considered to be optimal, being warm and preceded by heavy rain which flooded many shallow temporary pools across the subject land. Additionally, common frog species were heard in full chorus during the survey, with a notable increase in calling activity during the 26-27 February survey period, indicating that conditions were generally suitable for frog activity.

Survey access in some sections of the pipeways was limited due to asbestos contamination controls. Staff entered the contaminated pipeways on only one night of survey. However, it was possible to undertake aural-visual survey at a distance of less than 20 m from aquatic habitats in the contaminated pipeways during the other three nights of surveys. Surveyors were equipped with spotlights and binoculars to observe calling frogs, and due to the sparse vegetation in the pipeways in most sections an unobstructed view of open water and flooded areas was possible.

4.3.4 Invertebrates

Diurnal targeted surveys for the Maroubra Woodland Snail were undertaken by two ecologists on 21 May 2024, with nocturnal spotlighting surveys undertaken over two nights on 13 and 14 January 2025.

Survey method and effort

The diurnal survey methodology consisted of a modified Spot Assessment Technique (SAT) (Phillips & Callaghan 2011) within areas of suitable habitat, with 30 microhabitats sampled around a central survey point. Each microhabitat sample was searched for a minimum of two person minutes with ecologists gently raking leaves and woody debris searching for live snails or empty shells. The nocturnal survey methodology consisted of spotlighting over two nights by two ecologists undertaking meandering transects within areas of potential habitat at a very slow walking pace. Ecologists targeted micro-habitats for snails during these surveys. The spotlighting surveys for Maroubra Snail were undertaken separately to those undertaken for Eastern Pygmy-possum, with the former focussed on the ground level and the later focussed in the canopy.

Justification of survey method and effort

Survey methods followed published survey recommendations for the related Cumberland Plain Land Snail *Meridolum corneovirens* (NPWS 2000). The survey recommendations were adapted to the microhabitats preferred by Maroubra Woodland Snail, being leaf litter in sandy coastal vegetation. Searches also included turning over logs and other larger ground litter (e.g. dumped strips of shade cloth) which provide moist refugia. The modified SAT technique allows search effort to be quantified while also ensuring a minimum search time at each habitat patch.

Following completion of the diurnal survey, methodologies (both diurnal and nocturnal) were released on BioNet for this species. The described diurnal survey effort above is considered consistent with the released survey methods which recommend undertaking meandering transect across suitable habitat, searching for empty shells, and targeted microhabitats likely to be utilised by the species (i.e., leaf litter, decorticated bark, coarse woody debris, grass clumps and discarded rubbish). The survey effort undertaken is considered sufficient to cover the potential habitat identified within the development footprint.

Timing of survey

This species may be surveyed at any time of year. Detections of shells allow for identification of the species even when live snails are not present or active.

Survey personnel and relevant experience

Invertebrate surveys were undertaken by the Biosis ecologists outlined in Table 4-10.

Table 4-10 Targeted invertebrate survey personnel and relevant experience

Staff member	Role	Relevant experience
Bret Stewart	Senior Zoologist	BSc. Evolution and Ecology Accredited BAM assessor (BAAS22033) Over 10 years' experience undertaking impact assessment, project management and threatened fauna surveys across New South Wales and the Sydney Basin Bioregion. Experience includes detection and identification of <i>Meridolum</i> snails in the Sydney Region.

Staff member	Role	Relevant experience
Joel Nicholson	Senior Zoologist	BSc. Over 5 years’ experience undertaking impact assessment, project management and threatened fauna surveys across New South Wales and the Sydney Basin Bioregion. Experience includes detection and identification of <i>Meridolum</i> snails in the Sydney Region.
Julia Hutton	Graduate Zoologist	BSc. Ecology and Conservation Over 2-years’ experience completing fauna surveys and has assisted with the completion of numerous targeted fauna surveys. Experience includes detection and identification of <i>Meridolum</i> snails in the Sydney Region.

Results

No Maroubra Woodland Snails or similar species in the *Meridolum* or *Pommerhelix* genera were observed. More than 40 shells of the introduced Asian Tramp Snail *Bradybaena similaris* were recorded in densely vegetated areas in the south of Zone 3 (Photo 4-1). An additional shell of marine origins was also located and is depicted in the photo below.

During the nocturnal spotlighting surveys, a Giant Dragonfly was incidentally recorded, thus confirming the presence of the species within the broader assessment area. The Giant Dragonfly was detected in a connected patch of vegetation to the south of the subject land, which occurs within 500 metres of wetland environments.



Photo 4-1 Empty shells collected during targeted surveys for Maroubra Woodland Snail



Photo 4-2 Giant Dragonfly detected during surveys

Limitations

Surveyors had sufficient experience to distinguish *Meridolum* or *Pommerhelix* land snails from the more common introduced species. If any shells similar to these native snail genera were detected, these would have been collected and sent to an expert to confirm identification.

Every snail shell detected was readily identifiable as an Asian Tramp Snail and not a native snail species due to the presence of a distinctive reddish stripe.

4.3.5 Mammals

Eastern Pygmy-possum spotlighting surveys were undertaken over two nights 13 – 14 January 2025. Remote cameras were also deployed for this species and were functional between 19 December 2024 and 7 January 2025.

Survey method and effort

Five arboreal remote cameras were deployed for this species in December and January, which is within the allowable survey season for this species. Cameras were set up in native vegetation considered likely to support the species. Bait stations baited with universal bait (peanut butter, honey and oats) were set up within the field of view of deployed cameras. Cameras were deployed for 19 nights however two bait stations were lost (one slipped down out of view of the camera, and one was removed by a Brush-tailed Possum) on the first night, giving a total of 57 trap nights.

The remote camera surveys were supplemented with spotlight surveys, conducted by two observers walking a transect through suitable habitat. A total of two separate spotlight nights were completed across the subject land by the two observers. These spotlighting surveys were supported by a thermal camera, with one of the ecologists sweeping the way ahead with the thermal camera in addition to spotlighting. This thermal camera assisted with locating arboreal wildlife within dense canopy foliage and greatly increased the effectiveness of the spotlighting survey.

Spotlighting and remote camera surveys were undertaken to target Eastern Pygmy-possum, however these surveys also would have assisted in the detection of Squirrel Glider and Southern Greater Glider (excluded as candidate species) if they had been present. The spotlighting surveys for Eastern Pygmy-possum were undertaken separately to those undertaken for Maroubra Woodland Snail, with the former focussed on the forest canopy, and the later focussed on the ground.

Justification of survey method and effort

Spotlighting survey followed the NSW *Threatened Biodiversity Survey and Assessment: Guidelines for development and activities (working draft)* (DEC 2004a) which recommends a minimum of two separate nights, each for one hour along a traverse of one kilometre. BioNet notes that Eastern Pygmy Possum can be difficult to detect with spotlight surveys. As such two different survey techniques were utilised to target this species, and spotlighting surveys were supported with the use of a thermal camera to assist with spotting arboreal fauna within dense foliage.

No survey guidance is provided for remote camera surveys for Eastern Pygmy-possum. Instead, the minimum night of deployment (i.e., 14 nights) as per the *Survey guidelines for Australia's threatened mammals* (DEWHA 2011) were utilised.

Timing of survey

Survey timing was conducted in accordance with the relevant guidelines (DEC 2004a) and the survey timing provided in BioNet (DPE 2023b).

Survey personnel and relevant experience

Mammal surveys were undertaken by the Biosis ecologists outlined in Table 4-12.

Table 4-11 Microbat roost survey personnel and relevant experience

Staff member	Role	Relevant experience
Bret Stewart	Senior Zoologist	BSc. Evolution and Ecology Accredited BAM assessor (BAAS22033) Over 10 years' experience undertaking impact assessment, project management and threatened fauna surveys across new South Wales and the Sydney Basin Bioregion, including extensive surveying for threatened mammals using both spotlighting and remote camera techniques.
Joel Nicholson	Senior Zoologist	Bsc. Environmental Science Over 5 years' experience undertaking impact assessment, project management and threatened fauna surveys across New South Wales and the Sydney Basin Bioregion. Experience includes detection and identification of threatened mammals using both spotlighting and remote camera techniques.

Results

No threatened mammal species were detected during spotlighting or camera trapping surveys. All species recorded during these surveys consisted of general non-threatened species known to occur in the region. This primarily included the following:

- Brown Rat *Rattus rattus*.
- Brush-tailed Possum *Trichosurus vulpecula*.
- Common Ringtail Possum *Pseudocheirus peregrinus*.
- European Red Fox *Vulpes vulpes*.

Limitations

Remote cameras deployed for mammal species were baited with universal bait and left in place for an extended period. Baits were not replaced during this period which may have limited the bait attractiveness over time. However, it is noted that the moist conditions throughout this period kept the bait sufficiently hydrated to remain odorous. Upon collection of the remote cameras and bait stations it was noted that all bait stations still held moist bait. Survey was undertaken in suitable weather conditions for mammal activity.

4.3.6 Microbats

Microbat roost searches were undertaken on 11 April 2024 (diurnal surveys) and 21-22 May 2024 (dusk roost emergence surveys). Harp trapping, with thermal camera and echometer surveys of potential habitats were undertaken over four nights, between 9-13 December 2025.

Microbat roost surveys were undertaken to determine if the human-made structures being removed from the development site are being utilised as roosting habitat by microbat species. The surveys were undertaken to address the prescribed impact associated with removal of human-made structures and non-native vegetation under Section 6.1.2 of the BAM (DPIE 2020a).

Microbat surveys were undertaken to detect the presence of Southern Myotis and Large-eared Pied Bat.

Survey method and effort

The threatened species survey for microbats included diurnal roost searches and nocturnal surveys. The diurnal surveys focussed on identifying potential roost habitats, while the nocturnal surveys utilised thermal detectors, echometers, and harp traps to determine the presence of threatened microbats and breeding individuals within the subject land. This approach aimed to assess both habitat suitability and species presence during active foraging periods.

Diurnal roost searches were undertaken in 14 structures. These structures can be broadly categorised into two types.

- One type consisted of well insulated brick buildings. These buildings house large electrical panels in an air-conditioned concrete interior room, or house former offices. These buildings were found to be in a good state of repair, with virtually no suitable entry points visible from the exterior. From the interior, it could be seen that interior spaces were completely sealed off from the outside, with only well covered air conditioning ducts leading to the outside. The interior space was very clean with minimal clutter and very few locations on the walls or ceiling where a bat could gain purchase and roost. Both the interior and exterior of these structures could be ruled out as potential roost habitat.
- The other type consisted of generally larger more open buildings constructed of metal siding. These buildings generally had many potential entrances to the interior space, most being gaps between the exterior walls and the roof. The interior of these buildings was more cluttered; however, roosting potential is limited based on two factors. One is that the walls were not insulated and generally had no spaces between the exterior metal siding and any interior structure, as the walls consist of only

the exterior metal siding with no insulation or separate interior wall. The roofs were generally insulated, with the insulation in good repair, tightly fastened, and flush with the metal roof without gaps. The other factor is that the interior spaces were very open with little material adjoining the walls or ceiling. It was therefore possible to search the entire interior space, and most locations where a microbat could potentially roost were also very exposed.

Harp trapping was undertaken over four nights from 9 to 13 December 2024, using standard 4.2 m² traps strung with ≤3 kilogram monofilament nylon lines. Traps were set before sunset each evening and placed in key flyways, drainage lines, and waterbody edges to maximise capture potential. Trap locations were rotated nightly to reduce the risk of trap avoidance, with careful consideration given to selecting areas likely to intersect bat activity.

Traps were checked twice each night, once at approximately 10 pm and again pre-dawn, before being closed to prevent non-target captures during daylight hours. In addition to passive trapping, active surveys were conducted nightly using thermal cameras and echometers. The combination of trapping and active monitoring provided a robust approach to assessing bat presence and habitat use in the subject land.

Justification of survey method and effort

During the diurnal roost surveys, it was possible to comprehensively search both the interior and exterior of each building. No potential roost spaces were observed which could not also be accessed to search for roosting bats or secondary evidence.

Nocturnal microbat surveys (harp trapping) followed the NSW Survey Guide '*Species credit threatened bats and their habitats*' (DPIE 2021) developed for the survey of species credit bat species in accordance with the BAM. The active searches of potential habitat areas (fly ways and waterbodies) using a thermal camera and echometer were supplementary to the required survey effort under the BAM.

Timing of survey

Harp trapping was undertaken over four nights from 9 to 13 December 2024 in accordance with the survey timing provided in BioNet for the target species.

Survey personnel and relevant experience

Microbat surveys were undertaken by the Biosis ecologists outlined in Table 4-12.

Table 4-12 Microbat surveys personnel and relevant experience

Staff member	Role	Relevant experience
Bret Stewart	Senior Zoologist	BSc. Evolution and Ecology Accredited BAM assessor (BAAS22033) Over 10 years' experience undertaking impact assessment, project management and threatened fauna surveys across new South Wales and the Sydney Basin Bioregion, including stag watch and identification of roost sites of threatened bat species.
Aleksei Atkin	Senior Zoologist	B. Nat. Sc. (Nature Conservation), Master of Wildlife Management Over 10 years' experience undertaking impact assessment, project management and threatened fauna surveys across new South Wales

Staff member	Role	Relevant experience
		and the Sydney Basin Bioregion, including extensive experience undertaking fauna surveys (including surveys for threatened microbats).
Julia Hutton	Graduate Zoologist	BSc. Ecology and Conservation Over 2-years' experience completing fauna surveys and has assisted with the completion of numerous targeted fauna surveys, including stag watch and identification of roost sites of threatened bat species.
Jemma Giuliano	Graduate Zoologist	BSc. Ecology and Conservation Over a year experience completing fauna surveys and has assisted with the completion of numerous targeted fauna surveys, including stag watch and identification of roost sites of threatened bat species.

Results

No microbats or secondary evidence of microbats was observed during the diurnal roost searches of the 14 structures to be removed.

No bats were captured in the harp traps, despite multiple checks at 10 pm and pre-dawn. Active surveys conducted with thermal cameras and echometers detected bat activity, with one Southern Myotis individual detected foraging along the eastern portion of the subject land, with echometer readings and foraging patterns supporting the identification of the species.

No Large-eared Pied Bats were detected during the targeted surveys.

Limitations

Microbat surveys for breeding bats are limited by the successful trap rate of harp traps which is generally considered to be low (Berry et al. 2004). Harp trapping was also limited by the location and access to suitable flyways, within proximity of target habitat and within land forming part of the study area. Harp trap surveys were undertaken across periods of suitable weather for microbat species.

4.3.7 Birds

Targeted surveys for threatened avifauna using standardised techniques such as census survey, area or transect search, or call playbacks were not undertaken. However, ecologists who were suitably qualified to identify threatened bird species attended site on 12-13 and 26-27 February, 11 April, and 21-22 May 2024. During this time, ecologists were onsite for a cumulative total of at least 70 person-hours, primarily during late afternoons and after dark.

During nocturnal aural-visual surveys for threatened frog species on 27 February, two Latham's Snipe *Gallinago hardwickii* (Vulnerable, marine, migratory, EPBC Act) were incidentally flushed (i.e., driven out) from a flooded pipeway by the ecologists. A video recording of the individuals was taken and a screenshot have been reproduced below (Photo 4-3). Given the proximity of the subject land to extensive coastal wetlands, it is likely that the Latham's Snipe presence in the area is due to the high quality habitats in the surrounding Towra Point Nature Reserve (a known hotspot for migratory birds). The species may occasionally use the subject land, particularly after flooding rains, for nocturnal foraging. There are some limited areas of emergent aquatic vegetation (e.g. *Typha* rushes) which could also provide diurnal roost sites. Both of these habitats are associated with the occurrence of the modified condition PCT 3972 located within the human-made pipeways within the development footprint.

A species polygon for Latham's Snipe has not been generated as guidance for this species is not currently available in BioNet (profile not complete). It is assumed that the species is likely to share similar habitat requirements to the other migratory species for which important habitat mapping has been identified under the BAM. The species cannot currently be added to the BAM-C either as a species credit species or an ecosystem credit species and therefore credits cannot be generated. The potential habitat for the species (areas of modified PCT 3972) has been considered under the EPBC Act in Section 10.1.



Photo 4-3 Screenshot from video of Latham's Snipe recorded in the subject land

4.3.8 Local data

Under Section 5 of the BAM (DPIE 2020a), an assessor may use more appropriate local data (instead of data from the TBDC) when assessing the habitat suitability for threatened species. No such local data has been used for threatened species assessment.

4.3.9 Expert reports

Sections 5.2 and 5.3 of the BAM outlines that an expert report may be obtained instead of undertaking a species survey for a project, where the expert report is prepared by a person who, in the opinion of the Environment Agency Head, possesses specialised knowledge based on training, study or experience to provide an expert opinion in relation to the biodiversity values to which an expert report relates (DPIE 2020a).

No expert reports were utilised for the current assessment.

4.3.10 Threatened species summary and polygons

Table 4-13 provides details of threatened species impacted by the proposed modification and outlines the attributes that comprise the threatened species polygons. The presence of threatened species impacted by the proposed modification is illustrated in Figure 4-2.

During a field investigation, an individual Giant Dragonfly was detected approximately 35 metres south of the development site, along the northern border of Zone 4 (Figure 1-1). The individual was detected within an area of native vegetation mapped as PCT 3546 Coastal Sands Littoral Scrub-Forest, which is not formally recognised as being associated with Giant Dragonfly in BioNet (NSW DCCEEW 2025d). Given the detection of the species within connected native vegetation located adjacent to the project site, a species offset polygon was conservatively generated for the species. The polygon includes all areas of native vegetation that were contiguous with the vegetation patch within which the individual was found, that are also located within 500 metres of swamp environments (Table 4-13).

This species polygon extends into the delineation of RPIP Mountain. This area is mapped as containing PCT 3545 Coastal Sands Bloodwood Forest, which is also not associated with Giant Dragonfly in BioNet (NSW DCCEEW 2025d). The occurrence of this PCT within RPIP Mountain is significantly degraded (condition Low and Regenerating, as detailed in Table 3-4) and is currently composed of a high density of exotic Lantana, which is unlikely to provide habitat for Giant Dragonfly. Historical imagery shows that RPIP Mountain was completely cleared of vegetation in 1998 and impacted again by significant ground disturbance works in 2005 (as detailed in Section 5.1). As such, this vegetation is highly unlikely to provide more than opportunistic perching habitat for Giant Dragonfly, whilst individuals move around the swamp environments in the broader Kurnell area. It does not constitute core habitat for the species. The removal of the vegetation from RPIP Mountain is required to allow for the treatment of a former stockpile of asbestos contaminated soils.

The proposed modification avoids all swamp habitats which represent breeding habitat for this species and does not impact on any PCTs that are formally recognised as being associated with the species in BioNet (NSW DCCEEW 2025d).

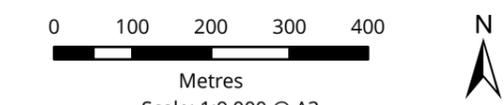
Table 4-13 Threatened species polygons within the development footprint

Threatened species	Impact (ha)	Biodiversity risk weighting	Polygon attributes
Fauna			
Giant Dragonfly	3.44	3.00	Polygon based on areas of native vegetation that were contiguous with the area the species was found, that also occur within 500 metres of swamp environments.
Southern Myotis	4.85	2.00	All habitat (i.e., associated native vegetation) within 200 m of a waterbody with pools/ stretches 3 m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies within the development footprint.



- Legend**
- Subject land
 - Development site
 - Development footprint
 - ▲ Maroubra Woodland Snail SAT survey (21/05/2024)
- Frog call and playback (12-13/02/2024 and 26-27/02/2024)**
- Frog call
- Diurnal microbat roost inspections (11/04/2024)**
- Habitat feature
- Remote camera trapping locations (19/12/2024 - 7/01/2025)**
- 📷 Camera trap
 - 📷 Camera trap (Failed after a single night)
- Harp trapping (9-13/12/2024)**
- ◇ Harp trap (1 night)
 - ◇ Harp trap (2 nights)
- Survey tracks - Fauna**
- Frog call/playback (12-13/02/2024 and 26-27/02/2024)
 - Dusk microbat roost emergence (21-22/05/2024)
 - Eastern Pygmy-possum nocturnal survey (13-14/01/2025)
 - Maroubra Woodland Snail nocturnal survey (13-14/01/2025)
- Survey tracks - Flora**
- Flora survey (12-27/02/2024)
 - Flora survey (22/05/2024)
 - Flora survey (13/01/2024)
- Fauna sightings - Biosis**
- ★ Giant Dragonfly - *Petalura gigantea*
 - ★ Latham's Snipe - *Gallinago hardwickii*
 - ★ Southern Myotis - *Myotis macropus*

Figure 4-1-1 Targeted flora/fauna species - Biosis survey efforts



Scale: 1:9,000 @ A3
 Coordinate System:
 GDA2020 MGA Zone 56



Matter: 40389, Date: 28 January 2026
 Prepared for: MH, Prepared by: HL, Last edited by: Iharley
 Location: P:\40300s\40389\Mapping\40389_Kurnell\SSD5544Mod.aprx
 Layout: 40389_F4-1-1_TargetedSpecies

Acknowledgements: Basemap © Land and Property Information 2016, Imagery © Nearmap, November 2024



Legend

- Subject land
- Development site
- Development footprint

Threatened flora records - BioNet

- Coast Groundsel - *Senecio spathulatus*
- Magenta Lilly Pilly - *Syzygium paniculatum*
- Sunshine wattle - *Acacia terminalis* subsp. Eastern Sydney

Threatened fauna records - BioNet

- Australasian Bittern - *Botaurus poiciloptilus*
- Green and Golden Bell Frog - *Litoria aurea*
- Grey-headed Flying-fox - *Pteropus poliocephalus*
- Large Bent-winged Bat - *Miniopterus orianae oceanensis*
- Latham's Snipe - *Gallinago hardwickii*
- Lesser Sand-plover - *Charadrius mongolus*
- Little Bent-winged Bat - *Miniopterus australis*
- Little Tern - *Sternula albifrons*
- Loggerhead Turtle - *Caretta caretta*
- New Zealand Fur-seal - *Arctocephalus forsteri*
- Powerful Owl - *Ninox strenua*
- Scarlet Robin - *Petroica boodang*
- Shy Albatross - *Thalassarche cauta*
- Southern Myotis - *Myotis macropus*
- Varied Sittella - *Daphoenositta chrysoptera*
- Wallum Froglet - *Crinia tinnula*
- Wandering Albatross - *Diomedea exulans*
- White-bellied Sea-Eagle - *Haliaeetus leucogaster*
- White-fronted Chat - *Epthianura albifrons*
- White-throated Needletail - *Hirundapus caudacutus*

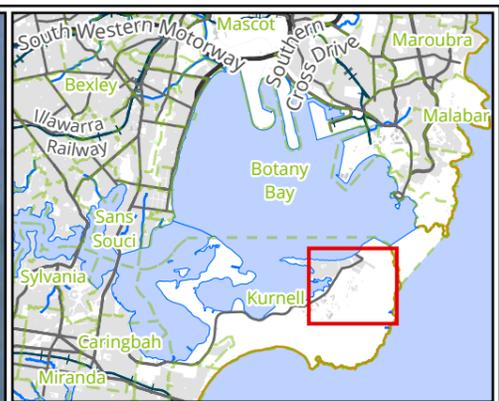
Figure 4-1-2 Targeted flora/fauna species - BioNet records



Metres
 Scale: 1:9,000 @ A3
 Coordinate System:
 GDA2020 MGA Zone 56



Matter: 40389, Date: 28 January 2026
 Prepared for: MH, Prepared by: HL, Last edited by: Iharley
 Location: P:\40300s\40389\Mapping\40389_Kurnell\SSD5544Mod.aprx
 Layout: 40389_F4-1-1_TargetedSpecies



Legend

- Subject land
- Development site
- Development footprint
- Threatened species habitat**
- Southern Myotis - *Myotis macropus*
- Giant Dragonfly - *Petalura gigantea*

Figure 4-2 Threatened species polygons

0 100 200 300 400 Metres

Scale: 1:9,000 @ A3
 Coordinate System: GDA2020 MGA Zone 56

biosis
 APEM Group

Matter: 40389, Date: 24 November 2025
 Prepared for: MH, Prepared by: HL, Last edited by: lharley
 Location: P:\40300s\40389\Mapping\40389_KurnellSSD5544Mod.aprx
 Layout: 40389_F4-2_ThrSpecPolygons

Acknowledgements: Basemap © Land and Property Information 2016, Imagery © NearMap, November 2024

Stage 2 — Impact assessment (Biodiversity Values)

5 Avoid and minimise impacts

This section demonstrates the efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the subject land in accordance with BAM.

5.1 Actions to avoid/ minimise impacts

The proposed modification occurs within a highly disturbed footprint associated with the existing Kurnell Terminal. The primary reason for the modification is to support the continued safe and reliable operation of the Kurnell Terminal. Therefore, the proposed modification works are required to remove or relocate terminal infrastructure into Zones 1 and 1A and to resolve legacy refinery contamination within Zones 2 and 3.

The primary means to reduce impacts on biodiversity values is to avoid and/or minimise the removal of native vegetation and fauna habitat. By removing the existing infrastructure and remediating areas of Zones 2 and 3, the proposed modification allows for the optimisation of the existing terminal and the remediation of legacy refinery contamination within this historically cleared site. Development within the historically disturbed and cleared parts of the site effectively results in the avoidance of impacts to new, previously unimpacted sites, by utilising this already impacted land.

Impacts associated with the clearing of native vegetation and/or threatened species habitat can be said to be largely avoided and minimised by:

- Locating the proposed modification within an area that lacks significant biodiversity values.
- Where native vegetation and threatened species habitat is impacted, it is within areas that have low vegetation integrity scores (<40), and primarily disturbs areas of exotic grass/turf vegetation and exotic vegetation.
- Avoids any areas that are mapped on the important habitat map.
- Avoids sensitive swamp areas that are key breeding habitats for the Giant Dragonfly, a SAll entity which was detected within adjoining vegetation.
- Primarily avoids impacts to any highly cleared PCTs (PCT 3545 has an estimated cleared value of 38%, comparatively low for the region and is the largest PCT impacted by the proposed works).
- Does not include any identified breeding habitat for threatened species (such as nest trees or caves).

The main impacts to native vegetation associated with the proposed modification are associated with a patch of vegetation located in the south of Zone 3 (known as RPIP Mountain, as shown in Figure 1-2). Soil sampling has indicated that this area contains significant asbestos contamination requiring remediation. The presence of vegetation and fauna activity in this area makes the management of the asbestos risk difficult. Therefore excavation of up to 23,650 cubic metres (m³) of asbestos contaminated soil (with an additional contingency of 11,825 m³) is proposed as part of the proposed modification. These remediation works necessitate the removal of vegetation and therefore, impacts to the low and regenerating condition native vegetation in this location are unavoidable.

The native vegetation within RPIP Mountain is mostly considered to be regenerating following a long history of clearing within the area. Historical aerial imagery from 2005 back to 1984, shows the disturbance that has occurred at this location throughout the development site's recent history. This is shown in Photo 5-1 to

Photo 5-4 below, which have been exported from the NSW *Historical Imagery Viewer* (NSW Spatial Services 2025).

Recommendations are provided in Section 7 of this BDAR which include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered.



Photo 5-1 RPIP Mountain in 1984



Photo 5-2 RPIP Mountain in 1998



Photo 5-3 RPIP Mountain in 2004



Photo 5-4 RPIP Mountain in 2005

6 Impacts that are unable to be avoided

Assessment of direct and indirect impacts unable to be avoided has been undertaken in accordance with the BAM (DPIE 2020a). The following direct and indirect impacts are unable to be avoided in progressing the proposed modification.

6.1 Direct impacts

Direct impacts include vegetation clearing to allow for the relocation of infrastructure assets and for ground remediation to occur. Direct impacts arising from the proposed modification include:

- Removal of 5.23 ha of native vegetation, comprising the following:
 - 0.35 ha of low condition PCT 3545.
 - 4.37 ha of regenerating PCT 3545.
 - 0.51 ha of modified PCT 3972.
- Removal of 6.04 ha of exotic grass.
- Removal of 0.55 ha of planted exotic vegetation.
- Removal of 3.44 ha of habitat for Giant Dragonfly.
- Removal of 4.85 ha of habitat for Southern Myotis.
- Removal of one hollow-bearing tree.

These impacts would be permanent and would occur from the outset of the proposed modification works. Mitigation measures outlined in Section 7 would help to minimise the potential impacts to biodiversity values that remain present within the subject land.

A summary of PCTs and zones directly impacted is demonstrated in Table 6-1. A summary of direct impacts to species credit species is demonstrated in Table 6-2.

Table 6-1 Summary of direct impacts to vegetation

Zone	PCT	TEC	Area within subject land (ha)	Area impacted (ha)	VI Score
3545_Low	PCT 3545 Coastal Sands Bloodwood Low Forest	Nil	0.35	0.35	38.1
3545_Regenerating	PCT 3545 Coastal Sands Bloodwood Low Forest	Nil	4.37	4.37	37.7
3972_Modified	PCT 3972 Sydney Creekflat Wetland	Nil	0.51	0.51	30.1

Table 6-2 Summary of direct impacts species credit habitat or individuals

Species	Sensitivity	Area (ha)
Giant Dragonfly	Very High Sensitivity to Gain	3.44
Southern Myotis	High Sensitivity to Gain	4.85

6.1.1 Loss of hollow-bearing trees

One hollow-bearing tree is present within the development footprint (Figure 3-2) and would be removed under the proposed modification. The hollow-bearing tree is medium in size and contains one medium-sized hollow (50-149 mm), located approximately 1 m off the ground. Given the size the location of the hollow, it is not suitable as breeding habitat for cockatoo and owl species that may be present in the locality.

6.2 Indirect impacts

Potential indirect impacts arising from the proposed modification are outlined and addressed in Table 6-3. The area of indirect impacts is shown on Figure 6-1.

Table 6-3 Assessment of indirect impacts

Indirect impact	Project phase/ duration	Likelihood and consequences
Inadvertent impacts on adjacent habitat or vegetation	Construction, operation/ Medium term	Impacts to adjacent vegetation during the construction and operational phase can be prevented or minimised through appropriate exclusion fencing, implementation of a Construction Environmental Management Plan (CEMP) detailing relevant environmental protection measures, strict water quality practices, and stormwater controls.
Reduced viability of adjacent habitat due to edge effects	Construction/ Short term	Adjacent habitats are currently subject to a moderate degree of edge effects due to prior clearing, access tracks/ roads, and current land use. The subject land includes a large fuel storage facility and as such, much of the subject land is heavily developed. Although native vegetation would be removed under the proposed modification (primarily associated with RPIP Mountain in Zone 3), the area is small and comprised of either isolated patches or low condition and regenerating condition vegetation. This patch is already fragmented from the surrounding areas of native vegetation by a cleared access road around the perimeter of the entire patch, which represents an existing source of edge effects. As most of the development footprint is restricted to previously developed areas, a significant increase in edge effects is not expected to occur to the remnant vegetation surrounding the subject land. This is because all such areas of remnant vegetation currently interface with the pre-existing cleared boundaries of the development site (i.e., they are already impacted by edge effects). Weed controls (detailed below and in Section 7) would further reduce potential edge effects associated with vehicles trafficking weeds during construction. These would be captured in the Biodiversity and Weed Management Plan (BWMP).

Indirect impact	Project phase/ duration	Likelihood and consequences
Reduced viability of adjacent habitat due to noise, dust, or light spill	Construction/ Short term	<p>It is likely that habitat adjacent to the development footprint would be impacted by noise and dust spill associated with construction works. However, the subject land includes an existing bulk liquid fuel terminal where light spill, noise, and dust are likely already of moderate impact to surrounding areas, and as such, minor increases during the construction phase of the proposed modification are not expected to have a substantial impact. Construction working hours are 7am to 6pm Monday to Friday and 8am to 1pm on Saturday which are unlikely to lead to significant lighting impacts during construction. Measures would be incorporated in the BWMP to reduce light spill that may occur. Where additional buildings are proposed as part of the proposed modification, permanent light pollution would be minimised through appropriate mitigation measures, such as ensuring any lighting is directed away from nearby retained habitat, installation of light shields, timer switchers (when possible), and appropriate wavelength controls.</p> <p>Increased dust associated with construction works would be minimised through the implementation of erosion and sediment controls and appropriate dust suppression measures. These indirect impacts would be managed via best practice mitigation measures outlined in a CEMP.</p>
Transport of weeds and pathogens from the site to adjacent vegetation	Construction/ Potential to be long term	<p>Weeds occurring within the subject land are common with those occurring within adjacent vegetation to be retained. Although construction works have the potential to facilitate the introduction or spread of exotic weeds and pathogens, this is not expected to be substantial given the nature of the development site and current land use. This indirect impact would be managed by measures outlined in the BWMP.</p>
Increased risk of starvation, exposure and loss of shade or shelter	Construction/ Short term	<p>Although the subject land contains suitable habitat for locally occurring fauna, including threatened species such as Giant Dragonfly and Southern Myotis, the proposed modification would not result in an increased risk of starvation, exposure, and loss of shade or shelter to native species. The vegetation to be removed is highly fragmented and represents a small proportion of commensurate habitats available in the immediate vicinity. There is substantial intact vegetation to the south and east of the subject land, which is well connected to the Kamay Botany Bay National Park, which likely supports higher quality habitat and would remain unaffected by the proposed modification.</p>
Loss of breeding habitats	Construction/ Short term	<p>The subject land contains potential breeding habitat for threatened arboreal mammals and microbats. However, retained vegetation in the southern portion of the subject land provides higher quality habitat which is well connected to vegetation across the broader landscape and would not be reduced by the proposed modification. Important potential breeding habitats for Giant</p>

Indirect impact	Project phase/ duration	Likelihood and consequences
		Dragonfly (i.e., swamp environments) would not be impacted by the proposed works.
Trampling of threatened flora species	Construction, operation/ Not applicable	No threatened flora species were recorded in the subject land during targeted survey, and thus trampling of threatened flora species is unlikely.
Inhibition of nitrogen fixation and increased soil salinity	Construction/ Short term	Soil disturbance during construction would be largely restricted to the development footprint of the existing bulk liquid fuel terminal. As the subject land has already experienced significant development, it is not considered likely that the proposed modification would result in substantial changes to the level of nitrogen fixation or soil salinity in the locality.
Fertiliser drift	Not applicable	No fertiliser is expected to be utilised as part of the proposed modification and as such, works are not expected to contribute to fertiliser drift into surrounding areas. However, works associated with vegetation management would be undertaken in accordance with a site-specific BWMP or Operational Environmental Management Plan (OEMP), including the use of fertilisers.
Rubbish accumulation	Construction / Short term	The proposed modification would occur predominantly within the development footprint of an existing bulk liquid fuel terminal, which may be subject to some level of rubbish accumulation. This is unlikely to substantially increase due to the proposed modification. Further details regarding the management of waste is detailed in Chapter 7.12 (Other issues) of the Modification Report.
Wood collection	Not applicable	Given the past and current land use, it is unlikely that the proposed modification works would increase access to any retained intact vegetation beyond the current level of access, and as such, the proposed modification is not expected to increase the likelihood of the public undertaking wood collection within the retained vegetation. Based on the future industrial use of the subject land, future landholders are not expected to undertake wood collection within the retained vegetation to a level that it would have a detrimental effect. Unauthorised access and collection of wood is expected to be minimal.
Removal and disturbance of rocks, including bush rock		Based on the field investigations undertaken for the proposed modification, the subject land does not support bush rock. If any bush rock is encountered within the development site and is required to be removed, it should be managed via mitigation measures outlined in a CEMP, including re use where possible.
Increase in predators	Construction, operation/ Medium term	The subject land already occurs within a semi-urbanised landscape, with residential and industrial development common in the surrounding landscape. The subject land is already largely cleared, and the small area of vegetation clearance required for the proposed modification, particularly given past and current land use, is unlikely to exacerbate predatory species populations

Indirect impact	Project phase/ duration	Likelihood and consequences
		<p>in the area. The proposed modification would not “open up” large areas of habitat that may encourage predatory species to move into the area. There is potential for lighting during construction and operation of the proposed modification to attract predators and/ or prey; however, it is not expected that this would be substantial given the current and proposed land use. Impacts related to lighting during construction and operation would be mitigated through a CEMP (outlined above).</p>
Increase in pest animal populations	Construction, operation / Medium term	<p>The proposed modification occurs in a semi-urbanised area where introduced domestic pets such as cats <i>Felis catus</i> currently occur within the locality. Pest animals such as Rats <i>Rattus rattus</i> and European Rabbit <i>Oryctolagus cuniculus</i> are also widely spread across much of NSW. The proposed modification would not result in an increase in available habitat for these species and is unlikely to lead to an increase in pest animal populations. Suitable waste disposal implemented during, and post construction would further reduce the resources available for pest species.</p>
Changed fire regimes	Construction/ Potential to be long term	<p>The proposed modification occurs in a highly industrialised area. As such, risk of fire and emissions related to existing operational Terminal infrastructure remains. Appropriate asset protection zones and fire mitigation systems are already in place at the Kurnell Terminal. Part of the proposed modification includes upgrades to the firewater system. Additional mitigation measures for controlling fire risk during construction would be outlined in a CEMP. Given the current land use, the proposed modification would not result in an increased risk of fire. Further information regarding hazards and risk of the proposed modification and the existing operational of the Kurnell Terminal can be found in Appendix G (Preliminary Hazard Analysis) of the Modification Report.</p>
Disturbance to specialist breeding and foraging habitat, e.g. Beach nesting for shorebirds	Not applicable	<p>The proposed modification would not impact any specialist breeding or foraging habitat. Giant Dragonfly breeding habitat associated with Swamp environments would not be impacted by the proposed works.</p>
Fragmentation of movement corridors	Construction, operation/ Potential to be long term	<p>The major movement corridor within the locality occurs south and east of the subject land, connecting vegetation within the southern portion of the subject land to the vegetation within the Kamay Botany Bay National Park that extends along the coastline. Movement corridors are somewhat limited in availability across the locality due to substantial development within the locality, which has the potential to disrupt the flow of genetic material. The proposed modification would result in the removal of 5.23 ha of native vegetation, the majority of which is low quality, regenerating and modified native vegetation; much of this vegetation occurs in an already fragmented state. Impacts to native vegetation would</p>

Indirect impact	Project phase/ duration	Likelihood and consequences
		not fragment any habitat corridors or create a barrier to dispersal of species across the landscape.

6.3 Prescribed impacts

The identification and assessment of prescribed biodiversity impacts are outlined in the sections below. A summary of these impacts is included in Table 6-4 The area of prescribed impacts is shown on Figure 6-1.

Table 6-4 Identification of prescribed impacts

Prescribed impact	Description of relevant habitat features associated with prescribed impacts	Threatened species likely to utilise habitat features associated with prescribed impact	Significance to impacted species
Karst, caves, crevices, cliffs, rocks, and other geological features of significance	The subject land occurs on coastal sands which lack these geological features.	Not applicable.	Not applicable.
Occurrences of human-made structures and non-native vegetation	A total of 14 separate buildings (enclosed structures with four walls and a roof) and approximately 1.2 km of sunken impermeable (concrete lined) pipe ways which are subject to periodic inundation are found in the development footprint. A human-made channel approximately 220 m long which contains aquatic vegetation and is bordered by lands containing terrestrial native vegetation is also found in the south of Zone 3.	Green and Golden Bell Frog and Wallum Froglet were surveyed and confirmed absent from pipe ways and the channel. Comprehensive roost searches did not detect evidence of roosting microbats in any of the 14 buildings. Threatened microbat species with potential to occur are Southern Myotis, Eastern Coastal Free-tailed Bat, Eastern False Pipistrelle, Large Bent-winged Bat, Little Bent-winged Bat, Large-eared Pied Bat and Yellow-bellied Sheath-tail-bat. The pipeways and channel have potential to be utilised by Latham's Snipe, Australasian Bittern, Australian Painted Snipe, Bar-tailed Godwit, Black Bittern, Black-tailed Godwit, Curlew Sandpiper, Eastern Curlew, Great Knot, Greater Sand-plover, Lesser Sand-plover, Red Knot, Sanderling, and Terek Sandpiper.	The 14 buildings have limited potential to provide roost habitat for microbats. The pipe ways and channel provide temporary freshwater aquatic habitat for frogs, birds, and Southern Myotis. Non-threatened frog species may be resident in the aquatic habitats and use them for breeding. Wetland birds may use the aquatic habitats for foraging or roosting. Southern Myotis may use the aquatic habitats for foraging. Latham's Snipe may also use these features for nocturnal foraging and diurnal roosting.
Corridors or other areas of connectivity	Approximately 1.2 km of sunken impermeable	The pipeways and channel have potential to be utilised by	The pipeways and channel could potentially be used as

Prescribed impact	Description of relevant habitat features associated with prescribed impacts	Threatened species likely to utilise habitat features associated with prescribed impact	Significance to impacted species
linking habitat for threatened entities	(concrete lined) pipeways which are subject to periodic inundation are found in Zone 2 and Zone 3 of the subject land. A man-made channel approximately 220 m long which contains aquatic vegetation and is bordered by lands containing terrestrial native vegetation is found in the south of Zone 3.	Southern Myotis, Australasian Bittern, Australian Painted Snipe, Bar-tailed Godwit, Black Bittern, Black-tailed Godwit, Curlew Sandpiper, Eastern Curlew, Great Knot, Greater Sand-plover, Latham’s Snipe, Lesser Sand-plover. Red Knot, Sanderling, and Terek Sandpiper.	a temporary ‘stop over’ roost for migratory wetland birds.
Water bodies or any hydrological processes that sustain threatened entities	<p>Human-made pipeways Approximately 1.2 km of sunken impermeable (concrete lined) pipeways which are subject to periodic inundation are found in Zone 2 and Zone 3 of the subject land. A man-made channel approximately 220 m long which contains aquatic vegetation and is bordered by lands containing terrestrial native vegetation is found in the south of Zone 3.</p> <p>Natural GDEs A groundwater assessment has been undertaken and included in Annexure A of Appendix F (Updated Soils, Groundwater, and Contamination Report) of the Submissions Report (AECOM 2025a). This assessment has determined that these ecosystems occur adjacent to the subject land and will be potentially impacted by the proposed works. These impacts are discussed</p>	<p>Human-made pipeways Green and Golden Bell Frog and Wallum Froglet were surveyed and confirmed absent from pipeways and the channel. The pipeways and channel have potential to be utilised by Southern Myotis, Australasian Bittern, Australian Painted Snipe, Bar-tailed Godwit, Black Bittern, Black-tailed Godwit, Curlew Sandpiper, Eastern Curlew, Great Knot, Greater Sand-plover, Lesser Sand-plover. Red Knot, Sanderling, and Terek Sandpiper.</p> <p>Natural GDEs The above species would also likely use the GDEs identified in the broader locality as these features are associated with wetland PCTs.</p>	<p>Human-made pipeways Tadpoles and aquatic insects may provide some food resources for wetland birds and Southern Myotis, however, the richness of this resource is very low compared to natural aquatic habitats adjacent to and surrounding the subject land. Wetland birds may use the emergent aquatic vegetation for sheltered roosts, or alternatively the very open paved areas as roosts with good sight lines of potential predators.</p> <p>Natural GDEs A Groundwater Management Plan (GWMP) is proposed in Section 6.5. This would include trigger response adaptive management actions to allow for effective and quick responses to GDE impacts. Given the temporary nature of the groundwater drawdowns associated with the proposed modification, and</p>

Prescribed impact	Description of relevant habitat features associated with prescribed impacts	Threatened species likely to utilise habitat features associated with prescribed impact	Significance to impacted species
	further in Section 6.5.		the robust mitigation measures that will be incorporated into the GWMP, significant impacts to species are unlikely to occur.
Protected animals that may use the proposed wind farm development site as a flyway or migration route	Not applicable.	Not applicable.	Not applicable.
Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	Internal roadways within the development site border most of the aquatic habitats. The internal roads have a posted speed limit of 20 km/hr which significantly reduces risk of vehicle strike.	The threatened species which may use aquatic or roost habitats have very low potential to cross the internal roads, or those that do are capable of flight.	Wetland birds are generally alert when in open spaces and highly mobile, capable of moving out of the way of vehicles. Threatened microbats are at very low risk of vehicle strike at speeds less than 20 km/hr.

6.3.1 Human-made structures and non-native vegetation

Nature

Removal of structures as part of the proposed modification would cause the loss of potential, but currently unoccupied, roosting habitat for microbats. Roosting habitat is of poor quality as the buildings lack cracks, crevices, or similar sheltered interior spaces which are accessible from the outside.

The removal of the pipeways as part of the proposed modification represents the loss of temporary freshwater aquatic habitat. These features may be utilised by Latham's Snipe for nocturnal foraging and diurnal roosting. The pipeways contain shallow (<0.5 m deep) water after heavy rain and patches of emergent aquatic vegetation over an impermeable substrate. The channel contains deeper (up to 1 m deep) water, aquatic vegetation, and soft organic and sandy substrate.

Extent

Fourteen buildings would be removed. Approximately 1.2 km of pipeways containing inundated sections, up to 20 m wide in a few locations but generally <1 m wide, would be removed, modified, or relocated. Wider inundated sections of the pipeways contain patches of emergent aquatic vegetation. The channel in Zone 3 is approximately 220 m long and up to 3 m wide.

Duration

Permanent.

Consequences

Detailed in Table 6-4.

6.3.2 Habitat connectivity

Nature

Only highly mobile migratory wetland bird species have potential to utilise the subject land for habitat connectivity. The nature of this use is as a temporary 'stop over' roost during migration. The aquatic habitat features are very nutrient poor, being concrete lined pipe ways or a channel over sandy soils, and therefore are unlikely to support quantities of aquatic invertebrates or tadpoles that could provide important food resources for migratory birds.

Extent

Approximately 1.2 km of pipe ways containing inundated sections up to 20 m wide in a few locations but generally <1 m wide would be removed, modified, or relocated. Wider inundated sections of the pipe ways contain patches of emergent aquatic vegetation. The channel in Zone 3 is approximately 220 m long and up to 3 m wide.

Duration

Permanent.

Consequences

Detailed in Table 6-4.

6.3.3 Water bodies, water quality and hydrological processes

Nature

Wetland birds may use the emergent aquatic vegetation within the temporary human-made water bodies for sheltered roosts or low-quality foraging habitat. However, these features are very nutrient poor, being concrete lined pipeways or a channel over sandy soils and are therefore unlikely to support quantities of aquatic invertebrates or tadpoles that could provide important food resources for migratory birds. Common frog species also utilise these features and Southern Myotis may utilise them as low-quality foraging habitat. The proposed modification would result in the removal of these features, as well as potential further contamination during removal (however these features are already contaminated due to their location within a hydrocarbon storage facility).

A groundwater assessment has been undertaken and included in Annexure A of Appendix F (Updated Soils, Groundwater, and Contamination Report) of the Submissions Report (AECOM 2025a). This assessment has determined that, these ecosystems occur adjacent to the subject land and may be potentially impacted by the proposed works. Impacts to the GDEs are associated with potential groundwater drawdown associated with dewatering activities at trenches and excavations required as part of the proposed modification. Similar to the human-made structures, wetland birds, frogs and microbats would use these GDEs as these features are associated with wetland PCTs. Other species that may use these GDEs include the Giant Dragonfly, which was

identified in the locality as part of this assessment, as well as a range of common and threatened native flora and fauna species, given the proximity of the subject land to the large areas of remnant vegetation that comprise the Botany Bay National Park.

A surface water assessment has been undertaken and is included in Appendix G (Updated Surface Water, Wastewater and Flooding Assessment) of the Submissions Report (AECOM 2025b). The assessment identifies potential surface water, wastewater, and flooding impacts from the proposed modification's construction and operation, and outlines safeguards and management measures to negate or minimise effects on the receiving environment. These measures ensure the proposed modification would:

- Retain existing landform and finished surface levels (with the exception of RPIP Mountain), bunding around former OWS areas, and existing surface water storage across the site. Any excavations required would be reinstated to existing pre-modification surface levels (with the exception of RPIP Mountain, which would be regraded).
- Redirect runoff from bunded OWS areas in Catchments B and F via low-flow outlet pipes to existing SWS in Catchment B, minimising peak flows and preventing any alteration in surface water flows entering the southern natural retention basin and protected coastal wetland communities. Operational controls would be used to manage surface water flow volumes from any bunded areas.
- Ensure increases in surface water flows in Catchment B would be managed by existing surface water detention and retention systems. These have sufficient capacity to contain additional inflow whilst maintaining pre-modification discharge rates to Quibray Bay in all storm events up to and including the 1 % Annual Exceedance Probability (AEP) Event.
- Implement two separate OSD systems in Catchment E to maintain existing, pre-modification discharge rates to the roadside channel along Sir Joseph Banks Drive in all storm events up to and including the 1% AEP event. This would also maintain existing peak discharge rates entering the downstream Towra Point Nature Reserve (Ramsar site) and Quibray Bay.
- Sediment loads in stormwater during the operational phase of the proposed modification are expected to be low given there will be no changes to the landform (with the exception of RPIP Mountain), surface levels, and surface finishes. However, in order to further protect sensitive receiving environments permanent sediment control measures are proposed to be installed within or at the downstream end of the two proposed OSD systems, including one at RPIP Mountain. This is in addition to the existing water quality treatment measures in place, which would be retained through both the construction and operational phase. The combination of water quality treatment measures would mitigate potential water quality impacts on downstream sensitive receptors (AECOM 2025b).

As these measures effectively ensure no impacts will arise from altered surface water flows and sediment loads, further consideration is not required as part of this assessment.

Extent

Approximately 1.2 km of pipe ways containing temporarily inundated sections up to 20 m wide in a few locations but generally <1 m wide would be removed, modified, or relocated. Wider inundated sections of the pipe ways contain patches of emergent aquatic vegetation (<0.2 ha in total area). The channel is approximately 220 m long and up to 3 m wide.

The extent and impact of groundwater drawdown is discussed in Section 6.5. Approximately 16.83 hectares of GDEs (high, moderate and low probability GDEs) occur within identified zones of drawdown influence and may be temporarily impacted during construction works.

Duration

Permanent (human-made waterbodies and pipe ways) and temporary (groundwater drawdown).

Consequences

Detailed in Table 6-4.

6.3.4 Vehicle strikes

Nature and extent

The workforce and plant vehicle requirements that are expected to be required as part of the proposed modification are detailed in Table 6-5.

Table 6-5 Workforce and plant requirements for construction

Description		Daily movements (return trips)	Peak hour trips ¹
Heavy vehicles	Construction vehicles (cranes, semi-trailers, etc.)	10	0
	Truck and dog (off-site disposal and imported fill)	120	12
	Equipment/material delivery vehicles	6	2
	Subtotal	136	14
Private vehicles	Construction personnel	200	100
Total		120	104
Heavy vehicle proportion		40%	12%

¹ Assumptions:

Conservatively, it has been assumed that all personnel would arrive to Site during the AM Peak Hour and depart during the PM Peak Hour

Personnel would utilise their own private vehicle with no use of car-pooling or public transport

Heavy vehicle movements would be evenly distributed throughout the hours of operation (10-hour workdays)

All plant delivery vehicles are assumed to occur on the same day in order to produce a 'worst-case' scenario.

² Max number of construction staff.

The greatest vehicle risks are expected to be associated with personnel driving to and from the Site. The internal road posted speed limit of 25 km/hr (and 10 km/hr in congested areas) would significantly reduce the risk of vehicle strike within the Site itself. The increase in daily movements associated with construction personnel attending site is expected to be approximately 200 daily movements (return trips). The total number of heavy vehicles arriving and leaving the Site at any time during construction of the proposed modification would be 14 per hour. When compared to the lowest volumes travelling through the local roads, an increase in 14 heavy vehicles would equate to an increase of about 2%. The proposed modification's Traffic Management Plan (TMP) (detailed in Section 7) would assist with reducing the risk of vehicle collision with native fauna. The TMP would also detail any restrictions necessary to keep construction traffic confined to defined roads and tracks where necessary. This is further discussed in Appendix I (Traffic and Transport Impact Assessment) of the Modification Report.

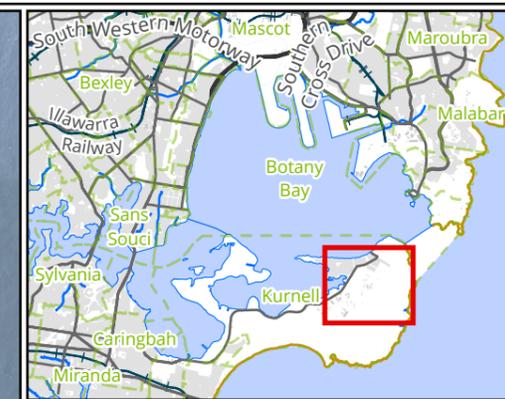
Duration

Impacts are likely to be during construction only. Once the modification works are complete, the development site would continue to operate as described in the approval documentation for the approved project and would be consistent with the development consent for SSD-5544.

Consequences for entities

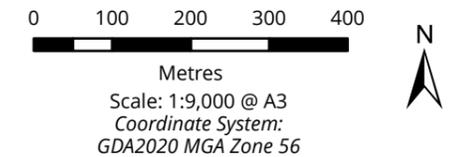
Threatened fauna included in the current assessment that may be at risk of vehicle strike include wetland birds and microbats that are known to occur within the subject land. Consequences to these species are expected to be very low, due to their highly mobile nature. The very low level of collisions to these species does not represent a significant level of impact to these species.

Other threatened fauna species not included in the current assessment may be at risk of collision from increased vehicular traffic associated with personnel driving to and from the development site (particularly along Captain Cook Drive leading into site). Speed limits approaching the Kurnell Terminal are sign-posted at 60 km/hr, which would allow more mobile fauna an opportunity to avoid collision. Given the very low increase in construction traffic of 2%, the proposed modification is not expected to have any significant impacts on the frequency of collisions.



- Legend**
- Subject land
 - Development site
 - Development footprint
- GDE zones of influence**
- FWS augmentation
 - OWS pumps
 - OWS removal
 - OWS upgrade
 - Targeted soil remediation works
- Indirect impacts**
- Edge effects
- Prescribed impacts (human-made structures)**
- Building
 - Pipeway
 - Channel
- Prescribed impacts (GDE)**
- High probability GDE
 - Medium probability GDE
 - Low probability GDE

Figure 6-1 Areas of prescribed and indirect impacts



Matter: 40389, Date: 28 January 2026
 Prepared for: MH, Prepared by: HL, Last edited by: Iharley
 Location: P:\40300s\40389\Mapping\40389_Kurnell\SSD5544Mod.aprx
 Layout: 40389_F6-1_Impacts

Acknowledgements: Basemap © Land and Property Information 2016, Imagery © Nearmap, November 2024

6.4 Impacts considered uncertain

Potential temporary impacts arising from groundwater drawdown on surrounding vegetation, as discussed below in Section 6.5, are considered uncertain. There are no additional impacts considered uncertain for the current assessment.

6.5 Impacts to Groundwater Dependent Ecosystems (GDE)

The subject land is mapped as environmentally sensitive land in the Groundwater Vulnerability Map (Sutherland Shire LEP 2015). Therefore, before any development can occur, the consent authority must consider impacts associated with the proposed development, and the avoidance and minimisation of such impacts, in accordance with requirements outlined in Section 6.6 of the Sutherland Shire LEP.

6.5.1 GDEs within the locality

The following GDEs are located within the broader locality (Bureau of Meteorology 2024):

- Marton Park Wetland, to the north. Mapped as a high probability terrestrial GDE and high probability wetland GDE.
 - PCT 4028 Estuarine Swamp Oak Twig-rush Forest was mapped in moderate condition along Solander Street (i.e., along the southern border of Marton Park Wetland) as part of the field investigations supporting the current assessment.
 - The State Vegetation Type Map (NSW DCCEEW 2024a) indicates the potential further presence of PCT 3972 Sydney Creekflat Wetland and PCT 3986 Coastal Sands Swamp Mahogany Rush Forest within Morton Park Wetland.
- Vegetation within Kamay Botany Bay National Park, to the east. The closest areas to the subject land are mapped as medium probability GDEs.
 - The State Vegetation Type Map (NSW DCCEEW 2024a) indicates the potential presence of PCT 3545 Coastal Sands Bloodwood Low Forest within these vegetated areas adjacent to the subject land. This matches the vegetation mapping undertaken by Biosis for areas along the eastern edge of the subject land.
- The wetland area in Zone 4 (mapped as high to medium probability terrestrial GDE and high probability wetland GDE) and Zone 5 (mapped as medium to low probability terrestrial GDE with patches of high probability).
 - PCT 3545 Coastal Sands Bloodwood Forest, PCT 3546 Coastal Sands Littoral Scrub-Forest, PCT 3638 South Coast Sands Bangalay Forest, PCT 3921 Coastal Sydney Sands Saw-sedge Wet Shrubland and PCT 3986 Coastal Sands Swamp Mahogany Rush Forest were mapped in Zone 4 as part of the field investigation supporting the current assessment.
 - The State Vegetation Type Map (NSW DCCEEW 2024a) indicates the potential further presence of PCT 3805 Southern Sandplain Heath, PCT 3812 Sydney Coastal Sandstone Headland Heath and PCT 3922 Sydney Coastal Sand Swamp Scrub.
 - A natural retention basin is located in the south of Zone 4.
 - The same PCTs recorded or predicted to occur (via the State Vegetation Type Map) in Zone 4 are likely to occur within Zone 5.
- Towra Point Nature Reserve, a listed Ramsar Wetland of international significance. Mapped as a high probability terrestrial GDE and high probability estuarine and near shore marine ecosystems GDE. This area lies outside of the groundwater drawdown zones of influence associated with the proposed

modification, as calculated in Appendix F (Updated Soils, Groundwater, and Contamination Report) of the Submissions Report (AECOM 2025a), and therefore will not be impacted.

The mapping also indicates that there is terrestrial vegetation that relies on groundwater within RPIP Mountain (high to medium probability GDE). This vegetation has been assessed as PCT 3545 Coastal Sands Bloodwood Forest (in Low and Regenerating conditions) and would be removed as part of the proposed modification.

Patches of medium probability GDE are also present along the eastern boundary of the subject land. These patches have been assessed as PCT 3545 (Coastal Sands Bloodwood Low Forest) (Regenerating) (refer to Table 3-7 and Figure 3-2). Only one of these patches (the southernmost patch) is to be removed as part of the proposed modification.

6.5.2 Proposed impacts

The proposed modification involves excavation of pits and trenches during Stage 2 (Removal, relocation and/or augmentation of infrastructure) and Stage 3 (Remediation). There is potential for these excavations to intercept groundwater. Groundwater is relatively shallow in different parts of the subject land; the shallowest depth recorded within the subject land is 0.2 mbgl in Zone 2. Temporary groundwater dewatering would be required where groundwater accumulates in excavations. Groundwater ingress (quantity of groundwater take and extent of groundwater drawdown, also called the radius of influence) has been estimated and is presented in Annexure A of Appendix F (Updated Soils, Groundwater, and Contamination Report) of the Submissions Report (AECOM 2025a).

Drawdown would be temporary and diminish with distance from the excavations. Where the radius of influence intercepts a GDE, there is potential for flora and fauna that are dependent on the supply of groundwater to be affected. Based on this radius influence, the groundwater assessment determined that the following GDEs have potential to be impacted:

- Vegetation within Kamay Botany Bay National Park, to the east. Groundwater drawdown extends approximately 4 m into the National Park boundary, with drawdown expected to be within natural groundwater fluctuations.
- A small area to the north-east intersecting with vegetation adjacent to Reserve Road (not associated with the Kamay Botany Bay National Park).
- A small area to the west intersecting with vegetation adjacent to Sir Joseph Banks Drive.
- The wetland areas in Zone 4 (Figure 1-1).

Ampol have advised based on their knowledge of the Site, that the Zone 4 wetland regularly dries out during periods of natural drought. As such, groundwater drawdown in this area may also be reflective of natural seasonal groundwater fluctuations. The construction program is such that the longest period of time that any single excavation will be open is estimated to be a maximum of 8 weeks. This will further ensure that groundwater drawdown and potential impacts to GDEs are minimal.

Whilst the subject land is located approximately 150 metres from the Towra Point Nature Reserve, which is a listed Ramsar wetland of international importance, the wetland is outside the radius of influence for all proposed excavations. Therefore, it is not anticipated that the proposed modification works would affect the wetland (AECOM 2025a).

Approximately 16.83 hectares of probable GDE vegetation occur within the areas of influence associated with groundwater drawdown from trenches/excavation associated with the proposed modification. This includes:

- 11.55 ha of high probability GDE.
- 4.90 ha of moderate probability GDE.
- 0.38 ha of low probability GDE.

These areas are also shown on Figure 6-1. As noted above, drawdown would be temporary and diminish with distance from the excavations. As such, the areas of influence are also shown on Figure 6-1 to provide some context regarding the distance these GDEs occur from each excavation.

6.5.3 Nature of impacts

GDEs include a broad range of environments from highly specialised species and ecosystems that possess unique biotic and abiotic characteristics that 'separate' them from other ecosystems that do not rely on groundwater to survive, to more general terrestrial and aquatic ecosystems that have an opportunistic dependence on groundwater or rely on it during times of drought. It is often difficult to determine the degree of dependency an ecosystem will have on groundwater as the degree of dependence can be variable from partial and infrequent (such as episodic or seasonal dependency) full to continual dependency for those ecosystems that are located within area of continual groundwater discharge (such as mound springs) (Serov et al. 2012).

Where impacts to GDEs occur as a result of groundwater drawdown, the extent of impacts expressed would be linked to the level of groundwater dependency as well as the degree of groundwater drawdown. Impacts associated with a decrease in groundwater levels could include:

- Decrease in water available to dependent surface species. At first, these species would enter water stress leading to desiccation of vegetation matter and then eventual death.
- Reduction in groundwater levels can also lead to exposure of acid sulfate soil horizons which can lead to acidification of groundwater and mobilisation of heavy metals, harming vegetation and contaminating surrounding groundwater and surface systems.

If impacts are prolonged this can lead to alteration of species composition within the ecosystem or permanent loss of the ecosystem (Serov et al. 2012). However, as noted above, the maximum period any single excavation will be open during the construction program is 8 weeks. Impacts as a result of prolonged groundwater drawdown are therefore unlikely.

The Stage 2 (Removal, relocation and/or augmentation of infrastructure) and Stage 3 (Remediation) works are anticipated to be staged across a five-year construction program (refer to Table 1-2). Construction works would occur across 5.5 days a week (full day on Monday to Friday and half day Saturday); groundwater take (refer to Annexure A of Appendix F of the Submissions Report) has been estimated based on each excavation being open on a 24-hour basis. The number of days each excavation would be open has been estimated and included in the groundwater ingress estimates, with the longest duration that any single excavation is open being estimated as a maximum of 8 weeks. The anticipated drawdown extents would be reviewed following completion of the construction program.

Groundwater levels and flow would return to current observation levels following completion of the proposed dewatering activities (AECOM 2025a).

6.5.4 Minimising impacts

In order to minimise impacts to GDEs, groundwater drawdown would be managed by adhering to a Groundwater Management Plan (GWMP), which if required would include trigger response adaptive management actions to allow for effective and quick responses. At a minimum, this plan would include the following mitigations:

- Staged approach to excavations/ trenching works to ensure required drawdowns are minimised as much as practicable throughout works. This would also include ensuring that excavations/ trenches in closest proximity to GDEs (and therefore with the highest impact on drawdown) are open for the shortest period of time possible. The maximum time any single excavation will be open is estimated to be 8 weeks.
- A highly adaptive monitoring program, responsive to work construction scheduling, for the GDE vegetation surrounding the development site. This would include mapping of the GDE/ PCT extents and regular monitoring at selected sites (control and impact) throughout the period of drawdown influence (i.e., whilst the excavations are open), and monitoring for a suitable period following closure of each excavation. The scope and frequency of the monitoring program will be outlined in the GWMP for each required excavation, and would be developed based on the finalised design for trenches/ excavations and the level of drawdown influence, available field data (surface water, groundwater, and mapping of GDE extents and PCTs), and other relevant factors, including the timing and intensity of storm events.
- Thresholds or triggers to indicate when drawdown in the zone of influence approaches, reaches, and exceeds an identified benchmark (i.e., benchmark indicating that a prescribed impact has the potential to occur). Any such exceedances would trigger the implementation of management actions. These triggers would be detailed in a Trigger Action Response Plan (TARP) developed by a suitably qualified ecologist and would require approval alongside the GWMP prior to commencement of the proposed modification works. Examples of trigger action responses which may be included in the TARP include:
 - Where a statistically significant change is detected in Total Species Richness (TSR) and species composition (as informed by collection of vegetation plot data) between control and impact sites, this may trigger either additional monitoring or a more involved investigation to report on the causation of vegetation change. This may lead to further mitigations, cessation of groundwater drawdown for a set period till ecosystems recover and a temporary increase in monitoring frequency. If recovery is unsuccessful, further rehabilitation actions would be required.
 - Where increases in dieback are recorded from observational monitoring (i.e., photo point monitoring) at impact sites (and not also recorded at control sites) this would similarly lead to either additional monitoring or a more involved investigation, depending on the scale of dieback and the time horizon within which dieback increases are recorded.
 - Where a change in swamp/GDE extent is recorded this may trigger further monitoring. Where sustained reductions in GDE extents are recorded at impact sites only this would likely trigger further formal investigations and mitigations, including cessation of groundwater drawdown until GDEs have an opportunity to recover. If recovery is unsuccessful, further rehabilitation actions would be required.
- A suite of adaptive management actions to be implemented to minimise prescribed impacts and/ or protect potentially affected GDEs within the area of drawdown influence. Management actions to be approved in coordination with CPHR prior to commencement of works.
- Post-construction monitoring to ensure no ongoing impacts to GDEs occur.

In developing and applying these benchmark triggers and adaptive management measures, the following would be considered where appropriate:

- Relevant literature to inform and guide adaptive management and support predictions about short-term and long-term surface water and groundwater drawdown related impacts related to GDEs.
- Whether, based on monitoring data collected prior to and during construction, the monitoring program and the implementation of management actions needs to extend beyond the conclusion of construction.
- Measures to address the residual prescribed impacts on threatened species or TECs that may be associated with areas of GDEs.

Given the temporary nature of the works and the proposed mitigations above, it is unlikely that there would be a permanent impact to the identified GDEs surrounding the development site. Impacts would be appropriately managed and the adaptive management actions would help ensure that, should temporary impacts related to drawdown occur, they are minimised and not permanent. As highlighted above, in the unlikely event that permanent prescribed impacts to GDEs do occur, a Restoration Management Plan would be developed, outlining how the affected GDE community would be rehabilitated and monitored. If ongoing impacts remain following all practical efforts to restore impacted ecosystems, biodiversity offset credits will need to be calculated for significant residual impacts.

6.6 Assessment of operation impacts

Once the modification works are complete, the development site would continue to operate as described in the approval documentation for the approved project and would be consistent with the development consent for SSD-5544.

6.7 Assessment of cumulative impacts

Cumulative impacts have the potential to occur when benefits or impacts from a project overlap or interact with those of other projects, potentially resulting in a larger overall effect (positive or negative) on the environment or local communities. Cumulative impacts may occur when projects are constructed or operated concurrently or consecutively.

Projects were reviewed against the following screening criteria for this cumulative impact assessment:

- Spatially relevant (i.e., the development or activity overlaps with, is adjacent to or within two kilometres of the Project Area).
- Scale (i.e., large-scale major development or infrastructure projects that have the potential to result in cumulative impacts with the proposed modification, as listed on the NSW Government Major Projects website and on the relevant council websites).
- Timing (i.e. the expected timing of its construction and/or operation overlaps or occurs consecutively to construction and/or operation of the proposed modification).
- Status (i.e., projects in development with sufficient publicly available information to inform this environmental impact statement and with an adequate level of detail to assess the potential cumulative impacts).

The following projects were considered to have met the above criteria, with the potential to have cumulative impacts with the proposed modification:

- Kamay Ferry Wharves (350 m north of the Project Area).
- Breen Resources Recovery Facility (2 km west of the Project Area).
- Woolooware to Kurnell Tower Replacement Project (120 m south west of the Project Area).
- Kurnell Planning Proposal (800 m south west of the Project Area).

The locations of these projects are shown on Figure 6-2.

Since lodgement of the Modification Report, one project, Kurnell Stormwater Separation Improvement Project, has since finished construction and has been removed from the cumulative impact assessment. No cumulative impacts were identified for this project upon biodiversity values, and therefore the baseline assessment of this Updated BDAR has not changed.

Kamay Ferry Wharves has also completed construction. However, as ferry services have not yet commenced, the project continues to be included in the operational cumulative impact assessment.

6.7.1 Construction

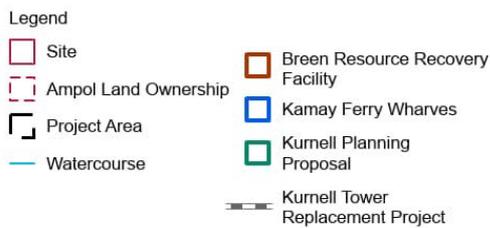
The proposed modification is considered unlikely to significantly contribute to direct cumulative impacts to biodiversity. Impacts associated with the proposed modification are relatively minor, comprising of 5.23 ha of native vegetation that is present in low, regenerating, and modified conditions within a highly disturbed environment with a history of clearing and contamination. As such, the proposed modification would not result in the reduction of any important habitat within the locality, nor would it result in an increase to the existing disturbance footprint associated with the Kurnell Terminal, which is already present within the locality.

Indirect impacts associated with all of these works would need to be appropriately managed to ensure that there are no indirect impacts to biodiversity. The Kurnell Refinery Conversion Project (SSD-5544) EIS to which the proposed modification would apply, states that the acoustic environment surrounding the approved project was, at the time of writing, influenced by the noise from the existing operations. During construction, there would be a number of construction plant operating, and a small number of additional vehicles. The combination of these noise sources would have a negligible impact on the surrounding receptors.

Mitigation measure for controlling vehicle movements, dust suppression, and construction noise and vibration would assist with minimising these impacts and should be included each project's CEMP.

6.7.2 Operation

Once the proposed modification works are complete, the development site would continue to operate as described in the approval documentation for the approved project and would be consistent with the development consent for SSD-5544. As such, further consideration of operational cumulative impacts is not considered necessary.



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Source: Department of Customer Service ID.

Figure 6-2 Cumulative development projects

7 Mitigation and management of impacts

Identification of measures to mitigate or manage impacts has been undertaken in accordance with the BAM (DPIE 2020a), including considerations such as:

- Techniques, timing, frequency, and responsibility
- Identification of measures for which there is risk of failure
- Evaluation of the risk and consequence of any residual impacts
- Documentation of any adaptive management strategy proposed.

Identification of measures for mitigating impacts related to:

- Displacement of resident fauna
- Indirect impacts on native vegetation and habitat
- Mitigating prescribed biodiversity impacts
- Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

Environmental mitigation measures to manage potential Biodiversity impacts of the proposed modification are outlined in Table 7-1. Implementation of the measures in the following management plans would also manage potential Biodiversity impacts:

- Construction Environmental Management Plan (CEMP).
- Soils and Water Management Plan (SaWMP).
- Surface Water Management Plan (SWMP).
- Erosion and Sediment Control Plan (ESCP).
- Groundwater Management Plan (GWMP).
- Traffic and Transport Management Plan (TTIA).
- Noise and Vibration Management Plan (NVIA).

Additional and/ or modified environmental safeguards and management measures to those presented in the approved SSD-5544 are shown in **bold** and deleted measures, or parts of measures, have been ~~struck out~~. Where approved measures have been consolidated to reduce duplication, these have been underlined.

Table 7-1 Management and mitigation measures – Biodiversity

ID	Issue	Mitigation measure
A2	General – Avoid and minimise	Caltex Ampol Ampol would implement reasonable and practicable measures to avoid or minimise impacts to the environment that may arise as a result of the approved project and proposed modification .
K1	Management of weeds	A Biodiversity and Weed Management Plan (BWMP) would be prepared in order to limit and control the spread of noxious weeds within the Site/demolition works area . It would include the following:

ID	Issue	Mitigation measure
		<ul style="list-style-type: none"> Wash down procedures to reduce the spread of weeds via vehicles and machinery Measures to target potential new weed outbreaks including soil stockpiles and any other disturbed areas Outline monitoring programs for noxious and problematic weeds on site and in the surrounding areas Measures for strict stockpiling control to help eradicate all noxious weeds as per NSW DPI specifications for Sutherland Shire LGA Include a list of 'frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO for the control of noxious weeds; and ensure that only amphibian friendly herbicides are used Wash down protocols for construction/demolition vehicles and machinery to prevent the spread of root-rot fungus (<i>Phytophthora cinnamomi</i>) and noxious weeds All personnel undertaking routine management activities of any noxious weeds should be appropriately trained and all contractors should hold the necessary permits and licenses. Noxious weed information sheets would be provided to demolition contractors to help identification of relevant noxious weeds.
K2	Restriction of Access to Existing Vegetated Areas	<p>A BWMP would be prepared in order to limit potential impacts to existing vegetation outside of the area of proposed works, but within the Site. It would include the following:</p> <ul style="list-style-type: none"> Existing vegetation on Site would be clearly marked on all Site plans and construction diagrams, with clear indications of no-go zones within all vegetated areas Existing vegetation would be clearly signposted and fenced off prior to the commencement of construction activities, and should remain fenced off until the completion of works (as per the Vegetation Exclusion Zones shown on Figure 17-1) <p>Absolutely all works would be limited to the defined construction/ demolition footprint Project Area, as defined in Figure 4-1 of the Modification Report.</p>
K3	Ecology – Fauna management	<p>To minimise the potential for impacts to native fauna species, the BWMP would be developed and include following measures:</p> <ul style="list-style-type: none"> Identification sheets would be provided to all construction workers on Site for the two threatened frog species predicted to occur within the Site. <u>Stop work procedures would be implemented during the works on the chance encounter of any dispersing threatened frogs or birds to avoid death or injury to frogs dispersing across the Site, or disturbance to nesting threatened birds.</u> If any frogs are found within the Project Area, works would cease until frogs have been relocated to areas outside the area of impact If any threatened frogs, e.g. Green and Golden Bell Frog or Wallum Froglet, are identified within the Site, works would cease and active searching should be undertaken by a qualified zoologist experienced in the identification and management of the Green and Golden Bell Frog and Wallum Froglet All trenches would be inspected prior to works each morning. <p>Exclusion fencing shall be maintained during all seasons of the year. Any frogs that become trapped within trenches would be</p>

ID	Issue	Mitigation measure
		<p>assessed by a suitably qualified ecologist or veterinarian and then released into the nearest suitable habitat if uninjured</p> <ul style="list-style-type: none"> Wash down protocols to prevent the spread of Amphibian Chytrid Disease (chytridiomycosis) would be implemented at relevant work areas. Protocols would be consistent with NSW DCCEEW OEH guidelines (DECC, 2008b) 'Frog-friendly' and 'wetland friendly' herbicides such as Roundup Biactive or Weedmaster DUO would be used for the control of noxious weeds If fauna are found to be utilising the Site, or a nest, den or roost is found, work in the immediate area is to stop and the animals are to be allowed to move off freely, or relocated by an authorised person to an area outside the construction footprint Measures to limit light spill during construction, such as strategic placement and directional lighting, and implementing motion sensor activation.
K8	Light spill during operation	The detailed design of new buildings would include measures to manage light spill.
F1	Soil and water management	<p>The Construction Environmental Management Plan (CEMP) for the Project proposed modification would include a Soil and Erosion and Water Soil and Water Management Plan (SaWMP). This plan would include the following measures:</p> <ul style="list-style-type: none"> All materials would be stockpiled in accordance with 'The Blue Book' Managing Urban Stormwater – Soils and Construction Volume 1 and 2 (Landcom, 2004) Sediment and erosion controls would be installed and operated in accordance with 'The Blue Book' Managing Urban Stormwater – Soils and Construction Volume 1 and 2 (Landcom, 2004) Silt fences would be installed around stockpiles to reduce erosion and the movement of suspended solids as necessary Soil stockpiles and any polluted materials would be stored in designated areas which are not in close proximity to any stormwater drainage systems Erosion control structures, bunded areas, containment areas, drainage lines and interception measures would be subject to regular inspection Clean materials would be separated from contaminated materials Soil erosion and sedimentation devices would remain in place until the disturbed ground surface is restored. These devices would also capture any gross pollutants.
F2	Soil and water management	<p>A Soils and Water Management Plan would include be developed as a sub plan to the DEMP-CEMP. M measures to be included in the plan and implemented during the demolition construction works to protect stormwater quality would including-e:</p> <ul style="list-style-type: none"> Stormwater or groundwater ponded in excavations would be sent to the WWTP, unless it is tested and is of suitable quality to be directed to stormwater Stormwater that is captured in the bunds around the contaminated soil stockpiles would be collected and sent to the WWTP Silt fencing and/or alternate sediment control measures would be installed around soil stockpiles and disturbed areas

ID	Issue	Mitigation measure
		<ul style="list-style-type: none"> • Regular inspection would be undertaken of soil stockpiles/ and excavation areas, including following rainfall events • Regular inspection of excavation areas and containment cell area, including following rainfall events • Regular inspections would be undertaken of stormwater drains down hydraulic gradient of disturbed areas • Stormwater management measures incorporated into the design of the containment cell would be regularly inspected during operation in line with the Site's existing Inspection Checklist and following heavy rain events; • If stormwater quality is impacted during the demolition works and ACS Modification works in areas that have been disturbed, water would be diverted to the intermediate sewer system; and • During the demolition works and ACS Modification works, following notable but prolonged rainfall events (over three days) or following heavy rainfall events over a shorter timescale, water sampling would be completed at the stormwater retention basin to ensure that the quality of the water is of an appropriate standard to be discharged from the Site. Water that is not of an appropriate quality would be either treated in situ or directed to the WWTP.
C10	Groundwater management	<p>A GWMP would be developed and included within the CEMP. This plan would outline the measures that would be used to manage the testing, dewatering, storage, movement and treatment of any groundwater intercepted during the construction phase. It would also outline measures to prevent and/ or minimise impacts to GDEs through groundwater drawdown. Measures would include:</p> <ul style="list-style-type: none"> • <u>Measures for the dewatering, storage, movement and treatment of groundwater encountered in excavations. Dewatered groundwater would be collected and sent to the on-site Wastewater Treatment Plant in accordance with the established Site wastewater management procedures, unless it is tested and is of suitable quality to be directed to stormwater</u> • The use of appropriate drip trays and interception techniques for any construction specific liquids stored on the Site • Bunding of any fuel or chemical storage area at the construction Site • Regular inspection of construction equipment to ensure any leaks are minimised and rectified • Management of vehicles leaving the Site to reduce soil on roads, production of dust and the introduction of contamination to the groundwater and/or stormwater system • Appropriate and timely disposal of any contaminated soil, water (if required) or waste generated during construction • Regular inspection of erosion control structures and bunded areas • Regular inspection and testing of bunded containment areas, drainage lines and process pipe work • <u>A plan for corrective action should unexpected finds increase in contaminants of potential concern (COPC) be observed in the groundwater monitoring during the proposed modification.</u> • The anticipated drawdown extents would be reviewed following completion of the construction program. • Excavations/ trenches would be staged to minimise drawdowns during delivery of the works. Excavations/ trenches in closest

ID	Issue	Mitigation measure
		<p>proximity to GDEs would be open for the shortest period of time possible.</p> <ul style="list-style-type: none"> • Following review of the drawdown extents, if required, a monitoring program for GDEs within the drawdown areas would be developed. The scope and frequency of the monitoring program would be developed based on the finalised design for excavations/ trenches and the level of drawdown influence, available field data (surface water, groundwater, and mapping of GDE extents and PCTs), and other relevant factors, including the timing and intensity of storm events. The monitoring program would include: <ul style="list-style-type: none"> - Establishment of groundwater level and quality triggers, and GDE vegetative triggers, and associated response actions in a Trigger Action Response Plan (TARP) by a suitably qualified ecologist. - Establishment of adaptive management actions to be implemented to minimise prescribed impacts and/ or protect potentially affected GDEs within the area of drawdown influence. - Post-construction survey to confirm no ongoing impacts to GDEs occur. - In the unlikely event that permanent prescribed impacts to GDEs do occur, a Restoration Management Plan would be developed, outlining how affected the GDE community would be rehabilitated.

8 Serious and irreversible impacts

In accordance with Clause 6.7 of the BC Regulation, an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

- Principle 1: It will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline.
- Principle 2: It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size.
- Principle 3: It is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution.
- Principle 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

Giant Dragonfly was detected during targeted surveys, which is a species that has been recognised as being at risk of a SAI. This species is considered an SAI entity as it is considered unlikely to respond to measures to improve its habitat as highlighted in Principle 4 above. An SAI assessment in accordance with Section 9.1 of the BAM has been undertaken for this species and is included in Annexure E.

9 Impact summary

9.1 Identification of impacts requiring offsets

9.1.1 Impacts to native vegetation (ecosystem credits)

As outlined in Section 9.2.1 of the BAM, the assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- ≥ 15 , where the PCT is representative of an Endangered Ecological Community (EEC) or a Critically Endangered Ecological Community (CEEC).
- ≥ 17 , where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community.
- ≥ 20 , where the PCT does not represent a TEC and is not associated with threatened species habitat.

On this basis, offsets are required for all three vegetation zones as they have vegetation integrity scores greater than 20.

The offset requirement for the proposed modification was calculated using the BAM Calculator. Table 9-1 provides a summary of the ecosystem credit offsets required for impacts from the proposed modification at the subject land.

Table 9-1 Offsets required (ecosystem credits)

Vegetation zone	Area (ha)	Impact	VI score	Offset required	TEC	HBTs	Credit requirement
3545_Low	0.35	Removal	38.1	Yes	Nil	Yes	5
3545_Regenerating	4.37	Removal	37.7	Yes	Nil	No	62
3972_Modified	0.51	Removal	30.1	Yes	Nil	No	8

9.1.2 Impacts to threatened species and their habitat

As outlined in Section 9.2.2 of the BAM, an offset is also required for the impacts of the proposals on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of ≥ 17 .

The offset requirement for the proposed modification was calculated using the BAM Calculator. Table 9-2 provides a summary of the species credit offsets required for impacts from the proposed modification at the subject land.

Table 9-2 Offsets required (species credits)

Species	Vegetation zone	Habitat condition (VI score) loss	Area (ha)	Biodiversity risk weighting	Credit requirement
Giant Dragonfly	3545_Low	38.1	0.35	3	10
	3545_Regenerating	37.7	3.09	3	87

Species	Vegetation zone	Habitat condition (VI score) loss	Area (ha)	Biodiversity risk weighting	Credit requirement
Southern Myotis	3545_Low	38.1	0.35	2	7
	3545_Regenerating	37.7	3.99	2	75
	3972_Modified	30.1	0.51	2	8

Species polygons for the above species credit species are illustrated in Figure 9-1 below.

9.1.3 Staging of offsets

The development footprint consists of four zones (Zones 1 and 1A, Zone 2 and Zone 3) within which staged retirement of the proposed modification's biodiversity credit liability would be undertaken. The proposed staging is detailed in the indicative program outlined in Table 1-2. The four zones are shown on Figure 1-1 and Figure 1-2 (colour-coded).

There is no removal of native vegetation and no impacts to species credit species habitat within Zones 1 and 1A and therefore offsets within these zones is not required. The staged ecosystem credit breakdown for Zone 2 and Zone 3 are shown below in Table 9-3 and the staged species credit breakdown is shown in Table 9-4.

Table 9-3 Staged ecosystem credit offset requirement

Vegetation zone	Area impacted (ha)	Credit requirement
Zone 2		
3545_Regenerating	0.39	6
3972_Modified	0.51	8
Zone 3		
3545_Low	0.35	5
3545_Regenerating	3.98	56

Table 9-4 Staged species credit offset requirement

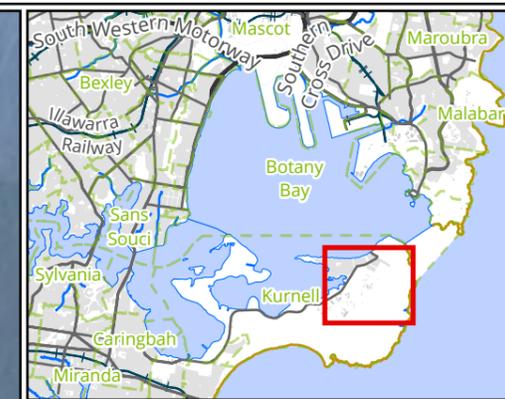
Species	Vegetation zone	Area impacted (ha)	Credit requirement
Zone 2			
Southern Myotis	3545_Regenerating	0.39	7
	3972_Modified	0.51	8
Zone 3			
Giant Dragonfly	3545_Low	0.35	10
	3545_Regenerating	3.09	87
Southern Myotis	3545_Low	0.35	7
	3545_Regenerating	3.60	68

9.2 Identification of impacts not requiring offset

There were no areas of native vegetation within a VI score below the threshold requiring offset. Therefore, there are no impacts not requiring offset.

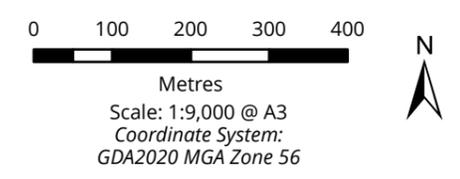
9.3 Identification of areas not requiring assessment

Following the assessment, it was determined that previously cleared areas of the development site did not require assessment. However, buildings and non-native vegetation to be removed were assessed for potential prescribed impacts. No such impacts were found.



- Legend**
- Subject land
 - Development site
 - Development footprint
 - Impacts requiring offset
- Threatened species habitat**
- Southern Myotis - *Myotis macropus*
 - Giant Dragonfly - *Petalura gigantea*
- Native vegetation - Biosis**
- 3545_Regenerating
 - 3545_Low
 - 3972_Modified

Figure 9-1 Impacts requiring offset



Matter: 40389, Date: 24 November 2025
 Prepared for: MH, Prepared by: HL, Last edited by: Iharley
 Location: P:\40300s\40389\Mapping\40389_Kurnell\SSD5544Mod.aprx
 Layout: 40389_F9-1_Offsets

Acknowledgements: Basemap © Land and Property Information 2016, Imagery © Nearmap, November 2024

TASMAN SEA

10 Assessment against biodiversity legislation

10.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act.

Under the EPBC Act, activities that have potential to result in significant impacts on MNES must be referred to the Cth DCCEEW for assessment. In addition to MNES, if an action is proposed that is either situated on, or which may impact upon, Commonwealth land, an assessment against *Significant impact guidelines 1.2: Actions on, or impacting upon, Commonwealth land and actions by Commonwealth agencies* (CoA 2013a) is required. As Commonwealth land is not impacted upon, further consideration of guideline 1.2 is not required.

MNES relevant to the proposed modification include nationally threatened species and ecological communities, migratory species, national heritage places and Ramsar wetlands. An assessment of the impacts of the proposed modification on these MNES is provided in Table 10-1.

Table 10-1 Assessment of the proposed modification against the EPBC Act

Matter of NES	Project specifics	Potential for significant impact
Threatened species	Latham's Snipe (Vulnerable, EPBC Act) was detected within the subject land during targeted survey. The species may occasionally utilise the modified condition PCT 3927 located within the human-made pipeways within the development footprint. A SIC assessment is included in Annexure F for this species that found that a significant impact would not occur for this species as a result of the proposed works.	No potential for impact.
Threatened ecological communities	There are no TECs within the subject land that are listed under the EPBC Act.	No potential for impact.
Migratory species	The subject land has the potential to support migratory species, however there are no areas that are considered significant habitat for migratory species. Migratory species may occasionally stopover on the Site; however, this would be enroute to the Towra Point Nature Reserve.	No direct impact is expected to any migratory listed species.
National Heritage Places	There are no National Heritage Places within the subject land. However, the 'Kamay Botany Bay: Botanical Collection Sites' (which includes Kamay Botany Bay National Park and Towra Point Reserve) are located within close proximity (within 500 m). No impacts to this site are included in the proposed modification.	No potential for impact.
Wetlands of international importance (Ramsar sites)	The Towra Point wetland is located within 500m of the subject land, and is considered a Ramsar wetland. No impacts to this site are included in the proposed modification.	No potential for impact.

10.2 Environmental Planning and Assessment Act 1979/Environmental Planning and Assessment Regulation 2021

The EP&A Act was enacted to encourage the proper consideration and management of impacts of proposed development or land-use changes on the environment (both natural and built) and the community. The EP&A Act is administered by the NSW DPHI.

The EP&A Act provides the overarching structure for planning in NSW and is supported by other statutory environmental planning instruments. Sections of the EP&A Act of primary relevance to the natural environment are outlined further below.

10.3 State Environmental Planning Policies

10.3.1 State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 2: Vegetation in non-rural areas

This chapter aims to protect the biodiversity values of trees and other vegetation in non-rural areas of NSW and to preserve the amenity of non-rural areas through the preservation of trees and other vegetation by ensuring that the BOS will apply to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that do not require development consent.

As the proposed modification requires development consent, the provisions of this chapter under the SEPP do not apply.

Chapter 3: Koala Habitat Protection 2020

This chapter applies to land zoned RU1, RU2, or RU3. As the proposed modification occurs on land zoned E5, this chapter does not apply.

Chapter 4: Koala Habitat Protection 2021

Chapter 4 Koala Habitat Protection aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

The subject land is located within the Sutherland Shire LGA, which is not listed under Schedule 2, Chapter 4 of SEPP, and is therefore not subject to the requirements laid out by the policy.

No further consideration is required.

10.3.2 State Environmental Planning Policy (Resilience and Hazards) 2021

Chapter 2 (Coastal Management) of SEPP (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) integrates guidance previously detailed in SEPP (Coastal Management) 2018 aims to promote a co-ordinated approach to land use planning in the coastal zone of NSW.

The Resilience and Hazards SEPP provide maps for Coastal Wetlands Proximity Area, Coastal Environment Area, and Coastal Use Area. Development consent cannot be granted within these areas unless the Consent

Authority is satisfied that the proposed development will not significantly impact on areas mapped as Coastal Wetlands, Coastal Wetlands Proximity Area, Coastal Environment Area, or Coastal Use Area.

The subject land contains areas mapped as 'Coastal Wetlands Proximity Areas' as defined by clause 6 of this policy. Therefore, Chapter 2 of Resilience and Hazards SEPP apply to the proposed modification.

Impacts to Coastal Wetlands Proximity Area

Under Part 2.2, Division 1, section 2.8 of the Resilience and Hazards SEPP, development consent may not be granted for a development on mapped Coastal Wetlands Proximity Areas unless the consent authority is satisfied that the proposed development will not significantly impact on:

- The biophysical, hydrological, or ecological integrity of the adjacent coastal wetland or littoral rainforest, or
- The quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

Actions required for the proposed modification are limited to "proximity areas for coastal wetlands." While the proposed modification may lead to a slight temporary decrease in the quality of surface flows, mitigation measures, including sedimentation controls are expected to mitigate impacts to downstream wetlands, and are outlined in Section 7. The existing Surface Water System (SWS) and Waste Water Treatment Plan (WWTP) also assist with the management of surface flows.

Kurnell Terminal SSD-5544 Mod-7 Appendix G – Updated Surface Water, Wastewater and Flooding Assessment (AECOM 2025b) has been completed and details surface water safeguards for the proposed modification which ensure no impacts to flows, flooding, or water quality in receiving environments including Towra Point Nature Reserve and coastal wetland proximity areas. Key management measure identified include:

- Retain landform (with the exception of RPIP Mountain), bunding, and surface water storage; reinstate excavations to pre-modification levels (with the exception of RPIP Mountain, which will be regraded).
- Redirect Catchments B and F runoff via low-flow pipes to existing SWS, preserving flows to southern basin/ wetlands.
- Manage added flows in Catchment B detention systems to maintain pre-modification discharges to Quibray Bay (up to 1% Annual Exceedance Probability [AEP]).
- Install two Catchment E OSD systems to sustain pre-modification rates to roadside channels, Ramsar site, and bay (up to 1% AEP).
- Add permanent sediment controls at OSD ends, retaining existing treatments for low operational sediment loads.

No further assessment required due to effective mitigation.

10.4 Other Environmental Planning Instruments

10.4.1 Sutherland Shire LEP

The subject land is mapped within the Sutherland Shire LGA. Development within the subject land must therefore comply with the LEP. The subject land is currently zoned E5 (Heavy Industrial). The relevant objectives of E5 zoning are:

- To provide areas for industries that need to be separated from other land uses.
- To ensure the efficient and viable use of land for industrial uses.
- To minimise any adverse effect of industry on other land uses.
- To encourage employment opportunities.

The proposed activities within the subject land is considered as permitted with consent on E5 zoned land under the Sutherland Shire LEP. The proposed modification is considered to be in line with the objectives of the LEP.

10.5 Biosecurity Act 2015

The Biosecurity Act provides for the identification, classification, and control of priority weeds with the purpose of determining if a biosecurity risk is likely to occur. A biosecurity risk is defined as the risk of a biosecurity impact occurring, which for weeds includes the introduction, presence, spread or increase of a pest into or within NSW or any part of the State. A pest plant has the potential to; harm or reduce biodiversity or out-compete other organisms for resources, including food, water, nutrients, habitat and sunlight.

The General Biosecurity Duty as outlined in the Biosecurity Act states:

All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Seven priority weeds for the Greater Sydney LLS Region have been recorded in the subject land and are listed in Table 10-2, along with their associated Duty. Mitigation measures in Section 7 for the control of weeds would minimise the spread of these weed species.

Table 10-2 Priority weeds within the subject land

Scientific name	Common name	Relevant biosecurity duty
<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	General biosecurity duty
<i>Asparagus aethiopicus</i>	Asparagus Fern	General biosecurity duty
<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	Bitou Bush	<ul style="list-style-type: none"> • General biosecurity duty • Biosecurity zone • The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south. • Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone
<i>Asparagus asparagoides</i>	Bridal Creeper	General biosecurity duty
<i>Senecio madagascariensis</i>	Fireweed	General biosecurity duty
<i>Lantana camara</i>	Lantana	General biosecurity duty
<i>Cortaderia selloana</i>	Pampas Grass	General biosecurity duty

10.6 Water Management Act 2000

The WM Act provides for the sustainable and integrated management of the state's water. The WM Act is supported by a series of interpretation guidelines which provide design considerations and overarching management measures for works on waterfront land.

Under the WM Act, an approval is required to undertake controlled activities on waterfront land, unless that activity is otherwise exempt under Section 91E of the WM Act, Section 4.41 of the EP&A Act, or Part 2 of the Water Management Regulation 2018. Waterfront land is defined within the Act as the bed of any river, lake, or estuary and any land within 40 m of the river banks, lake shore, or estuary mean high water mark.

The proposed modification is SSD, it is therefore exempt from the requirement to obtain a Controlled Activity Approval for activities on or under waterfront land.

10.7 Fisheries Management Act 1994

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened species, populations and communities, and critical habitats listed under the FM Act must be assessed through an Assessment of Significance process.

No predicted habitat for threatened aquatic species is mapped on the DPI spatial data portal within the subject land (DPI 2025). As there is no mapped key fish habitat within the subject land, the proposed modification is unlikely to result in impacts to fish passage.

11 Biodiversity credit reports

Offsetting through the transfer and retirement of biodiversity credits, or paying into the BCT Offset Fund, is required for the current assessment for impacts to multiple vegetation zones at the subject land. A biodiversity credit report is provided on the following pages.

As the proposed modification is intending to take a staged approach to satisfying its credit offset liability across Zone 2 and Zone 3, a separate credit report is also provided for each of these zones.

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00046963/BAAS17051/24/00046964	Kurnell Modification 7 BDAR	05/08/2025
Assessor Name	Report Created	BAM Data version *
Mitchell Palmer	19/03/2026	Current classification (live - default) (82)
Assessor Number	BAM Case Status	Date Finalised
BAAS17051	Finalised	19/03/2026
Assessment Revision	BOS entry trigger	Assessment Type
10		Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Coastal Sands Bloodwood Low Forest												
1	3545_Low	Not a TEC	38.1	38.1	0.35	PCT Cleared - 38%	High Sensitivity to Gain			1.50		5

2	3545_Regenerating	Not a TEC	37.7	37.7	4.4	PCT Cleared - 38%	High Sensitivity to Gain			1.50		62
										Subtotal	67	
Sydney Creekflat Wetland												
3	3972_Modified	Not a TEC	30.1	30.1	0.51	PCT Cleared - 84%	High Sensitivity to Gain			2.00		8
										Subtotal	8	
										Total	75	

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAIL	Species credits
Myotis macropus / Southern Myotis (Fauna)									
3972_Modified	30.1	30.1	0.51	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	8
3545_Regenerating	37.7	37.7	4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	75

BAM Credit Summary Report

3545_Low	38.1	38.1	0.35	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	7
								Subtotal	90
<i>Petalura gigantea / Giant Dragonfly (Fauna)</i>									
3545_Regenerating	37.7	37.7	3.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Not Listed	True	87
3545_Low	38.1	38.1	0.35	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Not Listed	True	10
								Subtotal	97

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00046963/BAAS17051/25/00054605	Kurnell Modification 7 BDAR - Zone 2	05/08/2025
Assessor Name	Report Created	BAM Data version *
Mitchell Palmer	19/03/2026	Current classification (live - default) (82)
Assessor Number	BAM Case Status	Date Finalised
BAAS17051	Finalised	19/03/2026
Assessment Revision	BOS entry trigger	Assessment Type
3		Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
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Coastal Sands Bloodwood Low Forest											
1	3545_Regenerating	Not a TEC	37.7	37.7	0.39	PCT Cleared - 38%	High Sensitivity to Gain			1.50	6
										Subtotal	6
Sydney Creekflat Wetland											
2	3972_Modified	Not a TEC	30.1	30.1	0.51	PCT Cleared - 84%	High Sensitivity to Gain			2.00	8
										Subtotal	8
										Total	14

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAI	Species credits	
<i>Myotis macropus / Southern Myotis (Fauna)</i>										
3545_Regenerating		37.7	37.7	0.39	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	7

BAM Credit Summary Report

3972_Modified	30.1	30.1	0.51	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	8
								Subtotal	15

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00046963/BAAS17051/25/00054604	Kurnell Modification 7 BDAR - Zone 3	05/08/2025
Assessor Name	Report Created	BAM Data version *
Mitchell Palmer	19/03/2026	Current classification (live - default) (82)
Assessor Number	BAM Case Status	Date Finalised
BAAS17051	Finalised	19/03/2026
Assessment Revision	BOS entry trigger	Assessment Type
2		Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Coastal Sands Bloodwood Low Forest												
1	3545_Low	Not a TEC	38.1	38.1	0.35	PCT Cleared - 38%	High Sensitivity to Gain			1.50		5

2	3545_Regenerating	Not a TEC	37.7	37.7	4	PCT Cleared - 38%	High Sensitivity to Gain		1.50	56
									Subtotal	61
									Total	61

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAIL	Species credits	
<i>Myotis macropus / Southern Myotis (Fauna)</i>										
3545_Low	38.1	38.1	0.35	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	7	
3545_Regenerating	37.7	37.7	3.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	68	
									Subtotal	75
<i>Petalura gigantea / Giant Dragonfly (Fauna)</i>										
3545_Low	38.1	38.1	0.35	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Not Listed	True	10	

BAM Credit Summary Report

3545_Regenerat ing	37.7	37.7	3.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Not Listed	True	87
								Subtotal	97

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Glossary and abbreviations

Term	Description
ACS	Asbestos Contaminated Soil
ASC NEPM	<i>National Environment Protection (Assessment of Site Contamination) Measure 1999</i> (amended in 2013)
AOBV	Area of Outstanding Biodiversity Value
Assessment Area	All land within 1500 m of the subject land
BAM	NSW Biodiversity Assessment Method 2020
BAM-C	BAM Calculator
BC Act	<i>NSW Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
Biodiversity and Conservation SEPP	State Environmental Planning Policy (Biodiversity and Conservation) 2021
Biosecurity Act	<i>NSW Biosecurity Act 2015</i>
BOS	Biodiversity Offsets Scheme
BWMP	Biodiversity and Weed Management Plan
CEEC	Critically Endangered Ecological Community
COB	Central Operations Buildings
Cth DCCEEW	Australian Commonwealth Department of Climate Change, Energy, the Environment and Water
DCDB	Digital cadastral database
DCP	Development Control Plan
Development footprint	The area of land that is directly impacted by the proposed modification.
Development site	The broader area in which the subject land is located.
DoIW	Directory of Important Wetlands
DP	Deposited Plan
DPHI	NSW Department of Planning, Housing and Infrastructure
DPI	NSW Department of Primary Industries
DTDB	Digital topographic databases
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development
Ecosystem credit species	Threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. A targeted survey is not required to identify or confirm the presence of ecosystem credit species.

Term	Description
EEC	Endangered Ecological Community
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	Environmental Planning and Assessment Regulation 2021
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection License
FM Act	NSW <i>Fisheries Management Act 1994</i>
FWS	Fire-water systems
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation of Australia
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Services
Locality	Area located within 5 km radius from the subject land
LPI	NSW Land and Property Information
MNES	Matters of National Environmental Significance protected by a provision of Part 3 of the EPBC Act
NMP	Noise Management Plan
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
OEMP	Operations Environmental Management Plan
OSD	Onsite detention
OWS	Oily Water Sewer
PCT	Plant Community Type
RPIP	Refining Process Improvement Project
Resilience and Hazards SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
SAIL	Serious and Irreversible Impact
SEPP	NSW State Environmental Planning Policy
SOB	Supply Operations Buildings
Species credits	A class of biodiversity credits required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates
Species credit species	Threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. A targeted survey or an expert report is required to confirm the presence of these species on the subject land. Alternatively, the proponent may elect to assume the species is present for development/clearing projects only.
SSD	State Significant Development

Term	Description
Subject land	The areas within or the combined areas of the development site, and any indirect and prescribed impacts.
SWMS	Smart Water Management System
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection
TMP	Traffic Management Plan
VMP	Vegetation Management Plan
WM Act	NSW <i>Water Management Act 2000</i>
WWTP	Wastewater Treatment Plan

Annexure A Survey methods

Nomenclature

The flora taxonomy (classification) used in this report follows the most recent Flora of NSW (Harden 2002, 1993, 2000, 2002). All doubtful species names were verified with the online Australian Plant Name Index (Australian National Botanic Gardens & Australian National Herbarium 2007). Flora species, including threatened species and introduced flora species, are referred to by both their common and then scientific names when first mentioned. Subsequent references to flora species cite the common names only, unless there is no common name, for which scientific name will be used. Common names, where available, have been included in threatened species tables and the complete flora list in Annexure C.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by the Cth DCCEEW (DSEWPaC 2009). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only.

Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by NSW DCCEEW (SL100758, expiry date 30 June 2026). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor Mitch Palmer (BAAS17051).

Limitations

Field surveys were undertaken in accordance with the BAM (DPIE 2020a). Ecological surveys provide a sampling of flora and fauna at a given time and season. Factors influencing detectability of species during survey include species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases, these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The field survey was conducted in Summer and Autumn, which is a suitable time to determine the presence of most threatened species. Considering the subject land primarily exists within a largely developed heavy industrial areas and that areas of native vegetation are generally present in a disturbed state with easy access, surveys were suitable to determine the presence of most threatened species.

Surveys undertaken, combined with habitat assessments and desktop analysis are considered sufficient to reach the conclusions herein regarding this and all other species' likelihood of occurrence within the subject land.

Database searches, and associated conclusions on the likelihood of species to occur within the assessment area, are reliant upon external data sources and information managed by third parties.

Annexure B BAM Candidate species assessment

Table B-1 Threatened flora species assessment

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Sunshine wattle <i>Acacia terminalis</i> subsp. <i>Eastern Sydney</i>	EN	EN	Yes	Erect or spreading shrub limited to coastal areas spanning from the northern shores of Sydney Harbour to Botany Bay. Grows on creek banks, hillslopes or in shallow soil in rock crevices and sandstone platforms in cliffs in Sydney Coastal Dry Sclerophyll Forests, Coastal Headland Heaths, Sydney Coastal Heaths and Wallum Sand Heaths. Grows in sandy soils.	Moderate	Yes	Yes	Low	Surveyed (present). There are over 40 records of this species within 5 km of the subject land, with the closest located less than 100 m from the subject land boundary. This species is associated with the vegetation recorded in the subject land, and other habitat features associated with this species are present within the subject land and surrounding area. Targeted surveys were undertaken for this species; however, it was not recorded. No further consideration is required.
Thick Lip Spider Orchid <i>Caladenia tessellata</i>	VU	EN	Yes	Small orchid recorded from the Wyong, Ulladulla and Braidwood regions with the Kiama and Queanbeyan populations believed to be extinct. Found in a wide variety of communities including Central Gorge Dry Sclerophyll Forests, Cumberland Dry Sclerophyll	Low	No	No	Low	Excluded as a candidate. There are no records of this species within 5 km of the subject land. It has not previously been recorded in the region and habitat for this species is largely absent from the subject land, with any remaining patches of vegetation considered highly degraded. While the proposed works would impact some high-condition vegetation, these impacts are confined to the

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Forests, Coastal Floodplain Woodlands and Subalpine Woodlands. Grows on clay loam or sandy soils.					edges of these patches, where significant weed edge effects are present. These edge areas are heavily influenced by weeds and do not provide suitable habitat. As such, it has been excluded as a candidate and further consideration is not required.
Netted Bottle Brush <i>Callistemon linearifolius</i>	-	VU	Yes	Shrub recorded from the Georges River to the Hawkesbury River, north of the Nelson Bay area and south at Coalcliff in the Illawarra region. Grows on the coast and adjacent ranges in a variety of communities including Cumberland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Sydney Coastal Heaths and North Coast Wet Sclerophyll Forests.	Low	Yes	Yes	Low	Surveyed (not present). There are three records of this species within 5 km of the subject land. This species is associated with the vegetation recorded in the subject land; however, habitat was considered too degraded for this species to occur. Targeted surveys were undertaken for this species as a precaution; however, it was not recorded. No further consideration is required.
Sand Spurge <i>Chamaesyce psammogeton</i>	-	EN	Yes	Sand Spurge is herb that forms mats to 1 m across. It grows on dunes and sea strandlines. If is found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to Queensland (and Lord	Nil	No	No	Nil	Excluded as a candidate There are no records of this species within 5 km of the subject land. The closest record is approximately 6 km to the south-west and was recorded in 1933. The next closest record is approximately 24 km north. No recent records occur within the locality. The species typically grows on fore-dunes, pebbly strandlines and exposed headlands, often

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Howe Island). Populations have been recorded in Wamberal Lagoon Nature Reserve, Myall Lakes National Park, Moonee Beach Nature Reserve and Bundjalung National Park.					with Spinifex <i>Spinifex sericeus</i> and Prickly Couch <i>Zoysia macrantha</i> . These habitats were not present in the subject land and these co-occurring species were also not detected within any of the floristic plot data. As such, it has been excluded as a candidate and further consideration is not required.
Leafless Tongue Orchid <i>Cryptostylis hunteriana</i>	VU	VU	Yes	Orchid with a distribution spanning from Gibraltar Range National Park southwards to the coastal area near Orbost in Victoria. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Coastal Heath Swamps, New England Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows in sandy soils.	Low	No	No	Low	Excluded as a candidate. There are no records of this species within 5 km of the subject land. Although this species is associated with the vegetation type recorded in the subject land, woodland canopy species often found growing in association with this orchid were absent. In addition, the subject land was significantly degraded, and habitat for this species was considered absent. While the proposed works would impact some high-condition vegetation, these impacts are confined to the edges of these patches, where significant weed edge effects are present. These edge areas are heavily influenced by weeds and do not provide suitable habitat. As such, it has been excluded as a candidate and further consideration is not required.
Camfield's Stringybark	VU	VU	Yes	Mallee tree restricted to a narrow band stretching from	Low	Yes	Yes	Low	Surveyed (not present). Although this species is associated with the

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Eucalyptus camfieldii</i>				Raymond Terrace to the north and Waterfall in the south. Grows in scattered, localised distributions including sites at Norah Head, Terrey Hills, North Head, Menai, Mt Colah, Peats Ridge and Elvina Bay Trail. Grows in scattered stands near the boundaries of tall coastal heath and low open woodland in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Sydney Coastal Heaths and Wallum Sand Heaths. Grows in sandy soils on Hawkesbury sandstone.					vegetation recorded in the subject land, there are no records within 5 km of the subject land and habitat was considered too degraded for this species to occur. Targeted surveys were undertaken for this species as a precaution; however, it was not recorded. No further consideration is required.
Tangled Bedstraw <i>Galium australe</i>	-	EN	Yes	Tangled Bedstraw is a straggling and inter-twining herb with weak, hairy stems to 60 cm long. It is widespread in Victoria and Tasmania and is also found in South Australia (and ACT Territory in Jervis Bay). Following a taxonomic revision, many recent records in NSW have been re-	Nil	No	No	Nil	Excluded as a candidate The closest record for this species is over 50 km away. It has not previously been recorded in the region and habitat for this species is largely absent from the subject land, with any remaining patches of vegetation considered degraded. As such, it has been excluded as a candidate and further consideration is not required.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				determined as other species. Tangled Bedstraw has been recorded historically in the Nowra (Colymea) and Narooma areas and is extant in Nadgee Nature Reserve, south of Eden. Records in the Sydney area are yet to be confirmed. In NSW (and ACT Territory in Jervis Bay), Tangled Bedstraw has been recorded in Turpentine forest and coastal Acacia shrubland.					
Bauer's Midge Orchid <i>Genoplesium baueri</i>	EN	EN	Yes	Terrestrial orchid with 13 populations totalling 200 plants distributed between Ulladulla and Port Stephens. Grows on moss gardens in a variety of communities including Sydney Coastal Dry sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths, Southern Lowland Wet Sclerophyll Forests and Sydney Hinterland Dry Sclerophyll Forests. Grows on sandstone substrates	Low	No	No	Low	Excluded as a candidate. There are no records of this species within 5 km of the subject land. Although this species is associated with the vegetation recorded in the subject land (PCT 3545), the area has undergone extensive historical clearing and was considered too degraded to support habitat for this species. As such, it has been excluded as a candidate and further consideration is not required.
Biconvex Paperbark	VU	VU	Yes	Biconvex Paperbark is a shrub	Nil	No	No	Nil	Excluded as a candidate.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Melaleuca biconvexa</i>				or small tree, usually up to 10 m tall, though occasionally as high as 20 m. 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.					There are no records of this species within 5 km of the subject land and the area has undergone extensive historical clearing so remaining habitat is considered degraded. As such, it has been excluded as a candidate and further consideration is not required. Targeted surveys were also undertaken for other <i>Melaleuca</i> species (Grove's Paperbark) which likely would have detected this species if present.
Grove's Paperbark <i>Melaleuca groveana</i>	-	VU	Yes	Shrub or small tree with a widespread distribution along coastal regions north of Yengo National Park to south-east Queensland with an additional disjunct population near Torrington. Grows in exposed sites on low coastal hills, escarpment ranges, rocky outcrops, cliffs and tablelands in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Sydney Coastal Heaths, and North Coast Wet Sclerophyll Forests. Grows on granite, sandstone and	Low	Yes	Yes	Low	Surveyed (not present). Although this species is associated with the vegetation recorded in the subject land (PCT 3545), there are no records within 5 km of the subject land and the area has undergone extensive historical clearing. Targeted surveys were undertaken for this species as a precaution; however, it was not recorded. No further consideration is required.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				rhyolite substrates.					
Eastern Australian Underground Orchid <i>Rhizanthella slateri</i>	EN	VU	Yes	An orchid with a whitish, fleshy underground stem to 15 cm long and 15 mm diameter. 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.	Nil	No	No	Nil	Excluded as a candidate. There are no records for this species within 5 km, the nearest record occurs over 30 kilometres north of the subject land. The subject land is a highly disturbed site with a long history of ground disturbance and clearing and any remaining habitats are considered degraded as a result. The location of the subject land is also outside of the known areas where this species occurs (i.e., does not occur in or close to any of the 10 identified locations from which this species is known). As such, it has been excluded as a candidate and further consideration is not required.
Coast Groundsel <i>Senecio spathulatus</i>	-	EN	Yes	Low growing perennial herb or shrub with populations occurring in Nadgee Nature Reserve and between Kurnell in Sydney and Myall Lakes National Park with additional populations occurring between Wilsons Promontory in Victoria to the NSW border. Found growing in coastal areas mostly on frontal dunes and forming low, broad	Moderate	Yes	Yes	Low	Surveyed (not present). Coast Groundsel has been recorded in the study area, and there are multiple records within 5 km of the subject land. This species is associated with the vegetation recorded in the subject land (PCT 3545), and other habitat features associated with this species are present within the subject land and surrounding area. Targeted surveys were undertaken for this species; however, it was not recorded. No further consideration is required.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				clumps in Maritime Grasslands and Sydney Coastal Heaths. Grows in soils ranging from clay to loamy sands.					
Magenta Lilly Pilly <i>Syzygium paniculatum</i>	VU	EN	Yes	The Magenta Lilly Pilly is a small to medium sized rainforest tree that grows to 8 m tall. The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. The species is also commonly planted across the Greater Sydney area.	Low	Yes	Yes	Nil	Surveyed (not present). Magenta Lilly Pilly has not been previously recorded within the subject land, however records do exist in the surrounding locality of the Kurnell Peninsula. The species is also commonly planted and therefore can occur as a planted native in locations outside of its typical distribution. <i>Syzygium</i> is a conspicuous genus and given no <i>Syzygium</i> or <i>Acmena</i> were detected on site, this species can be considered not present. No further consideration required.

Table B-2 Threatened fauna species assessment

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Birds									
Regent Honeyeater	CE	CE	Yes	Regent Honeyeaters are semi-nomadic, occurring in	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
(Breeding) <i>Anthochaera phrygia</i>				temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nest in tall mature eucalypts and sheoaks.					available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C. Further consideration is not required.
Bush Stone-curlew <i>Burhinus grallarius</i>	-	EN	Yes	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. Occurs in lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present.	Low	No	No	Low	Excluded as a candidate. There are no records of this species within 5 km of the subject land and habitat features that form a requirement for this species, including fallen or standing dead timber, was not recorded in the subject land during field investigations. As such, the species has been excluded as a candidate based on habitat constraints in the BAM-C. Further consideration is not required.
Sanderling (Breeding)	-	VU	Yes	Occurs on the coast mostly on open sand beaches exposed to	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Calidris alba</i>				open sea-swells.					available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.
Red Knot (Breeding) <i>Calidris canutus</i>	-	EN	Yes	Typically located within intertidal mudflats, sandflats and sandy beaches of sheltered coasts. Occasionally found on sandy open beaches or shallow pools, or in saline wetlands close to the coast.	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.
Curllew Sandpiper (Breeding) <i>Calidris ferruginea</i>	CE	EN	Yes	Inhabits sheltered intertidal mudflats. Also, non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.
Great Knot (Breeding) <i>Calidris tenuirostris</i>	VU	VU	Yes	Mainly found on intertidal mudflats, sandflats and sandy beaches. Rarely found on inland lakes and swamps,	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				instead preferring sheltered coastal habitats. In hot conditions, the Great Knot often roosts on damp substrates to keep cool.					footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.
Gang-gang Cockatoo (Breeding) <i>Callocephalon fimbriatum</i>	EN	VU	Yes	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	Low	No	No	Nil	Excluded as a candidate. There are a low number of records of this species within 5 km of the subject land. The species credit is for breeding habitat only which is represented by hollow-bearing trees containing hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger. As no such features were present within the subject land, the species has been excluded as a candidate based on habitat constraints detailed in the BAM-C. Further consideration is not required.
South-eastern Glossy Black-Cockatoo (Breeding) <i>Calyptorhynchus lathami lathami</i>	VU	VU	Yes	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.	Low	No	No	Nil	Excluded as a candidate. There are a low number of records of this species within 5 km of the subject land. The species credit is for breeding habitat only which is represented by hollow-bearing trees containing hollows greater than 15 cm diameter and higher than 8 m above ground. As no such features were

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									present within the subject land, the species has been excluded as a candidate based on habitat constraints detailed in the BAM-C. Further consideration is not required.
Greater Sand-plover (Breeding) <i>Charadrius leschenaultii</i>	VU	VU	Yes	Entirely coastal in NSW, foraging on intertidal sand and mudflats in estuaries and roosting during high tide on sandy beaches or rocky shores. Individuals have been recorded on inshore reefs, rock platforms, small rocky islands and sand cays on coral reefs, within Australia. Occasional sightings have also occurred on near-coast salt lakes, brackish swamps, shallow freshwater wetlands and grassed paddocks.	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.
Lesser Sand-plover (Breeding) <i>Charadrius mongolus</i>	EN	VU	Yes	In Australia, the species is known to favour coastal environs including beaches, mudflats and mangroves. Within NSW, individuals have been observed on intertidal sand and mudflats in estuaries or roosting on sandy beaches or rocky shores at high tide.	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.
Little Penguin	-	EN	Yes	Endangered population in the	Nil	No	No	Nil	Excluded as a candidate.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Eudyptula minor</i> – endangered population				Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline). A range of nest sites are utilised by the penguins at Manly including under rocks on the foreshore, under seaside houses and structures, such as stairs, in wood piles and under overhanging vegetation including lantana and under coral tree roots.					There are a handful of records of this species within 5 km of the subject land. Given the proximity of these records to the subject land, potential habitat for this species was considered. However, given the long history of disturbance across the Kurnell Terminal, the areas within the development footprint were considered degraded. As such this species has been excluded from the BAM-C based on habitat degradation. Little Penguin is an iconic species that is easily recognisable. Repeated targeted surveys were undertaken across the subject land (both diurnal and nocturnal) during various seasons by trained ecologists, all of whom would easily recognise this species. None of the survey work undertaken detected the presence of this species.
Pied Oystercatcher <i>Haematopus longirostris</i>	-	EN	Yes	An intertidal forager found on undisturbed sandy beaches and spits, tidal mudflats and estuaries. Its food supply (beach macroinvertebrates) have been negatively affected by human impacts. The Pied Oystercatcher is restricted to the littoral zone of beaches and	Moderate	Yes	No	Low	Excluded as a candidate. There are a large number of records of this species within 5 km of the subject land, and it is associated with vegetation present within the site. Given the proximity of the subject land to an important wetland located in the Towra Point Nature Reserve, potential habitat for this species was considered. However, according to the

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				estuaries, nesting on the ground above the tideline. A pair will re-nest in the same spot each year, rarely shifting their territory. Occasionally the Pied Oystercatcher is found in paddocks near the coast.					TBDC, habitat constraints for the species are areas within 100 metres of estuarine areas and the ocean. These areas do not occur within the development footprint. Given the proximity of important shorebird habitat within the locality, this constraint was expanded to include any natural water body within 100 metres, however a species polygon based on naturally occurring water bodies and vegetation types with which the species are associated could not be generated. As such, this species was excluded as a candidate based on habitat constraints. Further assessment is not required.
White-bellied Sea-Eagle (Breeding) <i>Haliaeetus leucogaster</i>	-	VU	Yes	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.	Low	No	No	Low	Excluded as a candidate. There are numerous records of this species within 5 km of the subject land, with the closest located less than 50 m from the subject land boundary. This species credit is for breeding habitat only which is associated with living or dead mature trees. Whilst mature trees are located within the low condition PCT 3545 within the subject land, no particularly large emergent Eucalyptus were observed that were considered suitable for nesting. No evidence of prior nesting (demonstrated through old stick nests) was

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									observed during field investigations. Habitat has therefore been considered degraded and as such the species has been excluded as a candidate. Further consideration is not required.
Little Eagle <i>Hieraetus morphnoides</i>	-	VU	Yes	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.	Low	No	No	Low	Excluded as a candidate. There are no records of this species within 5 km of the subject land. This species credit is for breeding habitat only which is associated with live and occasionally dead large old nest trees. Whilst mature trees are located within the low condition PCT 3545 within the subject land, no particularly large emergent Eucalyptus were observed that were considered suitable for nesting. No evidence of prior nesting (demonstrated through old stick nests) was observed during field investigations. Habitat has therefore been considered degraded and as such the species has been excluded as a candidate. Further consideration is not required
Swift Parrot (Breeding) <i>Lathamus discolor</i>	CE	EN	Yes	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Grey Box E. microcarpa, Grey Box E. moluccana and Blackbutt E. pilularis. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.					candidate based on habitat constraints in the BAM-C further consideration is not required.
Bar-tailed Godwit (baueri) (Breeding) <i>Limosa lapponica baueri</i>	VU	-	Yes	The Bar-tailed Godwit (northern Siberian) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, salt lakes and	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats.					
Black-tailed Godwit (Breeding) <i>Limosa limosa</i>	EN	VU	Yes	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. The species has been recorded within the Murray-Darling Basin, on the western slopes of the Northern Tablelands and in the far north-western corner of the state.	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.
Square-tailed Kite (Breeding)	-	VU	Yes	Typically inhabits coastal forested and wooded lands of	Low	No	No	Low	Excluded as a candidate. This species has been recorded within 5

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Lophoictinia isura</i>				tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by Eucalyptus longifolia, Corymbia maculata, E. elata, or E. smithii. Individuals appear to occupy large hunting ranges of more than 100 km ² . They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.					km of the subject land and is associated with the vegetation present. This species credit is for breeding habitat only which is associated with nest trees. Whilst mature trees are located within the low condition PCT 3545 within the subject land, no particularly large emergent Eucalyptus were observed that were considered suitable for nesting. No evidence of prior nesting (demonstrated through old stick nests) was observed during field investigations. Habitat has therefore been considered degraded and as such the species has been excluded as a candidate. Further consideration is not required
Orange-bellied Parrot <i>Neophema chrysogaster</i>	CE	CE	Yes	A single breeding population of fewer than 200 individuals occurs in a narrow coastal strip of south-west Tasmania. Adult birds depart Tasmania for the mainland in February. The first adults begin leaving the mainland for Tasmania in September with the last birds having departed by November. It is a coastal species inhabiting saltmarshes, sedge plains,	Low	No	No	Low	Excluded as a candidate. There are no records of this species within 5 km of the subject land, and it is not associated with the vegetation communities recorded in the site. Species has been excluded as a candidate and further consideration is not required.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				coastal dunes, pastures, shrublands and moorlands, generally within 10 km of the coast. Critical winter habitat for the species includes natural saltmarshes dominated by <i>Sarcocornia quinqueflora</i> (Beaded Glasswort) and <i>Sclerostegia arbuscula</i> (Shrubby Glasswort), as well as the associated grassy or weedy pastures. Historical records indicate that the Orange-bellied Parrot was formerly more abundant and widespread in NSW than it is now, however the species' distribution continues to extend into south-eastern NSW where suitable habitat is still available.					
Cotton Pygmy-Goose <i>Nettapus coromandelianus</i>	-	EN	Yes	The Cotton Pygmy-goose is found along the coast from Northern Queensland extending south into Victoria. It is considered a vagrant throughout the southern extent of its range. The Cotton Pygmy-goose is rarely seen on land, preferring deep permanent	Low	No	No	Low	Excluded as a candidate. Although this species is associated with the vegetation communities recorded in the site, there are no records within 5 km of the subject land and other habitat features that form a requirement for this species, including deep, permanent freshwater, were absent from the subject land. As such, it has been excluded as a

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				water including freshwater swamps, lagoons, dams, with water lilies and other semi-emergent water plants. In the north it will move onto the floodplains following the wet season rain.					candidate based on habitat constraints detailed in the BAM-C. Further consideration is not required.
Barking Owl <i>Ninox connivens</i>	-	VU	Yes	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.	Low	No	No	Low	Excluded as a candidate. Although this species is associated with the vegetation communities recorded in the site, there are no records within 5 km of the subject land. Habitat features that form a requirement for this species (living or dead tree with a hollow >20 cm diameter that occurs >4 metres above the ground) were also absent from the subject land. As such, it has been excluded as a candidate based on habitat constraints detailed in the BAM-C. Further consideration is not required.
Powerful Owl <i>Ninox strenua</i>	-	VU	Yes	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep	Low	No	No	Low	Excluded as a candidate. There are a number of records of this species within 5 km of the subject land, and it is associated with the vegetation communities recorded in the site. However, habitat features that form a requirement for this species (living or dead tree with a hollow >20 cm diameter that occurs >4 metres above the ground) were

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.					absent from the subject land. As such, it has been excluded as a candidate based on habitat constraints detailed in the BAM-C. Further consideration is not required.
Eastern Curlew (Breeding) <i>Numenius madagascariensis</i>	CE	-	Yes	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.
Eastern Osprey (Breeding) <i>Pandion cristatus</i>	-	VU	Yes	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and	Low	No	No	Nil	Excluded as a candidate. There are numerous records of this species within 5 km of the subject land, with the closest located less than 550 m from the subject land boundary. This species credit is associated with breeding habitat only which is associated with the presence of stick-nests in living

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.					and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting). No stick nests were observed in such habitats during field investigations. As such the species has been excluded as a candidate based on habitat constraints in the BAM-C further consideration is not required.
Masked Owl <i>Tyto novaehollandiae</i>	-	VU	Yes	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.	Low	No	No	Low	Excluded as a candidate. There are a number of records of this species within 5 km of the subject land, and it is associated with the vegetation communities recorded in the site. However, habitat features that form a requirement for this species (living or dead tree with a hollow >20 cm diameter that occurs >4 metres above the ground) were absent from the subject land. As such, it has been excluded as a candidate based on habitat constraints detailed in the BAM-C. Further consideration is not required.
Terek Sandpiper (Breeding) <i>Xenus cinereus</i>	VU	VU	Yes	Mainly found on saline intertidal mudflats in sheltered estuaries, embayments, harbours and lagoons.	Low	No	No	Low	Excluded as a candidate. Important Habitat Mapping (DPIE 2024) is available for this species but this does not include any areas within the development footprint. As such the species has been excluded as a candidate based on habitat constraints in

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									the BAM-C further consideration is not required.
Mammals									
Eastern Pygmy-possum <i>Cercartetus nanus</i>	-	VU	Yes	Patchily distributed from the coast to the Great Dividing Range, and as far as Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable and it also feeds on insects. Will often nest in tree hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period.	Moderate	Yes	No	Low	Surveyed (not present). No records of this species within 5 km of the subject land. While vegetation present within the study area is associated with the species, targeted surveys (spotlighting and remote camera deployments) were completed and Eastern Pygmy Possum was not recorded.
Large-eared Pied Bat	EN	EN	Yes	A small to medium-sized bat with long, prominent ears and	Nil	Yes	Yes	Nil	Surveyed (not present). No records of this species occur within 5

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
<i>Chalinolobus dwyeri</i>				glossy black fur. 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 Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, and old mine workings. Also occurs in well-timbered areas containing gullies.					kilometres of the subject land. Harp trapping was undertaken across the subject land which failed to detect the presence of the species.
Southern Brown Bandicoot (eastern) <i>Isoodon obesulus obesulus</i>	EN	EN	Yes	This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	Low	No	No	Low	Excluded as a candidate. This species has previously been recorded within 5 km of the subject land, and it is associated with the vegetation communities recorded in the site. However, habitat features that form a requirement for this species, including dense ground cover, were absent from the subject land. As such, it has been excluded as a candidate based on habitat constraints detailed in the BAM-C. Further consideration is not required.
Little Bent-	-	VU	Yes	Occurs from Northern	Low	No	No	Nil	Excluded as a candidate.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
winged Bat (Breeding) <i>Miniopterus australis</i>				Queensland to the Hawkesbury River near Sydney. Roost sites encompass a range of structures including caves, tunnels and stormwater drains. Young are raised by the females in large maternity colonies in caves in summer. Shows a preference for well timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. The Little Bentwing bat forages for small insects (such as moths, wasps and ants) beneath the canopy of densely vegetated habitats.					This species has previously been recorded within 5 km of the subject land, and it is associated with the vegetation communities recorded in the site. However, habitat features that form a requirement for this species, including caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding. Inspections were undertaken of the buildings to be decommissioned within the subject land, and dusk watches were undertaken to determine if any microbats were present. No structures within the subject land were determined to be used as roosting locations and were known were considered suitable for breeding habitat for this species. As such, it has been excluded as a candidate based on habitat constraints detailed in the BAM-C. Further consideration is not required.
Large Bent-winged Bat (Breeding) <i>Miniopterus orianae oceanensis</i>	-	VU	Yes	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to	Low	No	No	Nil	Excluded as a candidate. This species has previously been recorded within 5 km of the subject land, and it is associated with the vegetation communities recorded in the site. However, habitat features that form a requirement for this species, including caves, tunnels, mines, culverts or other

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.					structures known or suspected to be used for breeding. Inspections were undertaken of the buildings to be decommissioned within the subject land, and dusk watches were undertaken to determine if any microbats were present. No structures within the subject land were determined to be used as roosting locations and were known were considered suitable for breeding habitat for this species. As such, it has been excluded as a candidate based on habitat constraints detailed in the BAM-C. Further consideration is not required.
Southern Myotis <i>Myotis macropus</i>		VU	Yes	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects.	Moderate	Yes	No	Low	Surveyed (present). Characteristic call shape for the species was seen on a bat detector meter during targeted surveys. An individual conducting characteristic fishing behaviour was also observed with a thermal camera at the same time the characteristic call shape was witnessed. Harp trapping was also undertaken across the subject land however the species was not detected through these means.
Long-nosed	-	EN	Yes	Endangered population occurs	Nil	No	No	Nil	Excluded as a candidate.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Bandicoot <i>Perameles nasuta</i> – endangered population				on North Head, South of Addison Road Manly Headland, including Sydney Harbour National Park (north).					The endangered population only occurs on North Head and the Sydney Harbour National Park (north). As such the species has been excluded as a candidate based on geographic constraints in the BAM-C further consideration is not required.
Squirrel Glider <i>Petaurus norfolcensis</i>	-	VU	Yes	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.	Low	No	No	Low	Excluded as a candidate. There are no records of this species within 5 km of the subject land, however, it is associated with the vegetation communities recorded in the site. However, habitat is considered is considered degraded due to fragmentation of the remaining vegetation patches. None of the isolated patches are large enough to support a viable population on its own. The entire area of native vegetation contiguous with the subject land is likely too small (<400 ha of vegetation containing mature trees) to support a viable population. Spotlight surveys (supported by scans with thermal camera) and remote camera deployments undertaken for Eastern Pygmy-possum also did not detect any individuals of this species. Species has been excluded as a candidate based on degraded habitat. Further consideration is not required.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill <i>Petaurus norfolcensis</i> (endangered population)	-	EN	Yes	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.	Low	No	No	Low	Excluded as a candidate. Endangered population is located on Barrenjoey Peninsula. Species has been excluded as a candidate based on geographic limitations detailed in the BAM-C. Further consideration is not required.
Southern Greater Glider <i>Petauroides volans</i>	EN	EN	Yes	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.	Low	No	No	Low	Excluded as a candidate. Although this species is associated with the vegetation communities recorded in the site, there are no records within 5 km of the subject land and potential habitat was considered degraded. As such, it has been excluded as a candidate and further consideration is not required. Spotlighting surveys (supported with scans of thermal camera) for the arboreal species Eastern Pygmy-possum also failed to detect this species.
Koala <i>Phascolarctos cinereus</i>	EN	EN	Yes	In NSW the Koala mainly occurs on the central and north coasts with some populations in the	Nil	No	No	Nil	Excluded as a candidate. Although this species is associated with the vegetation communities recorded in the

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include Eucalyptus robusta, E. tereticornis, E. punctata, E. haemostoma and E. signata. They are solitary with varying home ranges.					site, there are no records within 5 km of the subject land (and none on the isolated peninsula) and potential habitat was considered degraded. As such, it has been excluded as a candidate and further consideration is not required.
Long-nosed Potoroo <i>Potorous tridactylus</i>	VU	VU	Yes	The long-nosed potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	Nil	No	No	Nil	Excluded as a candidate. No records for the species exist within 5 kilometres of the subject land (or anywhere on the Kurnell Peninsula). The BAM-C notes that the species requires a dense shrub layer or alternatively high canopy cover exceeding 70% (i.e. to capture populations inhabiting wet sclerophyll and rainforest). The development footprint does not contain any areas of native vegetation with a sufficiently high enough shrub or canopy cover to support the species. Therefore the species has been excluded as a candidate based on habitat constraints in the BAM-C.
Grey-headed	VU	VU	Yes	Occurs along the NSW coast,	Low	No	No	Nil	Excluded as a candidate.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Flying-fox (Breeding) <i>Pteropus poliocephalus</i>				extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.					<p>This species has a large number of records within 5 km of the subject land and is associated with the vegetation communities recorded in the site. The species credit is for breeding habitat only which is associated with the presence of breeding camps. The closest known breeding camp occurs at Kurnell, approximately 700 metres to the southwest of the subject land. Whilst this breeding camp is in close proximity to the subject land, the impacts associated with the proposed modification are considered unlikely to impact upon breeding habitat for the species as:</p> <p>Vegetation clearance is restricted to the existing, heavily disturbed footprint of the Kurnell Terminal.</p> <p>The proposed construction hours are from 7am to 6pm on Monday to Friday, and 8am to 1 pm on Saturday.</p> <p>The proposed operation hours would continue as per the current operation of the Site.</p> <p>The noise and vibration mitigation measures detailed in Section 7 would also ensure no impacts occur to this camp. As impacts to the breeding camp are unlikely to occur, the species has been excluded based on habitat constraints</p>

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
									detailed in the BAM-C. Further consideration is not required.
Amphibians									
Wallum Froglet <i>Crinia tinnula</i>	-	VU	Yes	The Wallum Froglet is a coastal species, confined to acid, paperbark swamps and sedge swamps of the "wallum" country. The species occurs from near Noosa in southern Queensland south to the central coast of NSW, with a disjunct population on Kurnell Peninsula. The species is a late winter breeder and males call in choruses from within sedge tussocks or at the water edge.	Moderate	Yes	Yes	Low	Surveyed (not present). This species has numerous records within 5 km of the subject land, with the closest located within the subject land boundary. It is associated with the vegetation recorded in the site and has a limited geographic distribution, restricted to the Kurnell Peninsula and the margins of Botany Bay. Given the location of the site and the presence of standing water with fringing aquatic vegetation, habitat was considered present. Targeted survey was undertaken, and this species was not recorded. Further consideration is not required
Giant Burrowing Frog <i>Heleioporus australiacus</i>	VU	VU	Yes	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. Found in heath, woodland and open dry sclerophyll forest on a	Nil	No	No	Nil	Excluded as a candidate. There are no records for this species within 5 km of the subject land (none on the Kurnell Peninsula). The species is associated with soaks or pools within first or second order streams, as well as from 'hanging swamp' seepage lines. No such features occur within the development footprint. Whilst the species is known to occur within 300 metres of such features, due to the high disturbed nature of the

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				variety of soil types except those that are clay based. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water.					sites, and the predominantly degraded nature of vegetation being impacted, habitat for this species is not considered to be present. Targeted surveys for other frog species (Wallum Froglet and Green and Golden Bell Frog) also failed to detect this species. As such this species has been excluded as a candidate based on habitat degradation.
Green and Golden Bell Frog <i>Litoria aurea</i>	VU	EN	Yes	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC. The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks, although the species has also been recorded from highly disturbed areas including disused industrial sites, brick	Moderate	Yes	Yes	Low	Surveyed (not present). This species has numerous records within 5 km of the subject land, with the closest located within the subject land boundary. It is associated with the vegetation recorded in the site and the subject land is located within proximity to wet areas, which represent potential habitat for this species. Targeted survey was undertaken, and this species was not recorded. Further consideration is not required.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species.					
Gastropods									
Maroubra Woodland Snail <i>Meridolum maryae</i>	EN	EN	Yes	This species can be found in leaf litter within coastal vegetation communities and is typically active at night. During dry conditions, the species can dig several centimetres deep into the soil. The species is known to occur between Royal National Park and Palm Beach, in New South Wales.	Moderate	Yes	Yes	Low	Surveyed (not present). This species has previously been recorded within 5 km of the subject land and is associated with the vegetation recorded in the site. It is confined to a narrow band of habitat along the coast between the Royal National Park and Palm Beach, which includes the subject land, and potential habitat for this species was recorded in the subject land during field investigations. Targeted survey was undertaken, and this species was not recorded. Further consideration is not required.
Insects									
Giant Dragonfly <i>Petalura gigantea</i>	-	EN	Yes	Lives in permanent swamps and bogs with some free water and open vegetation. Adults spend most of their time settled on low vegetation on or	Low	No	No	Nil	Recorded. A Giant Dragonfly was incidentally recorded during spotlighting surveys within the subject land.

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM candidate species	Survey required / undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				adjacent to the swamp.					

Annexure C Flora

BAM plot field data

Table C-3 BAM plot floristics (Plots B01 – B07)

Family	Scientific name	Common name	40389_B01		40389_B02		40389_B03		40389_B04		40389_B05		40389_B06		40389_B07	
			Cvr%	Abund.												
Native species																
Apiaceae	<i>Actinotus helianthi</i>	Flannel Flower												0.1	1	
Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod														
Asphodelaceae	<i>Dianella caerulea</i>	Blue Flax-lily									0.1	10	0.1	2		
Campanulaceae	<i>Lobelia anceps</i>	-														
Campanulaceae	<i>Lobelia purpurascens</i>	Whiteroot									0.1	2			0.1	10
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed													0.1	10
Convolvulaceae	<i>Ipomoea cairica</i>	-														
Cyperaceae	<i>Machaerina juncea</i>	Bare Twig-rush														
Cyperaceae	<i>Fimbristylis dichotoma</i>	Common Fringe-sedge	0.1	10			0.1	10	0.1	20						
Cyperaceae	<i>Carex inversa</i>	Knob Sedge	0.1	10											0.1	10
Cyperaceae	<i>Ficinia nodosa</i>	Knobby Club-rush														
Cyperaceae	<i>Lepidosperma concavum</i>	-														
Cyperaceae	<i>Schoenus brevifolius</i>	-														
Cyperaceae	<i>Gahnia clarkei</i>	Tall Saw-sedge														
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken									1	30	0.1	10		
Dilleniaceae	<i>Hibbertia scandens</i>	Climbing Guinea Flower									0.1	1				

Family	Scientific name	Common name	40389_B01		40389_B02		40389_B03		40389_B04		40389_B05		40389_B06		40389_B07	
			Cvr%	Abund.												
Dilleniaceae	<i>Hibbertia</i> spp.	-														
Elaeocarpaceae	<i>Elaeocarpus reticulatus</i>	Blueberry Ash														
Ericaceae	<i>Monotoca scoparia</i>	-											2	10		
Ericaceae	<i>Astroloma pinifolium</i>	Pine Heath											0.3	10		
Ericaceae	<i>Leucopogon juniperinus</i>	Prickly Beard-heath											0.1	10		
Ericaceae	<i>Monotoca elliptica</i>	Tree Broom-heath														
Euphorbiaceae	<i>Euphorbia</i> spp.	-					0.5	70								
Euphorbiaceae	<i>Homalanthus populifolius</i>	-									0.5	20	0.1	1		
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	False Sarsaparilla														
Fabaceae (Faboideae)	<i>Viminaria juncea</i>	Native Broom														
Fabaceae (Faboideae)	<i>Dillwynia floribunda</i>	-											0.2	10		
Fabaceae (Faboideae)	<i>Bossiaea heterophylla</i>	Variable Bossiaea											0.1	2		
Fabaceae (Faboideae)	<i>Glycine tabacina</i>	Variable Glycine					0.1	20								
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>	-							0.1	10			0.5	10		
Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>	Prickly Moses											3	30		
Fabaceae (Mimosoideae)	<i>Acacia terminalis</i>	Sunshine Wattle														
Fabaceae (Mimosoideae)	<i>Acacia suaveolens</i>	Sweet Wattle											0.1	5		
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	Sydney Golden Wattle														
Geraniaceae	<i>Pelargonium australe</i>	Native Storksbill														
Gleicheniaceae	<i>Gleichenia dicarpa</i>	Pouched Coral Fern														
Gleicheniaceae	<i>Gleichenia microphylla</i>	Scrambling Coral Fern														
Haloragaceae	<i>Gonocarpus teucrioides</i>	Germander Raspwort														
Juncaceae	<i>Juncus usitatus</i>	-	10	300					0.1	10						

Family	Scientific name	Common name	40389_B01		40389_B02		40389_B03		40389_B04		40389_B05		40389_B06		40389_B07	
			Cvr%	Abund.												
Lauraceae	<i>Cassytha glabella</i>	-														
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush									0.5	1	0.5	10		
Luzuriagaceae	<i>Geitonoplesium cymosum</i>	Scrambling Lily									0.1	2				
Menispermaceae	<i>Stephania japonica</i>	Snake vine														
Moraceae	<i>Maclura cochinchinensis</i>	Cockspur Thorn														
Moraceae	<i>Ficus rubiginosa</i>	Port Jackson Fig														
Myrtaceae	<i>Eucalyptus botryoides</i>	Bangalay														
Myrtaceae	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark														
Myrtaceae	<i>Lophostemon confertus</i>	Brush Box														
Myrtaceae	<i>Leptospermum laevigatum</i>	Coast Teatree											35	100		
Myrtaceae	<i>Callistemon citrinus</i>	Crimson Bottlebrush														
Myrtaceae	<i>Darwinia fascicularis</i>	-											0.1	1		
Myrtaceae	<i>Leptospermum squarrosum</i>	-														
Myrtaceae	<i>Melaleuca nodosa</i>	-														
Myrtaceae	<i>Corymbia gummifera</i>	Red Bloodwood														
Myrtaceae	<i>Melaleuca squarrosa</i>	Scented Paperbark														
Myrtaceae	<i>Eucalyptus robusta</i>	Swamp Mahogany									10	3				
Myrtaceae	<i>Angophora costata</i>	Sydney Red Gum									15	10	1	1		
Myrtaceae	<i>Kunzea ambigua</i>	Tick Bush														
Oleaceae	<i>Notelaea longifolia</i>	Large Mock-olive														
Onagraceae	<i>Ludwigia peploides subsp. montevidensis</i>	Water Primrose	0.1	10												
Oxalidaceae	<i>Oxalis perennans</i>	-													0.1	20

Family	Scientific name	Common name	40389_B01		40389_B02		40389_B03		40389_B04		40389_B05		40389_B06		40389_B07	
			Cvr%	Abund.												
Phyllanthaceae	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Cheese Tree														
Phyllanthaceae	<i>Breynia oblongifolia</i>	Coffee Bush									0.1	5				
Pittosporaceae	<i>Billardiera scandens</i>	Hairy Apple Berry														
Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum														
Poaceae	<i>Imperata cylindrica</i>	Blady Grass														
Poaceae	<i>Entolasia marginata</i>	Bordered Panic														
Poaceae	<i>Cynodon dactylon</i>	Common Couch	3	30	60	6000	80	5000	65	5000			1	30	65	6000
Poaceae	<i>Phragmites australis</i>	Common Reed									0.1	5				
Poaceae	<i>Dichelachne crinita</i>	Longhair Plumegrass														
Poaceae	<i>Hemarthria uncinata</i>	Matgrass														
Poaceae	<i>Lachnagrostis filiformis</i>	-			0.1	1	0.1	5								
Poaceae	<i>Oplismenus hirtellus</i>	-									0.1	10				
Poaceae	<i>Themeda triandra</i>	-									0.1	10	0.1	5		
Poaceae	<i>Panicum</i> spp.	Panicum														
Poaceae	<i>Bothriochloa macra</i>	Red Grass			0.1	2	0.1	1								
Poaceae	<i>Melinis repens</i>	Red Natal Grass			0.1	10			0.2	20						
Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass														
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass							5	90	0.2	20			15	200
Poaceae	<i>Chloris truncata</i>	Windmill Grass	0.1	10	0.1	20										
Poaceae	<i>Entolasia stricta</i>	Wiry Panic									0.1	10				
Polygonaceae	<i>Persicaria decipiens</i>	Slender Knotweed	0.1	10	0.1	1										
Portulacaceae	<i>Portulaca oleracea</i>	Pigweed														
Proteaceae	<i>Banksia integrifolia</i>	Coast Banksia									1	2	1	1		

Family	Scientific name	Common name	40389_B01		40389_B02		40389_B03		40389_B04		40389_B05		40389_B06		40389_B07	
			Cvr%	Abund.												
Proteaceae	<i>Petrophile pulchella</i>	Conesticks											0.3	5		
Proteaceae	<i>Banksia ericifolia</i>	Heath-leaved Banksia														
Proteaceae	<i>Hakea sericea</i>	Needlebush											0.3	5		
Proteaceae	<i>Hakea teretifolia</i>	Needlebush														
Proteaceae	<i>Grevillea mucronulata</i>	-											4	20		
Proteaceae	<i>Persoonia</i> spp.	-											10	30		
Proteaceae	<i>Banksia serrata</i>	Old-man Banksia														
Ranunculaceae	<i>Clematis glycinoides</i>	Headache Vine									0.1	2	0.1	1		
Restionaceae	<i>Lepyrodia scariosa</i>	-														
Rubiaceae	<i>Opercularia aspera</i>	Coarse Stinkweed														
Sapindaceae	<i>Dodonaea triquetra</i>	Large-leaf Hop-bush														
Sapindaceae	<i>Cupaniopsis anacardioides</i>	Tuckeroo														
Selaginellaceae	<i>Selaginella uliginosa</i>	Swamp Selaginella														
Smilacaceae	<i>Smilax glyciophylla</i>	Sweet Sarsparilla														
Thymelaeaceae	<i>Pimelea linifolia</i>	Slender Rice Flower											0.1	5		
Typhaceae	<i>Typha orientalis</i>	Broad-leaved Cumbungi	15	100												
Violaceae	<i>Hybanthus monopetalus</i>	Slender Violet-bush														
Xanthorrhoeaceae	<i>Xanthorrhoea</i> spp.	-											0.2	1		
Zamiaceae	<i>Macrozamia communis</i>	Burrawang														
Introduced species																
Fabaceae (Mimosoideae)	<i>Acacia saligna</i>	Golden Wreath Wattle							35	60					0.1	1
Polygonaceae	<i>Acetosa sagittata</i>	Rambling Dock									0.2	20				
Agavaceae	<i>Agave</i> spp.	-														

Family	Scientific name	Common name	40389_B01		40389_B02		40389_B03		40389_B04		40389_B05		40389_B06		40389_B07	
			Cvr%	Abund.												
Asteraceae	<i>Ageratina adenophora</i>	Crofton Weed							0.5	30	0.1	10				
Poaceae	<i>Andropogon virginicus</i>	Whisky Grass			0.5	30			0.1	2			0.1	1		
Apocynaceae	<i>Araujia sericifera</i>	Moth Vine							0.1	1						
Asparagaceae	<i>Asparagus aethiopicus</i>	Asparagus Fern									5	100			0.1	1
Asteraceae	<i>Aster subulatus</i>	Wild Aster	5	50					2	80						
Asteraceae	<i>Bidens bipinnata</i>	Bipinnate Beggar's Ticks														
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs			0.1	10	0.1	5	0.1	10	0.1	10				
Brassicaceae	<i>Brassica oleracea</i>	Collards			2	40										
Poaceae	<i>Bromus catharticus</i>	Prairie Grass			0.1	10										
Brassicaceae	<i>Cardamine hirsuta</i>	Common Bittercress			0.5	20										
Sapindaceae	<i>Cardiospermum halicacabum</i> var. <i>halicacabum</i>	Small Balloon Vine														
Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass														
Gentianaceae	<i>Centaurium erythraea</i>	Common Centaury														
Chenopodiaceae	<i>Chenopodium album</i>	Fat Hen			2	20										
Poaceae	<i>Chloris gayana</i>	Rhodes Grass			0.5	10	0.1	10								
Asteraceae	<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	Bitou Bush							1	30	15	90				
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle			0.1	10			1	30						
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	0.3	30			0.5	20	3	100	0.1	10			0.1	10
Poaceae	<i>Cortaderia selloana</i>	Pampas Grass			0.2	1			0.1	2	0.3	2				
Apiaceae	<i>Cyclopermum leptophyllum</i>	Slender Celery														
Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge	0.1	10					0.1	5						
Poaceae	<i>Digitaria sanguinalis</i>	Crab Grass													0.1	10

Family	Scientific name	Common name	40389_B01		40389_B02		40389_B03		40389_B04		40389_B05		40389_B06		40389_B07	
			Cvr%	Abund.												
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass									0.1	10				
Onagraceae	<i>Epilobium ciliatum</i>	-	0.1	30												
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass					0.1	10	0.1	1						
Apiaceae	<i>Foeniculum vulgare</i>	Fennel														
Asteraceae	<i>Gamochaeta calviceps</i>	Cudweed					0.1	1							0.1	10
Asteraceae	<i>Gamochaeta purpurea</i>	Purple Cudweed							0.1	10						
Asteraceae	<i>Gazania rigens</i>	-					0.1	10								
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush							0.1	2						
Amaranthaceae	<i>Gomphrena celosioides</i>	Gomphrena Weed					0.1	5								
Apiaceae	<i>Hydrocotyle bonariensis</i>	-							0.5	10						
Asteraceae	<i>Hypochaeris glabra</i>	Smooth Catsear	0.1	10			0.1	10	0.1	2					0.5	10
Asteraceae	<i>Hypochaeris radicata</i>	Catsear			0.1	10										
Verbenaceae	<i>Lantana camara</i>	Lantana							0.5	5	45	300				
Brassicaceae	<i>Lepidium africanum</i>	Common Peppercross														
Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet														
Liliaceae	<i>Lilium formosanum</i>	Formosan Lily									0.2	5				
Primulaceae	<i>Lysimachia arvensis</i>	Scarlet Pimpernel			0.1	2										
Fabaceae (Faboideae)	<i>Medicago polymorpha</i>	Burr Medic					0.1	10	0.5	30						
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow	0.5	20	0.1	10	0.1	1							0.1	10
Onagraceae	<i>Oenothera mollissima</i>	-														
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive									0.5	2				
Poaceae	<i>Paspalum dilatatum</i>	Paspalum			20	2000			5	500					0.5	20

Family	Scientific name	Common name	40389_B01		40389_B02		40389_B03		40389_B04		40389_B05		40389_B06		40389_B07	
			Cvr%	Abund.												
Poaceae	<i>Paspalum urvillei</i>	Vasey Grass			0.2	10			3	30						
Poaceae	<i>Phalaris aquatica</i>	Phalaris			5	20										
Phytolaccaceae	<i>Phytolacca octandra</i>	Inkweed							0.5	20						
Pinaceae	<i>Pinus radiata</i>	Radiata Pine													30	20
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues			0.1	10	3	300	5	100	0.1	10			3	100
Apocynaceae	<i>Plumeria rubra</i>	Frangipani														
Polygalaceae	<i>Polygala virgata</i>	-														
Salicaceae	<i>Populus nigra</i>	Lombardy Poplar														
Rubiaceae	<i>Richardia brasiliensis</i>	Mexican Clover					0.1	5							0.1	10
Iridaceae	<i>Romulea rosea var. australis</i>	Onion Grass							0.1	10						
Polygonaceae	<i>Rumex crispus</i>	Curled Dock	0.1	10												
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed							0.1	1						
Poaceae	<i>Setaria parviflora</i>	-	0.1	10	0.1	10	0.1	10	5	500	0.1	10				
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne					0.2	20	0.1	10					0.1	10
Solanaceae	<i>Solanum nigrum</i>	Black-berry Nightshade			0.1	2			0.1	2	0.1	10				
Solanaceae	<i>Solanum sisymbriifolium</i>	-			0.1	10			0.1	10						
Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle	0.1	10	0.1	10			0.1	10					0.1	10
Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass					0.1	10								
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo Grass					0.5	20							0.1	10
Asteraceae	<i>Taraxacum officinale</i>	Dandelion														
Fabaceae (Faboideae)	<i>Trifolium repens</i>	White Clover			0.5	20										
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop			0.1	10	0.1	5	0.1	10					0.1	10
Fabaceae (Faboideae)	<i>Vicia sativa</i>	Common vetch			0.5	20			0.1	10						

Table C-4 BAM plot floristics (Plots B08-B14)

Family	Scientific name	Common name	40389_B08		40389_B09		40389_B10		40389_B11		40389_B12	
			Cvr%	Abund.								
Native species												
Apiaceae	<i>Actinotus helianthi</i>	Flannel Flower					0.2	20				
Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod			0.2	5	0.1	2				
Asphodelaceae	<i>Dianella caerulea</i>	Blue Flax-lily			0.1	3	0.2	40	0.2	50		
Campanulaceae	<i>Lobelia anceps</i>	-										
Campanulaceae	<i>Lobelia purpurascens</i>	Whiteroot										
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed										
Convolvulaceae	<i>Ipomoea cairica</i>	-					0.3	20	0.3	40		
Cyperaceae	<i>Machaerina juncea</i>	Bare Twig-rush			0.2	200			0.3	200		
Cyperaceae	<i>Fimbristylis dichotoma</i>	Common Fringe-sedge										
Cyperaceae	<i>Carex inversa</i>	Knob Sedge										
Cyperaceae	<i>Ficinia nodosa</i>	Knobby Club-rush			0.2	200						
Cyperaceae	<i>Lepidosperma concavum</i>	-					40	1000	1	60		
Cyperaceae	<i>Schoenus brevifolius</i>	-										
Cyperaceae	<i>Gahnia clarkei</i>	Tall Saw-sedge			2	10						
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken			0.3	30			0.8	50		
Dilleniaceae	<i>Hibbertia scandens</i>	Climbing Guinea Flower			0.3	3	0.1	2	3	40		
Dilleniaceae	<i>Hibbertia</i> spp.	-					0.1	1				
Elaeocarpaceae	<i>Elaeocarpus reticulatus</i>	Blueberry Ash					0.1	1				
Ericaceae	<i>Monotoca scoparia</i>	-										
Ericaceae	<i>Astroloma pinifolium</i>	Pine Heath										
Ericaceae	<i>Leucopogon juniperinus</i>	Prickly Beard-heath										
Ericaceae	<i>Monotoca elliptica</i>	Tree Broom-heath			1	3	5	10				

Family	Scientific name	Common name	40389_B08		40389_B09		40389_B10		40389_B11		40389_B12	
			Cvr%	Abund.								
Euphorbiaceae	<i>Euphorbia</i> spp.	-										
Euphorbiaceae	<i>Homalanthus populifolius</i>	-			0.2	5	0.2	20	0.4	20		
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	False Sarsaparilla							0.1	4		
Fabaceae (Faboideae)	<i>Viminaria juncea</i>	Native Broom										
Fabaceae (Faboideae)	<i>Dillwynia floribunda</i>	-										
Fabaceae (Faboideae)	<i>Bossiaea heterophylla</i>	Variable Bossiaea							0.1	5		
Fabaceae (Faboideae)	<i>Glycine tabacina</i>	Variable Glycine							0.1	2		
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>	-	0.2	3	1	20	2	10				
Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>	Prickly Moses							0.2	20		
Fabaceae (Mimosoideae)	<i>Acacia terminalis</i>	Sunshine Wattle							0.1	3		
Fabaceae (Mimosoideae)	<i>Acacia suaveolens</i>	Sweet Wattle							0.1	2		
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i> subsp. <i>longifolia</i>	Sydney Golden Wattle							10	50		
Geraniaceae	<i>Pelargonium australe</i>	Native Storksbill										
Gleicheniaceae	<i>Gleichenia dicarpa</i>	Pouched Coral Fern										
Gleicheniaceae	<i>Gleichenia microphylla</i>	Scrambling Coral Fern										
Haloragaceae	<i>Gonocarpus teucroides</i>	Germander Raspwort					0.1	5	0.1	5		
Juncaceae	<i>Juncus usitatus</i>	-										
Lauraceae	<i>Cassytha glabella</i>	-					0.1	5	0.1	2		
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush			10	100	0.2	5	5	50		
Luzuriagaceae	<i>Geitonoplesium cymosum</i>	Scrambling Lily			0.3	30	0.2	20	0.5	100		
Menispermaceae	<i>Stephania japonica</i>	Snake vine			0.1	3	0.1	10				
Moraceae	<i>Maclura cochinchinensis</i>	Cockspur Thorn					0.1	1				
Moraceae	<i>Ficus rubiginosa</i>	Port Jackson Fig			0.1	1						
Myrtaceae	<i>Eucalyptus botryoides</i>	Bangalay			20	20						

Family	Scientific name	Common name	40389_B08		40389_B09		40389_B10		40389_B11		40389_B12	
			Cvr%	Abund.								
Myrtaceae	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	20	4								
Myrtaceae	<i>Lophostemon confertus</i>	Brush Box	3	1								
Myrtaceae	<i>Leptospermum laevigatum</i>	Coast Teatree			5	7	30	100				
Myrtaceae	<i>Callistemon citrinus</i>	Crimson Bottlebrush										
Myrtaceae	<i>Darwinia fascicularis</i>	-										
Myrtaceae	<i>Leptospermum squarrosum</i>	-										
Myrtaceae	<i>Melaleuca nodosa</i>	-			1	5						
Myrtaceae	<i>Corymbia gummifera</i>	Red Bloodwood							2			
Myrtaceae	<i>Melaleuca squarrosa</i>	Scented Paperbark										
Myrtaceae	<i>Eucalyptus robusta</i>	Swamp Mahogany										
Myrtaceae	<i>Angophora costata</i>	Sydney Red Gum			5	4			30	20		
Myrtaceae	<i>Kunzea ambigua</i>	Tick Bush										
Oleaceae	<i>Notelaea longifolia</i>	Large Mock-olive			0.2	2						
Onagraceae	<i>Ludwigia peploides</i> subsp. <i>montevidensis</i>	Water Primrose										
Oxalidaceae	<i>Oxalis perennans</i>	-										
Phyllanthaceae	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Cheese Tree							0.5	2		
Phyllanthaceae	<i>Breynia oblongifolia</i>	Coffee Bush			0.5	20	0.5	10	2	50		
Pittosporaceae	<i>Billardiera scandens</i>	Hairy Apple Berry					0.1	2	0.1	1		
Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum			0.1	2						
Poaceae	<i>Imperata cylindrica</i>	Blady Grass			10		5	800	20	2000		
Poaceae	<i>Entolasia marginata</i>	Bordered Panic			5	1000	0.5	100	0.2	50		
Poaceae	<i>Cynodon dactylon</i>	Common Couch	60	5000								
Poaceae	<i>Phragmites australis</i>	Common Reed			0.8	50						
Poaceae	<i>Dichelachne crinita</i>	Longhair Plumegrass										

Family	Scientific name	Common name	40389_B08		40389_B09		40389_B10		40389_B11		40389_B12	
			Cvr%	Abund.								
Poaceae	<i>Hemarthria uncinata</i>	Matgrass										
Poaceae	<i>Lachnagrostis filiformis</i>	-										
Poaceae	<i>Oplismenus hirtellus</i>	-										
Poaceae	<i>Themeda triandra</i>	-							0.2	10		
Poaceae	<i>Panicum</i> spp.	Panicum										
Poaceae	<i>Bothriochloa macra</i>	Red Grass										
Poaceae	<i>Melinis repens</i>	Red Natal Grass										
Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass					0.1	3				
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass	0.5	30	0.1	10						
Poaceae	<i>Chloris truncata</i>	Windmill Grass										
Poaceae	<i>Entolasia stricta</i>	Wiry Panic			0.5		3	500	2	1000		
Polygonaceae	<i>Persicaria decipiens</i>	Slender Knotweed										
Portulacaceae	<i>Portulaca oleracea</i>	Pigweed										
Proteaceae	<i>Banksia integrifolia</i>	Coast Banksia							0.1	1		
Proteaceae	<i>Petrophile pulchella</i>	Conesticks										
Proteaceae	<i>Banksia ericifolia</i>	Heath-leaved Banksia										
Proteaceae	<i>Hakea sericea</i>	Needlebush										
Proteaceae	<i>Hakea teretifolia</i>	Needlebush										
Proteaceae	<i>Grevillea mucronulata</i>	-										
Proteaceae	<i>Persoonia</i> spp.	-										
Proteaceae	<i>Banksia serrata</i>	Old-man Banksia			0.3	1	5	10				
Ranunculaceae	<i>Clematis glycinoides</i>	Headache Vine										
Restionaceae	<i>Lepyrodia scariosa</i>	-										
Rubiaceae	<i>Opercularia aspera</i>	Coarse Stinkweed							0.1	5		

Family	Scientific name	Common name	40389_B08		40389_B09		40389_B10		40389_B11		40389_B12	
			Cvr%	Abund.								
Sapindaceae	<i>Dodonaea triquetra</i>	Large-leaf Hop-bush	0.1	3								
Sapindaceae	<i>Cupaniopsis anacardioides</i>	Tuckeroo			0.1	3	0.1	2	0.1	2		
Selaginellaceae	<i>Selaginella uliginosa</i>	Swamp Selaginella										
Smilacaceae	<i>Smilax glycyphylla</i>	Sweet Sarsparilla			0.1	2	0.1	2	1	200		
Thymelaeaceae	<i>Pimelea linifolia</i>	Slender Rice Flower							0.1	5		
Typhaceae	<i>Typha orientalis</i>	Broad-leaved Cumbungi			0.1	5						
Violaceae	<i>Hybanthus monopetalus</i>	Slender Violet-bush					0.2	100				
Xanthorrhoeaceae	<i>Xanthorrhoea</i> spp.	-					0.2	1				
Zamiaceae	<i>Macrozamia communis</i>	Burrawang										
Introduced species												
Fabaceae (Mimosoideae)	<i>Acacia saligna</i>	Golden Wreath Wattle	0.1	10								
Polygonaceae	<i>Acetosa sagittata</i>	Rambling Dock										
Agavaceae	<i>Agave</i> spp.	-	0.2	3								
Asteraceae	<i>Ageratina adenophora</i>	Crofton Weed										
Poaceae	<i>Andropogon virginicus</i>	Whisky Grass										
Apocynaceae	<i>Araujia sericifera</i>	Moth Vine	0.1	1								
Asparagaceae	<i>Asparagus aethiopicus</i>	Asparagus Fern	0.1	3	0.2	50	0.1	20	0.1	20		
Asteraceae	<i>Aster subulatus</i>	Wild Aster										
Asteraceae	<i>Bidens bipinnata</i>	Bipinnate Beggar's Ticks										
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	0.1	10	0.1	5	0.1	10				
Brassicaceae	<i>Brassica oleracea</i>	Collards										
Poaceae	<i>Bromus catharticus</i>	Prairie Grass										
Brassicaceae	<i>Cardamine hirsuta</i>	Common Bittercress										
Sapindaceae	<i>Cardiospermum halicacabum</i> var. <i>halicacabum</i>	Small Balloon Vine	0.1	1								

Family	Scientific name	Common name	40389_B08		40389_B09		40389_B10		40389_B11		40389_B12	
			Cvr%	Abund.								
Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass										
Gentianaceae	<i>Centaurium erythraea</i>	Common Centaury										
Chenopodiaceae	<i>Chenopodium album</i>	Fat Hen										
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	0.5	20								
Asteraceae	<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i>	Bitou Bush			10		0.1	3	2	20		
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle										
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	0.1	10			0.1	10				
Poaceae	<i>Cortaderia selloana</i>	Pampas Grass										
Apiaceae	<i>Cyclospermum leptophyllum</i>	Slender Celery										
Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge										
Poaceae	<i>Digitaria sanguinalis</i>	Crab Grass										
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	0.5	30								
Onagraceae	<i>Epilobium ciliatum</i>	-										
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	3	100								
Apiaceae	<i>Foeniculum vulgare</i>	Fennel										
Asteraceae	<i>Gamochaeta calviceps</i>	Cudweed	0.5	20								
Asteraceae	<i>Gamochaeta purpurea</i>	Purple Cudweed										
Asteraceae	<i>Gazania rigens</i>	-										
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush										
Amaranthaceae	<i>Gomphrena celosioides</i>	Gomphrena Weed										
Apiaceae	<i>Hydrocotyle bonariensis</i>	-			10		0.3	80	0.3	200		
Asteraceae	<i>Hypochaeris glabra</i>	Smooth Catsear	1	30								
Asteraceae	<i>Hypochaeris radicata</i>	Catsear					0.1	2				
Verbenaceae	<i>Lantana camara</i>	Lantana			1	20	5	20	1	20		

Family	Scientific name	Common name	40389_B08		40389_B09		40389_B10		40389_B11		40389_B12	
			Cvr%	Abund.								
Brassicaceae	<i>Lepidium africanum</i>	Common Peppergrass										
Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet			0.1	1						
Liliaceae	<i>Lilium formosanum</i>	Formosan Lily					0.1	1				
Primulaceae	<i>Lysimachia arvensis</i>	Scarlet Pimpernel										
Fabaceae (Faboideae)	<i>Medicago polymorpha</i>	Burr Medic	0.3	10								
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow										
Onagraceae	<i>Oenothera mollissima</i>	-										
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	0.5	1								
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	2	200								
Poaceae	<i>Paspalum urvillei</i>	Vasey Grass										
Poaceae	<i>Phalaris aquatica</i>	Phalaris										
Phytolaccaceae	<i>Phytolacca octandra</i>	Inkweed										
Pinaceae	<i>Pinus radiata</i>	Radiata Pine										
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	5	100								
Apocynaceae	<i>Plumeria rubra</i>	Frangipani	0.2	3								
Polygalaceae	<i>Polygala virgata</i>	-			0.1	2						
Salicaceae	<i>Populus nigra</i>	Lombardy Poplar										
Rubiaceae	<i>Richardia brasiliensis</i>	Mexican Clover										
Iridaceae	<i>Romulea rosea</i> var. <i>australis</i>	Onion Grass										
Polygonaceae	<i>Rumex crispus</i>	Curled Dock										
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed										
Poaceae	<i>Setaria parviflora</i>	-	4	30								
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne										
Solanaceae	<i>Solanum nigrum</i>	Black-berry Nightshade										

Family	Scientific name	Common name	40389_B08		40389_B09		40389_B10		40389_B11		40389_B12	
			Cvr%	Abund.								
Solanaceae	<i>Solanum sisymbriifolium</i>	-										
Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle										
Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass										
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo Grass	0.5	30								
Asteraceae	<i>Taraxacum officinale</i>	Dandelion										
Fabaceae (Faboideae)	<i>Trifolium repens</i>	White Clover										
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop										
Fabaceae (Faboideae)	<i>Vicia sativa</i>	Common vetch										

Table C-5 BAM plot summary (part 1)

Plot ID	PCT	Area (Ha)	Patch size	Condition	Zone	Easting	Northing	Bearing	Comp. Tree	Comp. Shrub	Comp. Grass	Comp. Forbs	Comp. Ferns	Comp. Other
40389_B01	3972	0.51	1	Modified	56	335461	6234415	1	0	0	6	2	0	0
40389_B02	Exotic grass/turf	6.04	-	-	56	335509	6234157	184	0	0	4	1	0	0
40389_B03	Exotic grass/turf	6.04	-	-	56	335039	6234536	261	0	0	4	1	0	1
40389_B04	3545	4.37	481	Regenerating	56	335025	6233853	266	0	1	4	0	0	0
40389_B05	3545	0.35	481	Low	56	334960	6233690	149	3	2	6	2	1	3
40389_B06	3545	4.37	481	Regenerating	56	335829	6234607	178	2	16	3	2	1	2
40389_B07	Planted exotic	0.55	-	-	56	334568	6234815	20	0	0	3	3	0	0
40389_B08	Planted natives	0	-	-	56	334560	6234863	197	2	2	2	0	0	0
40389_B09	Exotic grass/turf	6.04	-	-	56	335274	6234030	102	0	0	0	0	0	0
40389_B10	Exotic grass/turf	6.04	-	-	56	335660	6233885	277	0	0	1	0	0	1
40389_B12	Planted exotic	0.55	-	-	56	335551	6233991	137	0	1	1	1	0	0

Table C-6 BAM plot summary (part 2)

Plot ID	Struc. Tree	Struc. Shrub	Struc. Grass	Struc. Forbs	Stuc. Ferns	Stuc. Other	Funn. Large Trees	Fun. Hollow Trees	Fun. Litter Cover	Fun Len. Fallen Logs	Fun. Tree Stem 5to9	Fun. Tree Stem 10to19	Fun. Tree Stem 20to29	Fun. Tree Stem 30to49	Fun. Tree 50to79	Fun. Tree Regen	Fun. High Threat Exotic
40389_B01	0.0	0.0	28.3	0.2	0.0	0.0	0	0	6	0	0	0	0	0	0	0	0.1
40389_B02	0.0	0.0	60.3	0.1	0.0	0.0	0	0	88	0	0	0	0	0	0	0	21.5
40389_B03	0.0	0.0	80.3	0.5	0.0	0.1	0	0	4	0	0	0	0	0	0	0	0.9
40389_B04	0.0	0.1	70.2	0.0	0.0	0.0	1	0	60	0	1	1	0	0	0	1	10.8
40389_B05	26.0	0.6	1.1	0.2	1.0	0.3	1	1	98	0	1	1	1	4	1	1	65.8
40389_B06	2.0	56.2	1.6	0.2	0.1	0.3	1	0	74	0	1	1	0	0	0	1	0.1
40389_B07	0.0	0.0	80.1	0.3	0.0	0.0	0	0	55	0	1	0	0	10	3	0	30.7
40389_B08	23.0	0.3	60.5	0.0	0.0	0.0	1	0	52	0	1	1	1	5	5	1	6.8
40389_B09	0.0	0.0	0.0	0.0	0.0	0.0	0	0	16	0	0	0	0	0	0	0	0.0
40389_B10	0.0	0.0	10.0	0.0	0.0	0.1	0	0	11	0	0	0	0	0	0	0	65.8
40389_B12	0.0	0.3	70.0	0.1	0.0	0.0	1	0	5	0	0	1	1	0	0	0	9.2

BAM plot data sheets

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	10/04/2024	Kurnell BDAR		jrs jh	
Zone	Datum	Plot ID	40389_B01	Plot dimensions	50x20
56	GDA94			Orientatio n of middle	1
Easting	Northing	IBRA region	Sydney Basin	Photo #	
335461	6234415				
Plant Community Type		3972		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	0	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	0
	Grasses etc.	6	50 - 79 cm	0
	Forbs	2	30 - 49 cm	0
	Ferns	0	20 - 29cm	0
	Other	0	10 - 19 cm	0
Sum of Cover of native vascular plans by growth form group	Trees	0	5 - 9 cm	0
	Shrubs	0	< 5 cm	0
	Grasses etc.	28.3	Length of logs (m)	0
	Forbs	0.2	No. trees with hollows	0
	Ferns	0		
	Other	0		
High Threat Weed cover		0.1		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	0	0	20	0	10
Average of the 5 subplots	6				

Notes Done adjacent to road. Road on left

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern	Modified.	Slope	Nil.	Soil Surface Texture	Sandy
Soil Colour	Light brown	Site Drainage	Moderate	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock)			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	10/04/2024	Kurnell BDAR	40389_B01	jrs jh

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Aster subulatus	E	5	50	
GG	Carex inversa	N	0.1	10	
GG	Chloris truncata	N	0.1	10	
	Conyza bonariensis	E	0.3	30	
GG	Cynodon dactylon	N	3	30	
	Cyperus eragrostis	HTE	0.1	10	
	Epilobium ciliatum	E	0.1	30	
GG	Fimbristylis dichotoma	N	0.1	10	
	Hypochaeris glabra	E	0.1	10	
GG	Juncus usitatus	N	10	300	
FG	Ludwigia peploides subsp.	N	0.1	10	
	Modiola caroliniana	E	0.5	20	
FG	Persicaria decipiens	N	0.1	10	
	Rumex crispus	E	0.1	10	
	Setaria parviflora	E	0.1	10	
	Sonchus oleraceus	E	0.1	10	
GG	Typha orientalis	N	15	100	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	10/04/2024	Kurnell BDAR	Other	JRS JH	
Zone	Datum	Plot ID	40389_B02	Plot dimensions	50x20
56	GDA94			Orientation of middle	184
Easting	Northing	IBRA region	Sydney Basin	Photo #	
335509	6234157				
Plant Community Type				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	0	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	0
	Grasses etc.	4	50 - 79 cm	0
	Forbs	1	30 - 49 cm	0
	Ferns	0	20 - 29cm	0
	Other	0	10 - 19 cm	0
Sum of Cover of native vascular plants by growth form group	Trees	0	5 - 9 cm	0
	Shrubs	0	< 5 cm	0
	Grasses etc.	60.3	Length of logs (m)	0
	Forbs	0.1	No. trees with hollows	0
	Ferns	0		
	Other	0		
High Threat Weed cover		21.5		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	85	75	90	95	95
Average of the 5 subplots	88				

Notes Modified. "cell" asbestos buried with cap over.

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Moderate	Soil Surface Texture	Clay loam
Soil Colour	Dark	Site Drainage	Moderate adjacent to modified waterway	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	10/04/2024	Kurnell BDAR	40389_B02	JRS JH

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Andropogon virginicus	HTE	0.5	30	
	Bidens pilosa	HTE	0.1	10	
GG	Bothriochloa macra	N	0.1	2	
	Brassica oleracea	E	2	40	
	Bromus catharticus	E	0.1	10	
	Cardamine hirsuta	E	0.5	20	
	Chenopodium album	E	2	20	
	Chloris gayana	HTE	0.5	10	
GG	Chloris truncata	N	0.1	20	
	Cirsium vulgare	E	0.1	10	
	Cortaderia selloana	HTE	0.2	1	
GG	Cynodon dactylon	N	60	6000	
	Hypochaeris radicata	E	0.1	10	
GG	Lachnagrostis filiformis	N	0.1	1	
	Lysimachia arvensis	E	0.1	2	
	Melinis repens	E	0.1	10	
	Modiola caroliniana	E	0.1	10	
	Paspalum dilatatum	HTE	20	2000	
	Paspalum urvillei	HTE	0.2	10	
FG	Persicaria decipiens	N	0.1	1	
	Phalaris aquatica	E	5	20	
	Plantago lanceolata	E	0.1	10	
	Setaria parviflora	E	0.1	10	
	Solanum nigrum	E	0.1	2	
	Solanum sisymbriifolium	E	0.1	10	
	Sonchus oleraceus	E	0.1	10	
	Trifolium repens	E	0.5	20	
	Verbena bonariensis	E	0.1	10	
	Vicia sativa	E	0.5	20	

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name	Veg Zone ID	Recorders		
Date	10/04/2024	Kurnell BDAR	Grass/Turf	Jrs jh		
Zone	Datum	Plot ID	40389_B03	Plot dimensions	50x20	Orientation of middle
56	GDA94					261
Easting	Northing	IBRA region	Sydney Basin	Photo #		
335039	6234536					
Plant Community Type				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	0	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	0
	Grasses etc.	4	50 - 79 cm	0
	Forbs	1	30 - 49 cm	0
	Ferns	0	20 - 29cm	0
	Other	1	10 - 19 cm	0
Sum of Cover of native vascular plants by growth form group	Trees	0	5 - 9 cm	0
	Shrubs	0	< 5 cm	0
	Grasses etc.	80.3	Length of logs (m)	0
	Forbs	0.5	No. trees with hollows	0
	Ferns	0		
	Other	0.1		
High Threat Weed cover		0.9		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	5	0	10	0
Average of the 5 subplots	4				

Notes

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern	Grass/Turf	Slope	Nil.	Soil Surface Texture	Sandy
Soil Colour	Light	Site Drainage	Low	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock)			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	10/04/2024	Kurnell BDAR	40389_B03	Jrs jh

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Bidens pilosa	HTE	0.1	5	
GG	Bothriochloa macra	N	0.1	1	
	Chloris gayana	HTE	0.1	10	
	Conyza bonariensis	E	0.5	20	
GG	Cynodon dactylon	N	80	5000	
	Eragrostis curvula	HTE	0.1	10	
FG	Euphorbia spp.	N	0.5	70	
GG	Fimbristylis dichotoma	N	0.1	10	
	Gamochaeta calviceps	E	0.1	1	
	Gazania rigens	HTE	0.1	10	
OG	Glycine tabacina	N	0.1	20	
	Gomphrena celosioides	E	0.1	5	
	Hypochaeris glabra	E	0.1	10	
GG	Lachnagrostis filiformis	N	0.1	5	
	Medicago polymorpha	E	0.1	10	
	Modiola caroliniana	E	0.1	1	
	Plantago lanceolata	E	3	300	
	Richardia brasiliensis	E	0.1	5	
	Setaria parviflora	E	0.1	10	
	Sida rhombifolia	E	0.2	20	
	Sporobolus africanus	E	0.1	10	
	Stenotaphrum secundatum	HTE	0.5	20	
	Verbena bonariensis	E	0.1	5	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	10/04/2024	Kurnell BDAR	Regeneration	Jrs jh	
Zone 56	Datum GDA94	Plot ID 40389_B04	Plot dimensions 50x20	Orientation of middle	266
Easting 335025	Northing 6233853	IBRA region Sydney Basin	Photo #		
Plant Community Type		3545		EEC: None	Confidence M

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	4
	Forbs	0
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0.1
	Grasses etc.	70.2
	Forbs	0
	Ferns	0
	Other	0
High Threat Weed cover		10.8

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	0
No. trees with hollows	0

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	95	80	25	45	55
Average of the 5 subplots	60				

Notes	modified waterway adjacent
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern	Modified	Slope	Low	Soil Surface Texture	Clay loam
Soil Colour	Light	Site Drainage	Moderate -	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock)			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	10/04/2024	Kurnell BDAR	40389_B04	Jrs jh

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia longifolia	N	0.1	10	
	Acacia saligna	E	35	60	
	Ageratina adenophora	HTE	0.5	30	
	Andropogon virginicus	HTE	0.1	2	
	Araujia sericifera	HTE	0.1	1	
	Aster subulatus	E	2	80	
	Bidens pilosa	HTE	0.1	10	
	Chrysanthemoides monilifera	HTE	1	30	
	Cirsium vulgare	E	1	30	
	Conyza bonariensis	E	3	100	
	Cortaderia selloana	HTE	0.1	2	
GG	Cynodon dactylon	N	65	5000	
	Cyperus eragrostis	HTE	0.1	5	
	Eragrostis curvula	HTE	0.1	1	
GG	Fimbristylis dichotoma	N	0.1	20	
	Gamochaeta purpurea	E	0.1	10	
	Gomphocarpus fruticosus	E	0.1	2	
	Hydrocotyle bonariensis	E	0.5	10	
	Hypochaeris glabra	E	0.1	2	
GG	Juncus usitatus	N	0.1	10	
	Lantana camara	HTE	0.5	5	
	Medicago polymorpha	E	0.5	30	
	Melinis repens	E	0.2	20	
GG	Microlaena stipoides	N	5	90	
	Paspalum dilatatum	HTE	5	500	
	Paspalum urvillei	HTE	3	30	
	Phytolacca octandra	E	0.5	20	
	Plantago lanceolata	E	5	100	
	Romulea rosea var. australis	HTE	0.1	10	
	Senecio madagascariensis	HTE	0.1	1	
	Setaria parviflora	E	5	500	
	Sida rhombifolia	E	0.1	10	
	Solanum nigrum	E	0.1	2	
	Solanum sisymbriifolium	E	0.1	10	
	Sonchus oleraceus	E	0.1	10	
	Verbena bonariensis	E	0.1	10	
	Vicia sativa	E	0.1	10	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	10/04/2024	Kurnell BDAR	Low	Jrs jh	
Zone	Datum	Plot ID	40389_B05	Plot dimensions	50x20
56	GDA94			Orientatio n of middle	149
Easting	Northing	IBRA region	Sydney Basin	Photo #	
334960	6233690				
Plant Community Type		3545		EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	3	DBH	# Tree Stems Count
	Shrubs	2	80+ cm	0
	Grasses etc.	6	50 - 79 cm	1
	Forbs	2	30 - 49 cm	4
	Ferns	1	20 - 29cm	1
	Other	3	10 - 19 cm	1
Sum of Cover of native vascular plans by growth form group	Trees	26	5 - 9 cm	1
	Shrubs	0.6	< 5 cm	1
	Grasses etc.	1.1	Length of logs (m)	0
	Forbs	0.2	No. trees with hollows	1
	Ferns	1		
	Other	0.3		
High Threat Weed cover		65.8		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	100	95	100	100	95
Average of the 5 subplots	98				

Notes	adjacent to modified waterway
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Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Low	Soil Surface Texture	Sandy
Soil Colour	Dark	Site Drainage	Moderate	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock)			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	10/04/2024	Kurnell BDAR	40389_B05	Jrs jh

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Acetosa sagittata	HTE	0.2	20	
	Ageratina adenophora	HTE	0.1	10	
TG	Angophora costata	N	15	10	
	Asparagus aethiopicus	HTE	5	100	
TG	Banksia integrifolia	N	1	2	
	Bidens pilosa	HTE	0.1	10	
SG	Breynia oblongifolia	N	0.1	5	
	Chrysanthemoides monilifera	HTE	15	90	
OG	Clematis glycinoides	N	0.1	2	
	Conyza bonariensis	E	0.1	10	
	Cortaderia selloana	HTE	0.3	2	
FG	Dianella caerulea	N	0.1	10	
	Ehrharta erecta	HTE	0.1	10	
GG	Entolasia stricta	N	0.1	10	
TG	Eucalyptus robusta	N	10	3	
OG	Geitonoplesium cymosum	N	0.1	2	
OG	Hibbertia scandens	N	0.1	1	
SG	Homalanthus populifolius	N	0.5	20	
	Lantana camara	HTE	45	300	
	Lilium formosanum	E	0.2	5	
FG	Lobelia purpurascens	N	0.1	2	
GG	Lomandra longifolia	N	0.5	1	
GG	Microlaena stipoides	N	0.2	20	
	Olea europaea subsp. cuspidata	E	0.5	2	
GG	Oplismenus hirtellus	N	0.1	10	
GG	Phragmites australis	N	0.1	5	
	Plantago lanceolata	E	0.1	10	
EG	Pteridium esculentum	N	1	30	
	Setaria parviflora	E	0.1	10	
	Solanum nigrum	E	0.1	10	
GG	Themeda triandra	N	0.1	10	

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name	Veg Zone ID	Recorders		
Date	11/04/2024	Kurnell BDAR	Other	Jrs jh		
Zone 56	Datum GDA94	Plot ID 40389_B06	Plot dimensions	50x20	Orientation of middle	178
Easting 335829	Northing 6234607	IBRA region	Sydney Basin	Photo #		
Plant Community Type		3545			EEC: None	Confidence M

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	2	DBH	# Tree Stems Count
	Shrubs	16	80+ cm	0
	Grasses etc.	3	50 - 79 cm	0
	Forbs	2	30 - 49 cm	0
	Ferns	1	20 - 29cm	0
	Other	2	10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	2	5 - 9 cm	1
	Shrubs	56.2	< 5 cm	1
	Grasses etc.	1.6	Length of logs (m)	0
	Forbs	0.2	No. trees with hollows	0
	Ferns	0.1		
	Other	0.3		
High Threat Weed cover		0.1		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	85	15	100	75	95
Average of the 5 subplots	74				

Notes Sandy plain, sections of debris concentrated under shrubbery. downward slope towards modified waterway

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Moderate	Soil Surface Texture	Sand
Soil Colour	Light	Site Drainage	Moderate,	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock)			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	11/04/2024	Kurnell BDAR	40389_B06	Jrs jh

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia longifolia	N	0.5	10	
SG	Acacia suaveolens	N	0.1	5	
SG	Acacia ulicifolia	N	3	30	
FG	Actinotus helianthi	N	0.1	1	
	Andropogon virginicus	HTE	0.1	1	
TG	Angophora costata	N	1	1	
SG	Astroloma pinifolium	N	0.3	10	
TG	Banksia integrifolia	N	1	1	
SG	Bossiaea heterophylla	N	0.1	2	
OG	Clematis glycinoides	N	0.1	1	
GG	Cynodon dactylon	N	1	30	
SG	Darwinia fascicularis	N	0.1	1	
FG	Dianella caerulea	N	0.1	2	
SG	Dillwynia floribunda	N	0.2	10	
SG	Grevillea mucronulata	N	4	20	
SG	Hakea sericea	N	0.3	5	
SG	Homalanthus populifolius	N	0.1	1	
SG	Leptospermum laevigatum	N	35	100	
SG	Leucopogon juniperinus	N	0.1	10	
GG	Lomandra longifolia	N	0.5	10	
SG	Monotoca scoparia	N	2	10	
SG	Persoonia spp.	N	10	30	
SG	Petrophile pulchella	N	0.3	5	
SG	Pimelea linifolia	N	0.1	5	
EG	Pteridium esculentum	N	0.1	10	
GG	Themeda triandra	N	0.1	5	
OG	Xanthorrhoea spp.	N	0.2	1	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	11/04/2024	40389_B07	Other	Jrs jh	
Zone	Datum	Plot ID	40389_B07	Plot dimensions	50x20
56	GDA94			Orientation of middle	20
Easting	Northing	IBRA region	Sydney Basin	Photo #	
334568	6234815				
Plant Community Type				EEC: None	Confidence M

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	0	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	0
	Grasses etc.	3	50 - 79 cm	3
	Forbs	3	30 - 49 cm	10
	Ferns	0	20 - 29cm	0
	Other	0	10 - 19 cm	0
Sum of Cover of native vascular plants by growth form group	Trees	0	5 - 9 cm	1
	Shrubs	0	< 5 cm	0
	Grasses etc.	80.1	Length of logs (m)	0
	Forbs	0.3	No. trees with hollows	0
	Ferns	0		
	Other	0		
High Threat Weed cover		30.7		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	70	65	30	55	55
Average of the 5 subplots	55				

Notes near modified stormwater drainage

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Low	Soil Surface Texture	Sand
Soil Colour	Light	Site Drainage	Moderate -	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	11/04/2024	40389_B07	40389_B07	Jrs jh

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Acacia saligna	E	0.1	1	
	Asparagus aethiopicus	HTE	0.1	1	
GG	Carex inversa	N	0.1	10	
	Conyza bonariensis	E	0.1	10	
GG	Cynodon dactylon	N	65	6000	
FG	Dichondra repens	N	0.1	10	
	Digitaria sanguinalis	E	0.1	10	
	Gamochaeta calviceps	E	0.1	10	
	Hypochaeris glabra	E	0.5	10	
FG	Lobelia purpurascens	N	0.1	10	
GG	Microlaena stipoides	N	15	200	
	Modiola caroliniana	E	0.1	10	
FG	Oxalis perennans	N	0.1	20	
	Paspalum dilatatum	HTE	0.5	20	
	Pinus radiata	HTE	30	20	
	Plantago lanceolata	E	3	100	
	Richardia brasiliensis	E	0.1	10	
	Sida rhombifolia	E	0.1	10	
	Sonchus oleraceus	E	0.1	10	
	Stenotaphrum secundatum	HTE	0.1	10	
	Verbena bonariensis	E	0.1	10	

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name	Veg Zone ID	Recorders		
Date	11/04/2024	40389_B08_JRS_JH_20240	Other	Jrs jh		
Zone	Datum	Plot ID	40389_B08	Plot dimensions	50x20	Orientation of middle
56	GDA94					197
Easting	Northing	IBRA region	Sydney Basin	Photo #		
334560	6234863					
Plant Community Type				EEC: None Confidence M		

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	2	DBH	# Tree Stems Count
	Shrubs	2	80+ cm	0
	Grasses etc.	2	50 - 79 cm	5
	Forbs	0	30 - 49 cm	5
	Ferns	0	20 - 29cm	1
	Other	0	10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	23	5 - 9 cm	1
	Shrubs	0.3	< 5 cm	1
	Grasses etc.	60.5	Length of logs (m)	0
	Forbs	0	No. trees with hollows	0
	Ferns	0		
	Other	0		
High Threat Weed cover		6.8		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	75	85	60	10	30
Average of the 5 subplots	52				

Notes adjacent to stormwater drainage

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Low	Soil Surface Texture	Sand
Soil Colour	Light	Site Drainage	Moderate -	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot:Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	11/04/2024	40389_B08_ JRS_JH_2024 0411	40389_B08	Jrs jh

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia longifolia	N	0.2	3	
	Acacia saligna	E	0.1	10	
	Agave spp.	E	0.2	3	
	Araujia sericifera	HTE	0.1	1	
	Asparagus aethiopicus	HTE	0.1	3	
	Bidens pilosa	HTE	0.1	10	
	Cardiospermum halicacabum	E	0.1	1	
	Chloris gayana	HTE	0.5	20	
	Conyza bonariensis	E	0.1	10	
GG	Cynodon dactylon	N	60	5000	
SG	Dodonaea triquetra	N	0.1	3	
	Ehrharta erecta	HTE	0.5	30	
	Eragrostis curvula	HTE	3	100	
	Gamochaeta calviceps	E	0.5	20	
	Hypochaeris glabra	E	1	30	
TG	Lophostemon confertus	N	3	1	
	Medicago polymorpha	E	0.3	10	
TG	Melaleuca quinquenervia	N	20	4	
GG	Microlaena stipoides	N	0.5	30	
	Olea europaea subsp. cuspidata	E	0.5	1	
	Paspalum dilatatum	HTE	2	200	
	Plantago lanceolata	E	5	100	
	Plumeria rubra	E	0.2	3	
	Setaria parviflora	E	4	30	
	Stenotaphrum secundatum	HTE	0.5	30	

BAM Plot Data Sheet				Site Sheet no:1 of 2	
		Survey Name	Veg Zone ID	Recorders	
Date	29/11/2024	Kurnell BDAR	Other	TOH	
Zone	Datum	Plot ID	40389_B09	Plot dimensions	50x20
56	GDA94			Orientation of middle	102
Easting	Northing	IBRA region	Sydney Basin	Photo #	
335274	6234030				
Plant Community Type				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	0	DBH	# Tree Stems Count
	Shrubs	2	80+ cm	0
	Grasses etc.	1	50 - 79 cm	0
	Forbs	1	30 - 49 cm	0
	Ferns	0	20 - 29cm	0
	Other	0	10 - 19 cm	0
Sum of Cover of native vascular plants by growth form group	Trees	0	5 - 9 cm	0
	Shrubs	4	< 5 cm	0
	Grasses etc.	30	Length of logs (m)	0
	Forbs	0.1	No. trees with hollows	0
	Ferns	0		
	Other	0		
High Threat Weed cover		23		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	5	20	10	25
Average of the 5 subplots	16				

Notes

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Sandy
Soil Colour	Sand brown	Site Drainage	Free	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock)			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	29/11/2024	Kurnell BDAR	40389_B09	TOH

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Acacia longifolia	N	3	20	
	Asparagus aethiopicus	HTE	0.1	20	
	Bidens pilosa	HTE	0.5	900	
	Bromus catharticus	E	1	500	
	Chrysanthemoides monilifera	HTE	2	10	
	Coreopsis lanceolata	E	0.2	20	
	Cortaderia selloana	HTE	0.2	3	
GG	Cynodon dactylon	N	30	4000	
	Eragrostis curvula	HTE	10	100	
	Euphorbia maculata		0.1	10	
	Hydrocotyle bonariensis	E	3	500	
	Ipomoea cairica	N	10	200	
SG	Leptospermum laevigatum	N	1	8	
	Medicago lupulina	E	0.5	500	
	Melinis repens	E	10	300	
FG	Pelargonium australe	N	0.1	5	
	Plantago lanceolata	E	0.2	100	
	Ricinus communis	HTE	0.2	1	
	Tagetes minuta	E	0.1	20	

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name	Veg Zone ID	Recorders		
Date	13/01/2025	Kurnell BDAR	Other	JRS, TOH		
Zone 56	Datum GDA94	Plot ID 40389_B10	Plot dimensions	50x20	Orientation of middle	277
Easting 335660	Northing 6233885	IBRA region	Sydney Basin	Photo #		
Plant Community Type				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	0	DBH	# Tree Stems Count
	Shrubs	0	80+ cm	0
	Grasses etc.	1	50 - 79 cm	0
	Forbs	0	30 - 49 cm	0
	Ferns	0	20 - 29cm	0
	Other	1	10 - 19 cm	0
Sum of Cover of native vascular plants by growth form group	Trees	0	5 - 9 cm	0
	Shrubs	0	< 5 cm	0
	Grasses etc.	10	Length of logs (m)	0
	Forbs	0	No. trees with hollows	0
	Ferns	0		
	Other	0.1		
High Threat Weed cover		65.8		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	10	15	15	10
Average of the 5 subplots	11				

Notes

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Sandy
Soil Colour	White to light brown	Site Drainage	Free	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock)			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/01/2025	Kurnell BDAR	40389_B10	JRS, TOH

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Acacia saligna	E	0.1	10	
	Bidens bipinnata	HTE	0.1	10	
	Bidens pilosa	HTE	0.1	10	
	Brassica oleracea	E	0.1	5	
	Cenchrus clandestinus	HTE	0.1	10	
	Centaurium erythraea	E	0.1	10	
	Chloris gayana	HTE	65	6000	
	Chrysanthemoides monilifera	HTE	0.1	10	
	Conyza bonariensis	E	0.1	20	
GG	Cynodon dactylon	N	10	1000	
	Foeniculum vulgare	E	5	100	
	Hydrocotyle bonariensis	E	0.1	10	
	Hypochaeris glabra	E	0.1	10	
	Ipomoea cairica	N	0.3	20	
	Lantana camara	HTE	0.1	10	
	Lepidium africanum	E	0.1	5	
	Lysimachia arvensis	E	0.1	10	
OG	Macrozamia communis	N	0.1	10	
	Melinis repens	E	0.2	20	
	Plantago lanceolata	E	5	100	
	Sida rhombifolia	E	0.1	10	
	Verbena bonariensis	E	0.1	10	

BAM Plot Data Sheet				Site Sheet no:1 of 2		
		Survey Name	Veg Zone ID	Recorders		
Date	13/01/2025	Kurnell BDAR	Other	JRS TOH		
Zone	Datum	Plot ID	40389_B12	Plot dimensions	50x20	Orientation of middle
56	GDA94					137
Easting	Northing	IBRA region	Sydney Basin	Photo #		
335551	6233991					
Plant Community Type				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values	BAM Attribute (1000m2 plot)	
Count of Native Richness	Trees	0	DBH	# Tree Stems Count
	Shrubs	1	80+ cm	0
	Grasses etc.	1	50 - 79 cm	0
	Forbs	1	30 - 49 cm	0
	Ferns	0	20 - 29cm	1
	Other	0	10 - 19 cm	1
Sum of Cover of native vascular plants by growth form group	Trees	0	5 - 9 cm	0
	Shrubs	0.3	< 5 cm	0
	Grasses etc.	70	Length of logs (m)	0
	Forbs	0.1	No. trees with hollows	0
	Ferns	0		
	Other	0		
High Threat Weed cover		9.2		

BAM Attribute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	0	10	5	5
Average of the 5 subplots	5				

Notes

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Sandy silt
Soil Colour	Light brown	Site Drainage	Good	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock)			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		Survey Name	Plot ID	Recorders
Date	13/01/2025	Kurnell BDAR	40389_B12	JRS TOH

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	<i>Cenchrus clandestinus</i>	HTE	2	900	
	<i>Chloris gayana</i>	HTE	2	500	
	<i>Chrysanthemoides monilifera</i>	HTE	0.1	2	
	<i>Cyclosporum leptophyllum</i>	E	0.1	10	
GG	<i>Cynodon dactylon</i>	N	70	5000	
	<i>Ehrharta erecta</i>	HTE	5	200	
	<i>Hydrocotyle bonariensis</i>	E	0.3	200	
	<i>Hypochaeris glabra</i>	E	0.1	20	
	<i>Lantana camara</i>	HTE	0.1	1	
SG	<i>Leptospermum laevigatum</i>	N	0.3	1	
	<i>Melinis repens</i>	N	0.2	50	
	<i>Oenothera mollissima</i>	E	0.1	10	
FG	<i>Pelargonium australe</i>	N	0.1	3	
	<i>Plantago lanceolata</i>	E	0.2	400	
	<i>Populus nigra</i>	E	35	50	
	<i>Setaria parviflora</i>	E	5	2000	
	<i>Taraxacum officinale</i>	E	0.1	10	
	<i>Trifolium repens</i>	E	0.1	50	

Annexure D Fauna

Table D-7 Fauna species recorded at the subject land

Common name	Scientific name
Birds	
Black-fronted Dotterel	<i>Elseyornis melanops</i>
Dusky Moorhen	<i>Gallinula tenebrosa</i>
Latham's Snipe	<i>Gallinago hardwickii</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Silvereye	<i>Zosterops lateralis</i>
White-browed Scrubwren	<i>Sericornis frontalis</i>
Mammals	
Brush-tail Possum	<i>Trichosurus</i> sp.
Cat	<i>Felis catus</i>
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>
House Mouse	<i>Mus musculus</i>
Rat	<i>Rattus rattus</i>
Southern Myotis	<i>Myotis macropus</i>
Frogs	
Brown-striped Frog	<i>Limnodynastes peronii</i>
Common Eastern Froglet	<i>Crinia signifera</i>
Eastern Dwarf Tree Frog	<i>Litoria fallax</i>
Jervis Bay Tree Frog	<i>Litoria jervisiensis</i>
Peron's Tree Frog	<i>Litoria peronii</i>
Reptile	
Eastern Snake-necked Turtle	<i>Chelodina longicollis</i>
Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>
Invertebrate	
Asian Tramp Snail	<i>Bradybaena similaris</i>
Giant Dragonfly	<i>Petalura gigantea</i>
Fish	
Mosquito Fish	<i>Gambusia holbrooki</i>

Annexure E SAIL

Giant Dragonfly

Giant Dragonfly *Petalura gigantea* is listed as Endangered under the BC Act. The species is identified in the TBDC as an entity at risk of SAIL in NSW. Specifically, it is considered at risk of SAIL based on the following principles (DPIE 2019):

- Principle 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

The SAIL threshold for the species is described in the TBDC as “*within 500m of swamps*”. Any other impact on the species habitat is unlikely to be a potential serious and irreversible impact. The potential for a SAIL will be determined by the consent authority, guided by the additional assessment provided below, undertaken in accordance with Section 9 of the BAM (DPIE 2020a).

Table E-8 Assessment of SAIL for Giant Dragon Fly *Petalura gigantea*

Information required (BAM Section 9.1.2)	Response
1. The action and measures taken to avoid the direct and indirect impact on the species at risk of an SAIL.	Actions and measures undertaken by the proponent to avoid and minimise impacts to Giant Dragonfly are provided in Section 5 of this BDAR and include the avoidance of all swamp habitats which represent breeding habitat for this species. Impacts to Giant Dragonfly habitat occur towards the southern end of the subject land, limited to native vegetation that occurs within a 500m buffer zone of swam environs.
2a. Evidence of rapid decline. (SAIL Principle 1)	<p>i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer).</p> <p>ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.</p> <p>Species and ecological communities that have undergone large reductions or are likely to undergo large reductions in the future are considered to be at greater risk of extinction than those that have undergone or are likely to undergo smaller reductions (NSW TSSC 2018). To be considered under this principle, the species should have an observed, estimated, inferred, suspected or projected population of $\geq 80\%$ in 10 years or three generations (whichever is longer) (DPIE 2019).</p> <p>Giant Dragonfly populations extend along the east coast of NSW (NSW Scientific Committee 1998, Baird 2012). Due to the lifecycle of this species, information on population size is difficult to determine and therefore is largely unknown. Giant Dragonfly is highly dependent upon swamp habitats for breeding and growth at the larval stage and therefore populations are restricted to these communities. Many of these swamp communities that contained historical records have since been lost due to urbanization and therefore likely resulted in a reduction in population size (Baird 2017, NSW Scientific Committee 1998, Baird 2012).</p> <p>Given the information above Giant Dragonfly has likely experienced a decrease in population size, however due to a lack of population estimates it is uncertain and</p>

Information required (BAM Section 9.1.2)	Response
	<p>difficult to determine the level of population decline.</p> <p>Given the available information the species does not meet the thresholds for consideration under SAI Principle 1. It is noted that the species is not identified as an SAI entity in BioNet because of this principle.</p>
<p>2b. Extent of small population size. (SAI Principle 2)</p>	<p>i. an estimate of the species' current population size in NSW.</p> <p>There is no current estimate of population size for this species (Baird 2017).</p> <p>ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer).</p> <p>Given the lack of population estimates, given the variable nature of the larval stage for this species (Baird 2012), it is difficult to estimate the amount of decline.</p> <p>iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations.</p> <p>No data about mature individuals within each subpopulation size is available.</p> <p>Given the available information the species does not meet the thresholds for consideration under SAI Principle 2. It is noted that the species is not identified as an SAI entity in BioNet because of this principle.</p>
<p>2c. Evidence of limited geographic range for the threatened species. (SAI Principle 3)</p>	<p>The geographic range of a species is measured by its area of occupancy, which represents the area of suitable habitat currently occupied by the taxon (IUCN Standards and Petitions Committee 2019). Species that are known to have a very limited geographic distribution are generally known to:</p> <ul style="list-style-type: none"> • Have an area of occupancy of $\leq 10 \text{ km}^2$. • Have an extent of occurrence of $\leq 100 \text{ km}^2$. • Have at least two of the following three conditions: <ul style="list-style-type: none"> – Are severely fragmented or only known from one location. – Continuing decline. – Extreme fluctuations. • Inhabit less than or equal to three locations in NSW (DPIE 2019). <p>i. extent of occurrence.</p> <p>The extent of occurrence is not accurately known for this species. Populations are known to occur across a large range along the east of Australia (Baird 2017). Given this extensive range, this species is unlikely to be less than the EOO threshold mentioned above.</p> <p>ii. area of occupancy.</p> <p>Area of occupancy is expected to have decreased since European settlement (Baird 2017). The current area of occupancy is not accurately known for this species, however studies have detected populations scattered along the east coast of Australia (Baird 2017, Baird 2012). Given this extensive range of occurrence, this species is unlikely to be less than the AOO threshold mentioned above.</p>

Information required (BAM Section 9.1.2)	Response
	<p>iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences).</p> <p>The number of threat-defined locations are not known. Habitat that is highly fragmented may likely to be most affected by a single threatening event as these habitats are likely to be due to the sensitivity and isolated nature of swamp habitats required for this species. However, overall Giant Dragonfly has an extensive range that contains well-distanced populations across greater than three locations. Therefore, a single threatening event is unlikely to rapidly affect all species' occurrences.</p> <p>iv. whether the species' population is likely to undergo extreme fluctuations.</p> <p>Giant Dragonfly is reliant on strict conditions to facilitate breeding and larval growth. For example, soil moisture and surface hydrology can reduce ovipositing and larval burrowing (Baird 2017). Therefore, drought, heavy rainfall events or changes to soil hydrology can impact breeding leading to population fluctuations. Additionally due to long larval periods and variance in egg hatching due to environmental conditions, populations may have large fluctuations in emergence (Baird 2017, Baird 2012). Therefore, lifecycle and environmental conditions can lead to population fluctuations. Given the available information the species does not meet the thresholds for consideration under SAI Principle 3. It is noted that the species is not identified as an SAI entity in BioNet because of this principle.</p>
<p>2d. evidence that the species is unlikely to respond to management. (SAI Principle 4)</p>	<p>i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site.</p> <p>Giant Dragonfly has strict reproductive requirements. The larval stage requires permanent wet, organic rich peat soil to construct their burrows. Additionally, knowledge of the life history of this species limited (Baird 2014). We do know that life cycle is quite variable and extreme in nature. The larval stage is highly variable and can exceed over 10 years (Baird 2014). The adults are expected to have a short flight season extending potentially from October to late January or February however these are largely undocumented (Baird 2014). All life stages are likely to be highly variable dependent on environmental conditions.</p> <p>Given these strict reproductive requirements, it would be difficult to replicate these conditions it would be difficult to facilitate an increase in population through breeding efforts, or introduction to a biodiversity site.</p> <p>ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site.</p> <p>Giant Dragonfly is highly reliant on abiotic factors associated with water in the environment to facilitate breeding. These include water quality and water table depth with the swamp habitat which are strongly associated with the larval stage of this species (Baird 2014).</p> <p>Given the above there is a strong reliance on abiotic factors for this species.</p>

Information required (BAM Section 9.1.2)	Response
	<p>iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).</p> <p>Many key threatening processes impact the Giant Dragonfly. Many of these can be controlled under biodiversity stewardship site (e.g. land clearance, feral predators, weed invasion, etc.). However, anthropogenic climate change is unable to be managed at sufficient scale under a biodiversity stewardship site. Given the larval requirements of this species, changes to rainfall patterns, or long droughts may impact the water table level creating an environment either too wet or too dry for Giant Dragonfly larvae to construct burrows. Given the above a biodiversity stewardship site would be unable to manage a key threatening process for this species.</p> <p>Given the available information the species does meet the thresholds for consideration under SAll Principle 4.</p>
<p>3. Where the TBDC indicates data is ‘unknown’ or ‘data deficient’ for a species, the assessor must record this in the BDAR or BCAR.</p>	<p>The TBDC does not state that data is ‘unknown’ or ‘data deficient’ for this species.</p>
<p>4a. The impact on the species’ population.</p>	<p>i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population.</p> <p>Only one individual was detected during surveys and historical records in the locality are limited. Therefore, an accurate subpopulation size is difficult to determine for this species. Due to lack of impacts to swamp environments, surveys have not been undertaken in the areas where this species is most likely to occur as impacts to these areas are not being considered as part of the proposed modification..</p> <p>ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population.</p> <p>Impacts would be limited to areas outside of important swamp breeding habitat and areas directly adjoining. The species is unlikely to be impacted directly.</p> <p>iii. if the species’ unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal.</p> <p>The impacts to potential habitat for Giant Dragonfly as a result of the proposed works include the following: Removal of approximately 3.44 ha of native vegetation that occurs within 500m of a swamp. Disturbance from indirect impacts in the form of increased traffic, noise and light during the proposed modification. These impacts would cease once works are completed. Ongoing indirect impacts are expected to be minimal and are assessed along with indirect impacts in Section 6.2 above. No individuals are likely to be directly impacted by the proposed works.</p>

Information required (BAM Section 9.1.2)	Response
<p>4b. The impact on the species’ geographic range.</p>	<p>i. the area of the species’ geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW.</p> <p>The impacts to potential habitat for Giant Dragonfly as a result of the proposed modification include the following:</p> <p>Removal of approximately 3.44 ha of native vegetation that occurs within 500 metres of a swamp as per the TBDC.</p> <p>Disturbance from indirect impacts in the form of increased traffic, noise and light during the project construction. These impacts would cease once works are completed. Ongoing indirect impacts are expected to be minimal and are assessed in Section 6.2 above.</p> <p>Given no AOO or EOO are known, a percentage of these factors is unable to be determined.</p> <p>ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted.</p> <p>The proposed works would impact 3.44 ha of potential habitat (within 500m of a swamp). Giant Dragonflies are known to have strict swamp habitat requirements for breeding and development of the larval stage (Baird 2017, Baird 2012). Given no swamps would be impacted, the works are unlikely to impact the breeding habitat of this species. Therefore, impacts would be limited to edge effected areas of potential foraging habitat. The edge effected areas are largely dominated by dense Lantana and given Giant Dragonflies requirement for capturing prey in flight the areas of habitat to be impacted are unlikely to restrict this feeding pattern. Therefore, impacts are only likely to only directly impact potential habitat for this species.</p> <p>iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species.</p> <p>Impacts are unlikely to fragment habitats or the subpopulation for this species. Impacts would be limited to the edge of non-swamp native vegetation which is currently edge effected primarily by dense Lantana and interfaces with the existing Kurnell Terminal. Given the preference swamp habitat for breeding and the limited amount of potential foraging habitat to be removed, the subpopulation is not expected to be fragmented. The subpopulation would still contain viable habitat to allow for the dispersal to alternative swamp habitat with no additional restriction in movement to be expected by the works.</p> <p>iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology,</p>

Information required (BAM Section 9.1.2)	Response
	<p>pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.</p> <p>Changes to fire regimes</p> <p>Giant Dragonfly may be vulnerable to changes to fire regimes. Fire can reduce organic matter and sheltering vegetation exposing Dragonflies in the larval stage to increased exposure. This makes foraging difficult due to reduced cover, exposes them to predation and can dry out swamps. Breeding and foraging for adults can also be impacted during fire events as it removes perches used to feed, moulting of exuviae or to breed.</p> <p>The risk of fire as a result of sparks from machinery during proposed works is unlikely but could increase the risk of fire occurring nearby to potential habitat. This risk would be managed by implementing appropriate mitigation measures such as spark dampeners, water spraying or the close proximity of fire-fighting gear such as extinguishers within the proposed modification's CEMP.</p> <p>Upon completion of works, the proposal is unlikely to result in changes to frequency or intensity of fire regimes within the locality.</p> <p>Hydrology</p> <p>Changes to hydrology are likely to have the greatest impact on Giant Dragonfly. Giant Dragonflies require wet, peaty soils to construct their larval burrows (Baird 2014). It is assumed that all burrow depths are required extend past the level of the water table for successful larval development (Baird 2017, Baird 2014).</p> <p>Changes to hydrology as a result of the proposal are discussed in Section 6.3.3. These changes are unlikely to significantly impact on the foraging or breeding habitat of the Giant Dragonfly.</p> <p>Pollutants</p> <p>Not much information is currently known on the water or air quality requirements for this species. Giant Dragonfly is known to inhabit similar habitats to other species associated with high water quality (Baird 2012). Therefore, it can be deemed that Giant Dragonfly may prefer high water quality. The proposed works are unlikely to result in any pollutants entering swamp environments which are located away from the proposed works.</p> <p>Species interactions</p> <p>The impact area and surrounds likely support several pest animal species such as feral cats, foxes and black rats. These species may opportunistically predate upon Giant Dragonfly. Several such pest animals were recorded during camera trap surveys indicating that they are already present within the broader locality. Given the nature of the proposed works restricted along the edges of potential habitat, the proposal is considered unlikely to increase pest numbers.</p> <p>Fragmentation</p> <p>Giant Dragonfly is mobile over small distances. The extent to which Giant Dragonfly is able to disperse across a patchy habitat is currently unknown, however it is likely to negatively impact their dispersal (Baird 2012).</p> <p>No breeding habitat is to be disturbed with impacts limited to edge affected, potential foraging habitat, vegetation. Therefore, the proposed modification is unlikely to result in further fragmentation of habitat for this species.</p>

Information required (BAM Section 9.1.2)	Response
	<p>Increased edge effects Edge effects may impact Giant Dragonfly by reducing movement, and encroaching on breeding habitat. Areas to be impacted by the works are already currently edge effected and dominated by Lantana. The area to be impacted by the works would not create additional edge effects or exacerbate existing one.</p> <p>Likelihood of disturbance Disturbance would be limited to edge effected areas of potential foraging habitat for the Giant Dragonfly. No breeding habitat would be directly impacted by the proposed works. Given that impacts would be limited to largely weed infested areas, and would not disturb breeding habitat the proposal is unlikely to cause disturbance to the Giant Dragonfly population.</p> <p>Disease, pathogens and parasites Not much information is known about diseases, pathogens and parasites that impact Giant Dragonfly. The proposal is unlikely to result in large scale changes to vegetation that could result in drastic changes to the current disease, parasite or pathogens abundance or diversity present within the habitat. Additionally, works are unlikely result in the introduction of additional disease, pathogens or parasites to the subject land.</p>

Annexure F Significant Impact Criteria assessments

This section includes assessments against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (CoA 2013b) for threatened entities for which potential habitat has been identified by this assessment.

Latham's Snipe

Distribution, lifecycle and habitat requirements

Latham's Snipe is a medium-sized wader, usually occurring singly or in small, loose groups. They are a nonbreeding migrant visitor to eastern Australia where the species occurs as a single dispersed population along the coast from Cape York Peninsula through to south-eastern South Australia. The species' range also extends inland over the eastern tablelands in south-eastern Queensland, west of the Great Dividing Range in NSW, and throughout much of Victoria and Tasmania (DCCEEW 2024).

The species breeds in Hokkaido and highland areas of Honshu in Japan, and in Sakhalin and the nearby Kuril Islands of far eastern Russia. The species migrates south to avoid the northern hemisphere winter. They arrive in Australia as early as mid-August and departing in March the following year.

When in Australia, the species occurs in a wide variety of open permanent and ephemeral wetlands and are regularly recorded in or around modified or artificial habitats including pasture, ploughed paddocks and irrigation channels. Habitat for Latham's Snipe includes low dense vegetation such as swamps, flooded grasslands, in and around bogs and other water bodies. Foraging areas are usually associated with areas of mud with some form of cover, where they typically feed at night, early morning or evening. They often roost on the ground near in small wetland areas among dense cover (DCCEEW 2024).

Important habitat for migratory shorebirds under the EPBC Act includes those that are recognised as nationally or internally important. Whilst Latham's Snipe does not utilise the same habitats as migratory shorebirds (tending to congregate less and occur in small, loose groups), the threshold estimates for determining nationally and internationally significant sites are still considered applicable (DCCEEW 2024). The flyway population for Latham's Snipe is estimated to be 30,000 individuals and therefore habitats supporting 300 individuals (1 % of the flyway estimate) are considered to be internationally significant, and habitat supporting 30 individuals (0.1 % of the flyway estimate) would typically be considered to be nationally important. However, a lower significance threshold of 18 individuals has been set nationally at the federal level (Weller et al. 2020, DCCEEW 2024)

Observation in current assessment

Two Latham's Snipe individuals were observed incidentally during targeted surveys undertaken as part of this assessment. Potential habitat for this species is considered to include the 0.51 ha of modified PCT 3972 which is associated with the human-made pipeways within the development footprint. Latham's Snipe may utilise these areas for occasional foraging and roosting habitat. The species is likely to be present in the area due to the nearby Towra Point Nature Reserve, which includes high quality habitat for a variety of migratory shorebirds.

Impact to the potential habitat areas have been considered below.

Table E-9 SIC assessment for Latham's Snipe

SIC assessment for vulnerable Latham's Snipe
<p><i>Lead to a long-term decrease in the size of an important population of a species.</i></p> <p>Due to the migratory nature of Latham's Snipe, the species is considered to exist as a single large population that occurs down the entire east coast of Australia. As such the entire population is considered important.</p> <p>Habitat for the species within the development footprint consists of 0.51 ha of modified PCT 3972, occurring within the human-made pipeways associated with the existing Kurnell Terminal. This habitat is not capable of supporting an ecologically significant proportion of the population (i.e., not capable to supporting 18 individuals), and is likely only used occasionally by individual birds as they are drawn to the locality by the high-quality foraging habitats in the nearby Towra Point Nature Reserve.</p> <p>The removal of this artificial habitat would not lead to a long term decrease in the size of the Latham's Snipe population in Australia (nor would is impact an ecologically significant portion of that population).</p>
<p><i>Reduce the area of occupancy of an important population.</i></p> <p>The area of occupancy for Latham's Snipe is estimated at 13,000 km² (DCCEEW 2024). The removal of 0.51 ha of habitat would not significantly reduce the area of occupancy or impact on an ecological significant proportion of the population.</p>
<p><i>Fragment an existing important population into two or more populations.</i></p> <p>Latham's Snipe is a migratory species that is considered to exist as a single, widely dispersed population within Australia. The impact's associated with proposed modification would not result in the fragmentation of this species due to it's highly mobile and transient nature. The proposed works would not remove important habitat which may impact on the species ability to disperse down the east coast of Australia.</p>
<p><i>Adversely affect habitat critical to the survival of a species.</i></p> <p>Habitat critical to the survival of the species refers to areas that are necessary:</p> <ul style="list-style-type: none"> • For activities such as foraging, breeding, roosting, or dispersal. • For the long-term maintenance of the species (including the maintenance of species essential to the survival of the Latham's snipe, such as macrobenthos). • To maintain genetic diversity and long-term evolutionary development. • For the re-introduction of populations or recovery of the species. <p>As Latham's Snipe exists across a large area of occurrence and utilises a variety of habitats, determining which sites are most important for Latham's snipe in Australia is challenging due to survey limitations. For the purposes of identifying nationally important habitat, important habitat for Latham's snipe is described as areas that have previously been identified as internationally important for the species, or areas that support at least 18 individuals of the species (DCCEEW 2024, Weller et al. 2020).</p> <p>Chapter Nine (Species Accounts) of the <i>Australian National Directory of Important Migratory Shorebird Habitat</i> lists previously identified internationally and nationally important habitats for the species, the closest of which is Eastlakes which is approximately 9 kilometres north of the subject land (Weller et al. 2020). The habitat within the subject land is also not considered important in its own right, as the 0.51 ha identified would be incapable of supporting 18 individuals of the species.</p> <p>As such the proposed works would not impact on habitat critical to the survival of the species.</p>
<p><i>Disrupt the breeding cycle of an important population.</i></p> <p>Latham's Snipe is a migratory species that breeds in the northern hemisphere, therefore the proposed works would not result in any impacts to important breeding areas. The potential habitat being removed is also not capable of supporting an ecologically significant proportion of the population such that the life cycle of the population would be impacted.</p>

SIC assessment for vulnerable Latham's Snipe

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The potential habitat identified within the subject land is not capable of supporting an ecological significant proportion of the population. The habitat is likely to be utilised only occasionally by individuals drawn to the higher quality habitats available in the nearby Towra Point Nature Reserve.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The proposed works would not result in the introduction of an invasive species that would impact upon Latham's Snipe. The Conservation Advice for the species notes that the species is at risk of impacts from foxes and cats (DCCEEW 2024). Both of these invasive species already exist on the Kurnell Peninsula and the proposed works are unlikely to result in a significant increase in their populations. The potential habitat within the subject land is also not used by an ecological significant proportion of the population of Latham's Snipe, therefore any impacts associated with invasive species would not be noticeable to the broader population.

Introduce disease that may cause the species to decline.

There are no threatening diseases currently recognised for the species within the recently produced Conservation Advice (DCCEEW 2024).

Interfere substantially with the recovery of the species.

The primary conservation outcomes noted for the species within the Conservation Advice (DCCEEW 2024) are:

- Latham's snipe populations are stable or increasing within the Australian jurisdiction.
- Ensure no further loss of habitat critical to the survival of Latham's snipe throughout Australia (including habitat predicted to become habitat critical to the survival in the future because of climate change).
- Protect and manage important feeding and roosting areas in Australia and staging and breeding areas throughout the East Asian - Australasian Flyway for Latham's snipe.

The potential habitat (0.51 ha of modified PCT 3972) being impacted by the proposed works has not been previously recognised as internationally or nationally important for the species, nor is it capable of supporting 18 individuals, the threshold for it being considered to be of national significance. As such the habitat is not considered to be critically to the survival of the species and its removal is considered unlikely to impact on the stability of the Latham's Snipe population.

Conclusion

Based on the assessment above, it is concluded that Latham's Snipe would not be significantly impacted by the works associated with the proposed modification (i.e. SSD-5544-MOD7). This conclusion was made on the basis that the proposed works:

- Would not lead to the long-term decrease in the size of an important population, reduce the areas of occupancy or fragment an existing population.
- Would not disrupt the breeding cycle of an important population.
- Would not modify the species habitat, or result in the introduction of invasive species/diseases.
- Would not interfere with the recovery of the species.

Considering the above, a referral is not required.