Transport for NSW

New Richmond Bridge and Traffic Improvements Stage 1 – The Driftway

Addendum Biodiversity Assessment Report

May 2024

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Executive summary

Introduction

Transport for New South Wales (Transport) are proposing to upgrade the Driftway as Stage 1 of the New Richmond Bridge and Traffic Improvements (the Project). The Project is located near Richmond, in Sydney's North West between Londonderry Road, Richmond to the west and Blacktown/Racecourse Road, South Windsor to the east. The Project is located within the Cumberland sub-region of the Sydney Basin Bioregion.

The *New Richmond Bridge and Traffic Improvements – Stage 1 The Driftway Review of Environmental Factors* (REF) was prepared to assess the impacts associated to the concept design, this is referred to as the Project REF. A Biodiversity Assessment Report (BAR) was prepared by Jacobs in 2021 to support the project REF, this assessment will be referred to as the Project BAR. A detailed design has now been produced which has optimised previous aspects of the design and required design changes that extend beyond the Project REF Boundary. An Addendum BAR (this assessment) is required to assess the impact of design changes on biodiversity values.

Native vegetation

The Project BAR field survey identified five separate plant community types (PCTs), occupying seven vegetation zones within the Project REF boundary. Field survey was undertaken to validate the vegetation within additional areas impacted by the Addendum REF. The vegetation in these areas was consistent with that previously surveyed and were assigned to one of the existing vegetation zones from the Project BAR.

Threatened species

One threatened flora species was recorded in the Project REF Boundary during targeted surveys for the Project BAR, *Dillwynia tenuifolia* listed as vulnerable under the BC Act. The extent of this local population is 67 hectares with about 1.3 hectares (1.9 %) occurring in the project boundary and would be directly impacted, this equates to an estimated 5,000 plants, many of which are juvenile. The remainder of the population occupies a biodiversity stewardship site adjoining to the north of the road reserve. Evidence of Cumberland Plain Land Snail (vulnerable BC Act) was confirmed via empty shells found in the study area and associated Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849).

Habitat in all PCTs is considered suitable for the Cumberland Plain Land Snail. The habitats within the modified area were confirmed as moderate to low quality and do not possess important habitat features required for many of the threatened fauna species predicted to occur within the locality. Given the degree of connectivity with woodland and forest habitats in adjoining land to the north some threatened fauna species could be considered moderately likely to occur, at least on occasion.

Impact assessment

The Project REF would require removal of around 5.66 hectares of native vegetation and the additional areas associated with the Addendum REF would require an additional removal of 0.216 hectares of native vegetation for the upgrade works. This is a total of 5.876 hectares of vegetation clearing including:

- Shale Gravel Transition Forest in the Sydney Basin Bioregion (Endangered – *Biodiversity Conservation Act 2016* [BC Act]) (PCT 724) – 0.511 hectares
- Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion (Endangered BC Act) (PCT 725) – 0.200 hectares
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered BC Act) (PCT 835) – 0.436 hectares
- Cumberland Plain Woodland in the Sydney Basin Bioregion (Critically Endangered BC Act) (PCT 849) – 3.537 hectares
- Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion (Vulnerable BC Act) (PCT 883) – 1.192 hectares.

A total of 0.08 hectares of the TEC associated with PCT 883 - Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion Community which occurs within the Project REF Boundary meets the condition criteria for the *Environment Protection Biodiversity Conservation Act* 1999 (EPBC Act) listed Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion endangered ecological community. Beyond the Project REF, No additional impacts would occur on this community as a result of the Proposed Modifications.

Assessments of significance in accordance with the BC Act and EPBC Act have been undertaken for each threatened species, population or ecological community that have been recorded in the Project REF and Addendum REF Boundary or are assumed present as they have a moderate to high likelihood of occurrence. The results of the Assessments of Significance under the BC Act and EPBC Act concluded that the cumulative impact of the Project REF and Addendum REF is unlikely to significantly impact any of the threatened entities.

Impact avoidance and minimisation

Transport's first priority is to avoid impacts to the environment and this has been achieved through the early consideration of biodiversity constraints on the Project at the inception and through options analysis of proposed modification to select design refinements with least impact on biodiversity.

To minimise impacts the Project BAR presents mitigation measures to be implemented during construction and operation. These mitigation measures would also apply to the areas to be impacted by the Addendum REF. As such, it is considered that existing safeguards would be sufficient in managing potential impacts.

Offsetting

Residual impacts are to be offset in accordance with the Transport Guideline for Biodiversity Offsets (Roads and Maritime, 2016). The guideline indicates that offsets are to be considered where there is any clearing of national or NSW listed critically endangered ecological communities in moderate to good condition.

There would be clearing of a critically endangered ecological community for the Proposed Modifications in moderate condition, comprising 0.077 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion (listed critically endangered under the BC Act). Beyond the Project REF, the Proposed Modifications would include clearing of habitat for a threatened fauna species Cumberland Plain Land Snail with the clearing area being above the threshold set for applying an offset under the RMS policy (>1 ha).. Therefore, biodiversity offsets are also required for the Cumberland Plain Land Snail species credit species. The Proposed Modifications are not likely to have a significant impact on threatened biodiversity listed under EPBC Act and no like-for like offsets for MNES are required.

1. Introduction

1.1. Proposal background

Transport for New South Wales (Transport) is proposing to upgrade the Driftway as Stage 1 of the New Richmond Bridge and Traffic Improvements (the Project). The Project is located near Richmond, in Sydney's North West between Londonderry Road, Richmond to the west and Blacktown/Racecourse Road, South Windsor to the east. The Driftway generally forms the border between the Hawkesbury Local Government Area (LGA) to the north and the Penrith LGA to the south. The Western Sydney University (Hawkesbury Campus) is to the immediate north of the Project.

The *New Richmond Bridge and Traffic Improvements – Stage 1 The Driftway Review of Environmental Factors (REF)* was prepared to assess the impacts associated to the concept design, this is referred to as the Project REF. A *Biodiversity Assessment Report (BAR)* was prepared by Jacobs in 2021 to support the project REF, this assessment will be referred to as the Project BAR.

The Project REF was placed on public display between 15 November 2021 and 10 December 2021 on the Transport for NSW website and made available for download. A submissions report was finalised in March 2022, which summarised nine submissions and how the Project addressed these or where changes to the project were required. The Project REF was approved. The approved Project included improvements to 3.6 kilometres of The Driftway including;

- upgrade of the intersection of Londonderry Road / the Driftway to a roundabout
- upgrade of the Driftway intersections with Luxford Road and Reynolds Road to channelised right turn T-junctions
- realignment of 230 metres of the Driftway at its eastern extent to create a four-leg roundabout with Blacktown Road and Racecourse Road
- a new 24 metre long bridge over a tributary of Rickaby's Creek
- a new 30 metre long retaining wall along the north western corner of Racecourse Road and Blacktown Road
- pavement improvements to 3.6km of the Driftway including widening both shoulders to 1.5 metres
- modifications to driveways and property adjustment works
- removal of the redundant section of the Driftway and its intersection with Blacktown Road
    - reshaping of this area for flood storage capacity
- drainage improvements along the Driftway
- relocation and/or adjustments to the public utilities and street lighting
- ancillary work including safety barriers, signage, line marking, and environmental protection work
- landscaping and rehabilitation work
- temporary ancillary construction facility and laydown areas

A detailed design has now been produced which has optimised previous aspects of the design and required design changes that extend beyond the Project REF Boundary, these changes are listed in detail in Section 1.2 and are referred to as the Proposed Modifications. As such, an Addendum REF is required to assess the additional impact in accordance with Section 171 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation). An Addendum BAR (this assessment) is required to assess the impact of design changes on biodiversity values. The location of the Project and the Proposed Modifications is presented in Figure 1-1 .

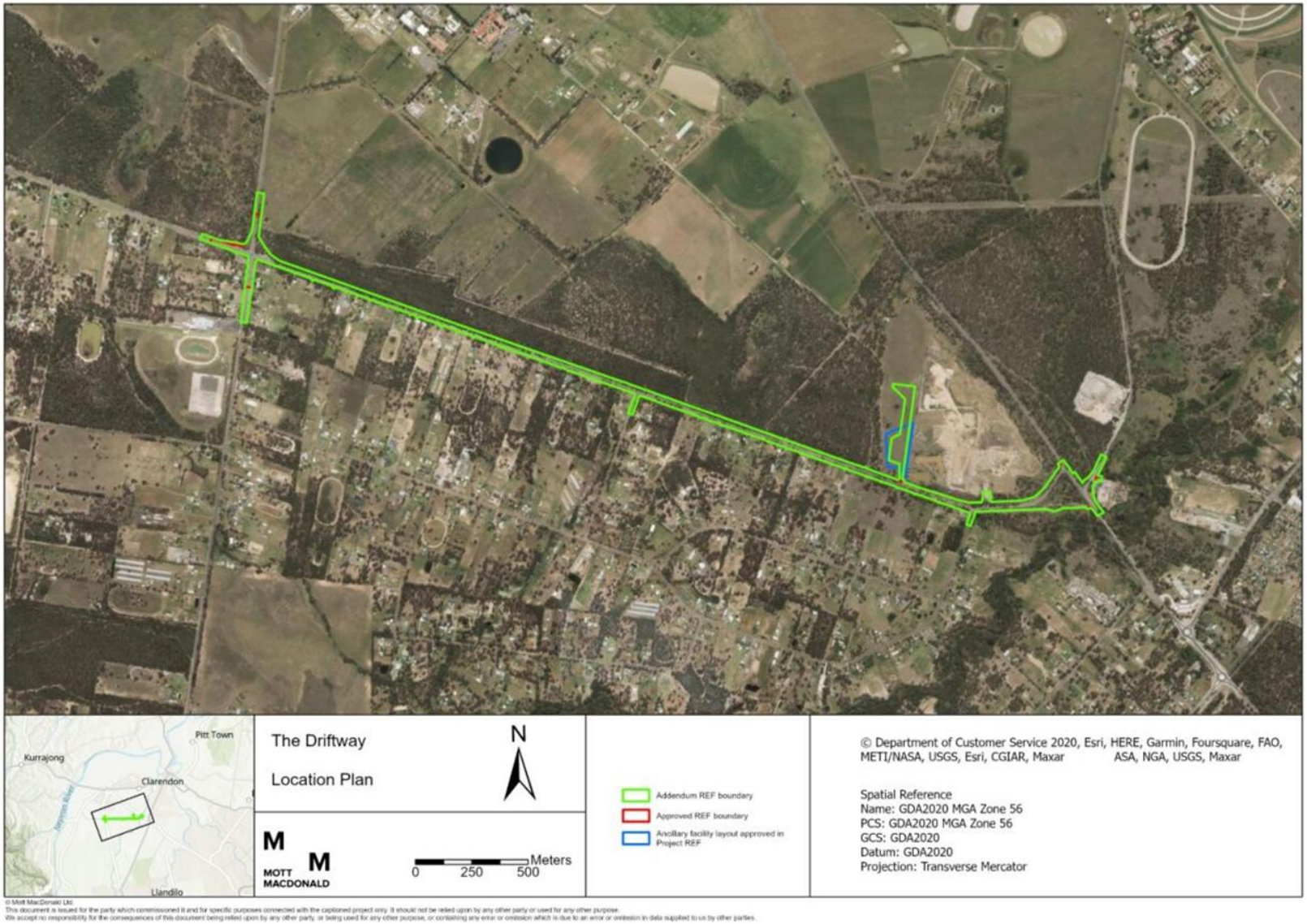

Figure 1-1 Location of the Proposed Modifications

1.2. The proposed modification

As discussed above, an Addendum REF is required to assess the potential impacts associated with the design optimisation which occurred during the detailed design and resulted in design components extending beyond the Project REF Boundary. The following design changes have been proposed:

- an additional southbound lane on the Londonderry Road roundabout was identified to facilitate a safe evacuation route for the surrounding communities. The inclusion of this additional southbound lane will remain within the previously assessed area of impact under The Project REF.
- new connections to the existing roads are required on the northern and southern sides of Londonderry Road, and on the western end of The Driftway required to meet Austroad guidelines, now extend beyond the existing Project REF boundary.
- realignment of drainage swales and amendments to the batter, where possible, to minimise hazards on the southern side of The Driftway. Realignment has been confined within the existing approved Project REF Boundary.
- batters along the northern verge of The Driftway have been flattened to decrease the required clear zone and improve road safety. This has also rationalised the constructability of batters and avoid impacts to native vegetation and corresponding ecological values.
- the ancillary facility layout has been modified to avoid sitting within the areas mapped as having a high flood potential. The area of the impact has increased by 0.1 ha from 1.9 ha to 2 ha compared to the Project REF.
- Additional construction ancillary site within the Project REF boundary west of Blacktown Road, at the section of the Driftway to be realigned. an additional access track is now proposed from Blacktown Road over Rickabys Creek to avoid impacts to the watercourse, and remove the cost of constructing a crossing.
- the posted speed approaching the Hawkesbury waste management facility has been changed from 80km/h to 60km/h, this is required to provide a compliant safe intersection sight distance.
- introduction of an auxiliary turning lane into the Hawkesbury Waste management facility
- traffic barriers have been located throughout The Driftway in locations that protect motorist from colliding with hazards, such as storm water culverts and power poles
- a bus stop on the southbound road south of the Londonderry roundabout has been relocated further south, with the inclusion of an in-lane bus stop
- modification of driveway tie-ins along Londonderry Road and The Driftway and including a new access driveway to the Turtle Landscape Supplies business on Racecourse Road.

Figure 1-2 presents the location of these proposed changes.

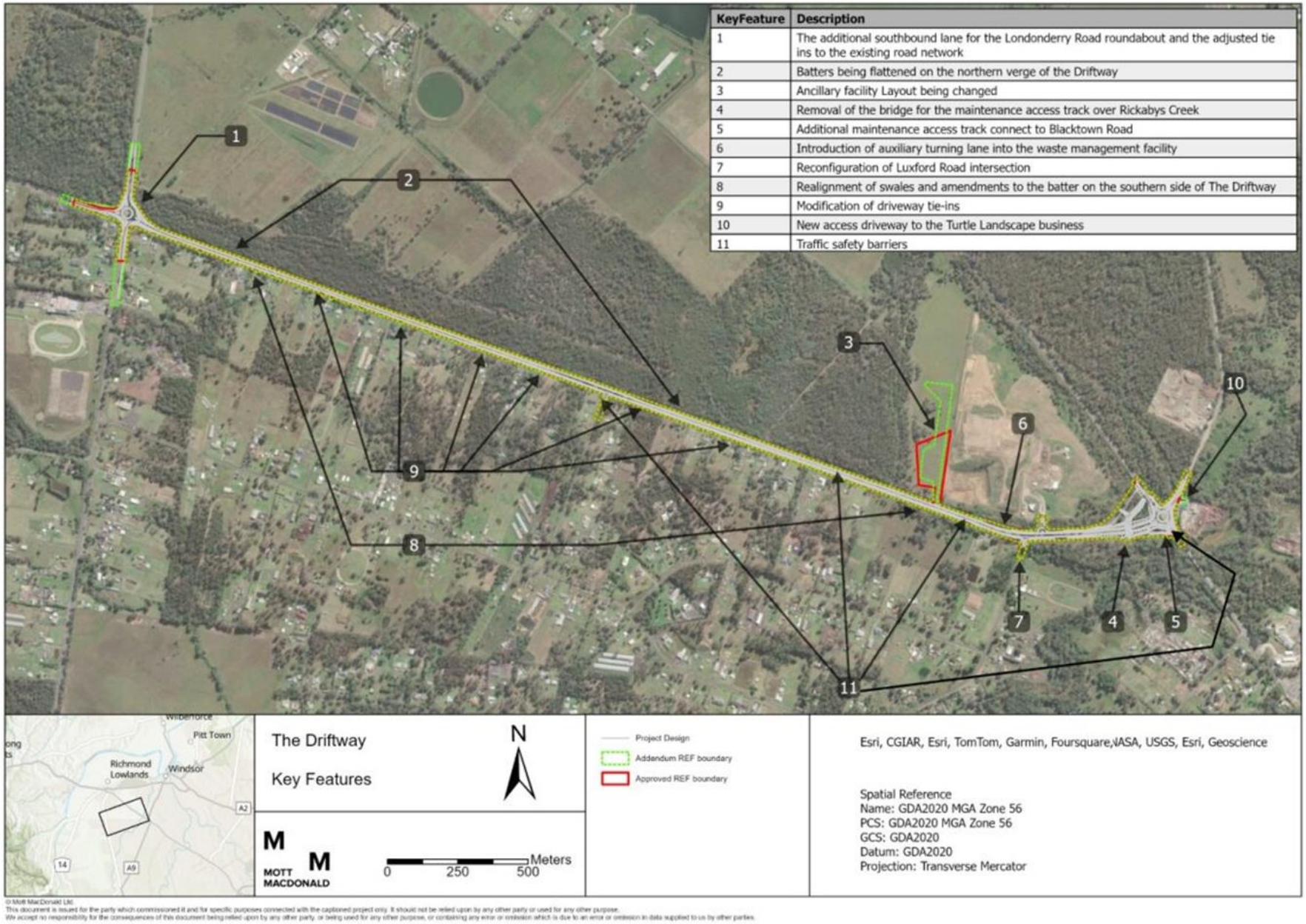

Figure 1-2 Key Features of the Proposed Modifications

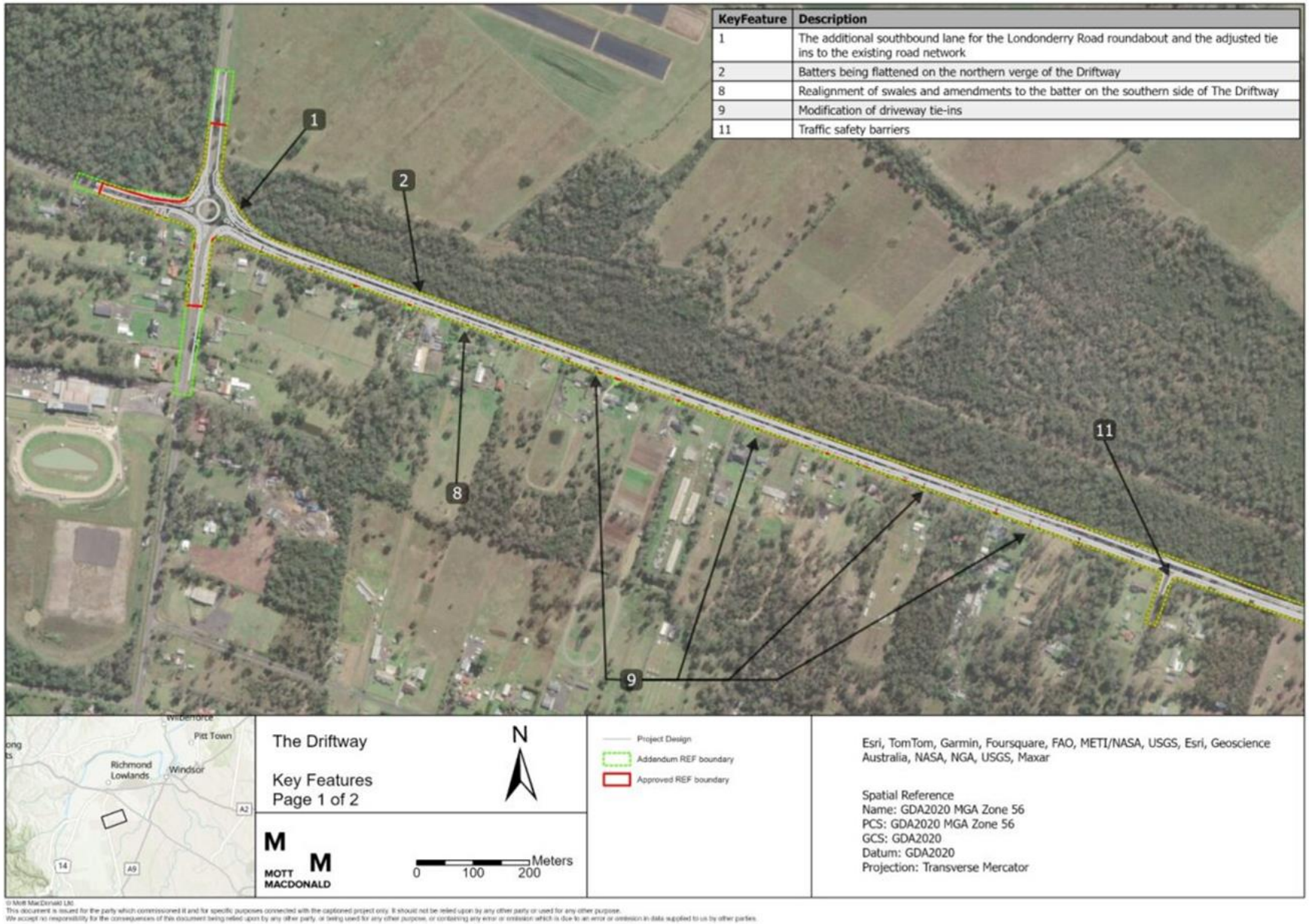

Figure 1-3 Key Features of the Proposed Modifications western extent

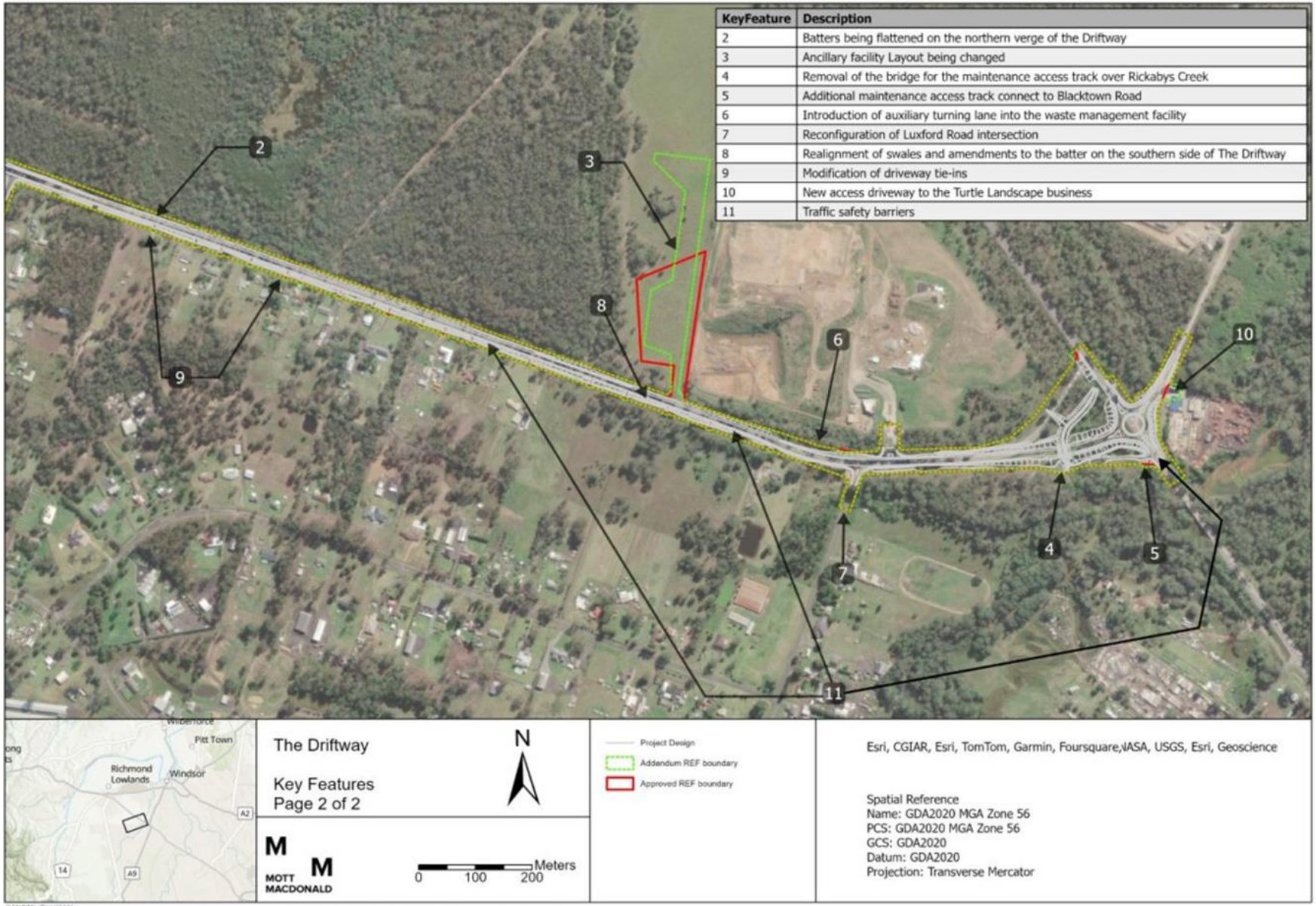

Figure 1-4 Key Features of the Proposed Modifications eastern extent

1.3. Assessment areas

This Addendum Biodiversity Assessment Report (BAR) has been prepared to assess the biodiversity values of the additional areas (Proposed Modifications) to be impacted where the detailed design extends beyond the Project REF Boundary. The report also assesses the cumulative impact of these areas and the Project REF on biodiversity values. This Addendum BAR has been prepared in accordance with *Biodiversity Conservation Act 2016* (BC Act) and *Environmental Protection Biodiversity Conservation Act 1999* (EPBC Act).

The additional areas are presented in Figure 1-2 where the Addendum REF Boundary extends beyond the Project REF Boundary.

The study area is defined as the area within the Addendum REF Boundary and Project REF Boundary and the vegetation in the broader locality, that provides context to this assessment. This includes the remnant native vegetation, within Lot 10 and 11 of DP12393174, to the north that sits outside of the Addendum REF Boundary.

For consistency when assessing cumulative impacts this Addendum BAR has utilised aspects of the Project BARs assessment. This includes the same vegetation zones, vegetation integrity scores, and justification for likelihood of occurrence assessment for the vegetation with the additional areas. The Project BAR data has been utilised for the assessment of land within the Project REF Boundary. In addition, the Addendum BAR has validated a small amount of vegetation within the Project REF Boundary that was previously unverified. The location of this is presented in Figure 1-5.

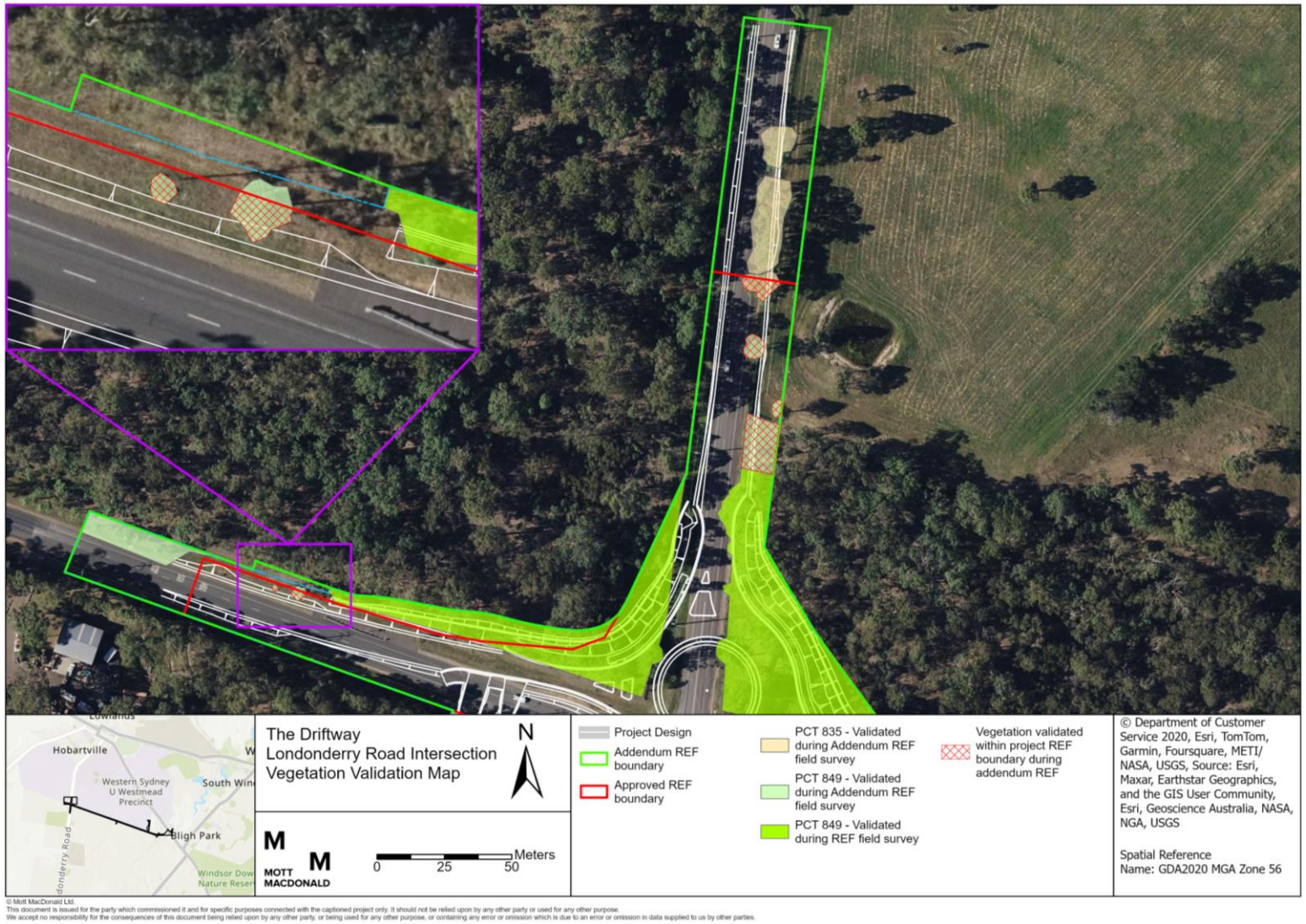

Figure 1-5 Vegetation validated within Project REF Boundary

1.4. Legislative context

An Addendum Review of Environmental Factors (REF) is prepared to satisfy Transport for NSW (Transport) duties under s.5.5 of the EP&A Act to *"examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity"* and s.5.5 in making decisions on the likely significance of any environmental impacts. This Addendum Biodiversity Assessment Report (BAR) forms part of the Addendum REF being prepared for the New Richmond Bridge and Traffic Improvements – Stage 1 The Driftway and assesses the biodiversity impacts of the Proposed Modifications to meet the requirements of the EP&A Act.

The BC Act requires that the significance of the impact on threatened species, populations and threatened ecological communities is assessed using the test listed in Section 7.3 of the BC Act. Similarly, Part 7A of the FM Act requires that significance assessments are undertaken in accordance with Division 12 of the FM Act. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Environment Agency Head's requirements, or a biodiversity development assessment report (BDAR) must be prepared by an accredited assessor in accordance with the biodiversity assessment method (BAM) (DPIE 2020a).

In September 2015, a 'strategic assessment' approval was granted by the Federal Minister in accordance with the EPBC Act. The approval applies to Transport's road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities and migratory species.

As a result, Transport road proposals assessed via an REF:

- Must address and consider potential impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species, including application of the "avoid, minimise, mitigate and offset" hierarchy
- Do not require referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for these matters, even if the activity is likely to have a significant impact
- Must use the Biodiversity Assessment Method (BAM) to calculate credits that would offset significant impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species.

Assessments of impact significance are required for all relevant biodiversity values in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013).

2. Methods

Section 2 of the Project BAR presents the methodology undertaken to complete the Project BAR. This section details the assessment methodology undertaken for the additional areas as presented in Section 1.3.

2.1. Personnel

This biodiversity assessment was carried out by qualified and experienced ecologists, refer to Table 2-1.

Table 2-1: Personnel

Name	Role	Qualifications
Dr Chris Allen	Principal ecologist – Field Survey and reporting	PhD (Ecology) BSc (Biology)
John Kraft	Environmental Consultant - Field survey assistant	BSc (soils)
Lachlan Sinclair	Environment Adviser – field survey assistant	BSc (soils)

2.2. Desktop assessment

A desktop assessment was undertaken to identify any change in the flora and fauna records in the locality and any change in land designation and protection. The assessment focused on reviewing legislative mapping and database searches identifying new records that were recorded after the date of the Project BAR, 8/7/2021.

The following database searches were performed prior to the additional field survey on the 1/06/2023 and then last accessed on the 8/12/2023 to be presented int this report:

- BioNet – Atlas of NSW Wildlife: http://www.bionet.nsw.gov.au
- NSW DPIE BioNet Vegetation Classification: http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx
- NSW Threatened Biodiversity Data Collection http://www.bionet.nsw.gov.au
- DAWE Protected Matters Search Tool (PMST): http://www.environment.gov.au/epbc/protected-matterssearch-tool
- Atlas of Living Australia: http://www.ala.org.au/

In addition, the following sources of data were checked for any updates from the Project BAR prior to the additional field survey on the 1/06/2023 and then last accessed on the 8/12/2023 to be presented int this report:

- State Vegetation Type Mapping 2023 Department of Planning and Environment (DPE)
- Area of Outstanding Biodiversity Value register available on the NSW DPIE website: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/areas-ofoutstanding-biodiversity-value
- National Flying-fox monitoring viewer. http://www.environment.gov.au/webgisframework/apps/ffc-wide/ffc-wide.jsf
- The Commonwealth Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems (GDE): http://www.bom.gov.au/water/groundwater/gde/map.shtml
- NSW DPI Weed Wise: http://weeds.dpi.nsw.gov.au

A review of the Project BAR was also undertaken.

2.2.1. Habitat assessment

To identify the threatened biodiversity that may be affected by the Proposed Modifications, a likelihood of occurrence analysis assessment was conducted. The analysis and assessment considered the following sources of information:

- Databases and literature on the threatened flora and fauna species known or predicted to occur in the Cumberland IBRA subregion
- Previous surveys undertaken within the locality and within a 10-kilometre radius of the Proposed Modifications
- Habitat descriptions provided in the Threatened Species Profile Database (TSPD; DPE 2023c)
- Habitat value and condition observed during the site inspection
- Effect of existing key threatening processes (KTPs).

The analysis and assessment compared the preferred habitat features for identified species with the type and quality of the habitats present within the area of the Proposed Modifications. The assessment was then used to determine the likelihood of species being present in the area of the Proposed Modifications. An assessment of significance was undertaken for species with a moderate to high likelihood of occurrence. The criteria used for the likelihood of occurrence ratings are detailed in Table 2-2. likelihood of occurrence ratings were first assessed prior to the field survey and then updated based on the findings of the field survey.

Table 2-2 Threatened biodiversity likelihood of occurrence habitat assessment criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	The study area has habitat values that are consistent with the BCD TSPD. The study area is within the known 'extent of occurrence' and 'area of occurrence' (i.e., standard grid size of 2x2 km [IUCN 2017]). The habitat occupancy is likely to be high and not affected by factors such as connectivity, patch size, habitat quantum and/or quality. The species is likely to inhabit the study area and depend on it for breeding or important life cycle periods. The species is unlikely to be affected by pre-existing or active KTPs.
Moderate	The study area has both vegetation classification-based habitat surrogates (i.e., PCT and/or vegetation formations) and species specific habitat types (i.e., important habitat features). The study area is within the known 'extent of occurrence' and may or may not be within the known 'area of occurrence' (i.e., standard grid size of 2x2 km [IUCN 2017]). The habitat occupancy may be influenced by factors such as connectivity, patch size, habitat quantum and/or quality. The species may use the study area seasonally or opportunistically, but is not dependent on it for breeding or important life cycle periods. The species may also be influenced by pre-existing or active KTPs.
Low	The study area has vegetation classification-based habitat surrogates (i.e., PCT and/or vegetation formations), but lacks or has very few species specific habitat types (i.e., important habitat features). The study area is outside the species known 'area of occurrence' and may or may not be within the known 'extent of occurrence' (i.e., standard grid size of 2x2 km [IUCN 2017]). The habitat occupancy is likely to be low due to factors such as connectivity, patch size, habitat quantum and/or quality. The species may visit the study area occasionally, but is not dependent on it for breeding or important life cycle periods. The species may also be affected by active or uncontrolled KTPs.
None	The study area does not have any habitat types that are specific to the species (i.e., important habitat features) or any vegetation classification that is known to be associated with the species (i.e., PCT and/or vegetation formations). The Study area is also likely outside the area where the species is usually found and may even be outside the area where the species is ever recorded (i.e., standard grid size of 2x2 km [IUCN 2017]). The species is not expected to occur in the Study area and, if observed, would likely be an unusual occurrence (e.g., related to temporary movement). The species is unlikely to use the habitat for important life cycle processes.

2.3. Field assessment

Field surveys were conducted on 1 June 2023 and 6 October 2023 to validate the vegetation within the area of the Proposed Modification in accordance with the vegetation zones identified within Project BAR. The field assessment involved the following tasks:

- Plant Community Types
    - Ground-truthing extent of Plant Community Types (PCTs)
- Flora
    - Opportunistic flora surveys
    - Assessment of potential threatened flora habitat
    - Identification of any Priority Weeds (LLS 2022).
- Fauna
    - Opportunistic fauna survey
    - Assessment of potential threatened fauna species habitat

Section 2.4 of the Project BAR presents the methodology for the field survey undertaken to inform that assessment. Two separate field surveys were carried out over four days on 22 April 2021 and between the 21 and 24 June 2021. Surveys included vegetation validation, condition classification, vegetation integrity plots, targeted flora and fauna surveys.

2.3.1. Vegetation surveys

Vegetation surveys undertaken for the Project BAR identified the most appropriate plant community types (PCTs) for the Project study area from those listed on the NSW BioNet Vegetation Classification Database (DPIE, 2021). Surveys also targeted the identification of environmental variation within the study area and any areas with gaps in existing mapping and site information.

The vegetation integrity (VI) of each of the PCTs were assessed in accordance with the Biodiversity Assessment Methodology (BAM) (DPIE, 2020), which was used in conjunction with the BAM Calculator to determine vegetation integrity scores to assist in the identification of offset requirements - where applicable. Walked transects and rapid data points were used to identify broad condition classes, variation and boundaries of PCTs in the study area. The criteria used to assign the broad condition class is detailed below in Table 2-3. The vegetation condition classes were applied to the vegetation zones.

Section 2.4.2 of the Project BAR presents the survey effort undertaken to establish the vegetation zones and condition classes during the Project BAR. The vegetation within the areas of the Proposed Modifications were validated during field survey to be consistent with vegetation zones and condition classes identified during the Project BAR vegetation surveys.

Table 2-3 Criteria used to assign broad condition classes in the Project BAR.

Likelihood	Criteria
Moderate	Vegetation has retained a native overstorey, but the understorey and groundcover layers are generally co-dominated by exotic species that generally exhibit between 10–49% foliage cover. The mid and low stratums may have been structurally modified as a result of previous clearing.
Low	Vegetation has retained a native overstorey or the cover is showing occasional signs of regeneration. The understorey and groundcover layers of this condition are absent and/or the understorey is generally dominated by exotic species (foliage cover >50%). Native species diversity is generally relatively low, and the mid and low stratums have been structurally modified.

2.4. Targeted flora surveys

Section 2.4.3 of the Project BAR presents the methodology for targeted flora surveys. Targeted surveys were undertaken in April 2021 in accordance with the *NSW Guide to Surveying Threatened Plants* (DPIE, 2020a) for the following species:

- *Acacia pubescens*
- *Dillwynia tenuifolia*

- *Grevillea juniperina subsp. Juniperina*
- *Micromyrtus minutiflora*
- *Persoonia nutans*
- *Pimelea spicata and Pimelea curviflora var. curviflora*
- *Pultenaea parviflora*

The only species identified during the field survey was *Dillwynia tenuifolia.* Additional survey effort for this species was completed in June to provide more detail about the local population, this was used to inform the assessment of significance.

During the field survey of the additional areas required for the Proposed Modification, opportunistic flora surveys were completed. No threatened flora species were identified during these surveys.

2.5. Targeted fauna survey

Section 2.4.4 of the Project BAR presents the methodology for targeted fauna surveys. Targeted fauna surveys were undertaken for Cumberland Plain Land Snail (*Meridolum corneovirens*). Targeted surveys for other fauna species were not carried out. Cumberland Plain Land Snail specimens were identified during field survey of the additional areas required for the Proposed Modification.

2.6. Aquatic surveys

Section 2.4.5 of the Project BAR presents the methodology for aquatic survey which included waterway classification in accordance with NSW DPI (Fisheries*) Policy and Guidelines for fish habitat conservation and management* (NSW Department of Primary Industries, 2013) and *Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003). A visual habitat assessment was also undertaken and no fish surveys or macroinvertebrate surveys were conducted. The aim of the habitat assessment was to identify the presence of 'key fish habitat'.

The additional area of impact associated to the Proposed Modification is not located within proximity to any watercourses therefore no additional aquatic survey was undertaken to support this assessment.

2.7. Limitations

This assessment has utilised the findings of the previous field surveys to create consistency across the assessment of the entire project. Therefore, the limitations specified in Section 2.4.6 of the Project BAR also apply to this assessment. In addition, the field survey undertaken on the 1 June 2023 and 6 October 2023 are representative of a certain point in time and additional flora species may appear in other times of the year. It is recognised that a period of several seasons or years is often needed to identify all the species present in an area, and specific weather conditions are required for optimum detection (breeding periods for fauna and flowering periods flora).

As such, the conclusions of this report are therefore based upon available data and limited field survey and are indicative of the environmental condition at the time of the survey. Site conditions, including the presence of threatened species, can change with time. The assessment has addressed this limitation by aiming to identify the presence and suitability of the habitat for threatened species through utilisation of species records and recorded habitat suitability.

3. Existing environment

Section 3 of the Project BAR presents the existing environment for the Project and the broader locality. The additional areas within the Addendum REF boundary required for the Proposed Modification are within the same landscape context and in addition the vegetation within these areas is consistent with PCTs and vegetation zones identified in the Project BAR. Due to this, components of the existing environment section of the Project BAR have been referenced for consistency.

3.1. Landscape Context

The additional areas within the Addendum REF boundary are within the same landscape context as presented in Section 3.1 of the Project BAR, this is summarised below.

The project area is located within the Cumberland sub-region of the Sydney Basin Bioregion (Thackway and Cresswell, 1995) and within the Hawkesbury - Nepean Terrace Gravels of the Mitchell Landscape Mapping (NPWS, 2002). The Hawkesbury - Nepean Terrace Gravels landscape is not classed as over-cleared landscape, but 69 per cent of its native vegetation has been cleared. Only 31 per cent of the original native vegetation remains.

The landscape is predominantly low rolling hills and wide valleys in a rain shadow area below the Blue Mountains (Morgan, 2001). Geology is dominated by undifferentiated middle Triassic Wianamatta group shales (Bringelly Shale) (Clarke and Jones, 1991). Soils overlying the Wianamatta Shale are of the residual Blacktown soil landscape (Hazelton et al., 1989, Morgan, 2001, Department of Environment and Climate Change, 2008).

To the south of the Project the land is extensively cleared where roadside vegetation, cleared paddocks and small scattered bushland remnants form the bulk of the remaining vegetation. To the north of the Project, there are large patches of remnant bushland some of which is contained within a proposed biodiversity stewardship site owned by the University of Western Sydney. The PCTs within the study area are described in Section 3.2.

3.2. Plant community types and vegetation zones

The native vegetation in the Project REF and Addendum REF boundary is comprised of five separate PCTs[1], occupying seven vegetation zones. Vegetation validated during the Addendum BAR field survey was found to be consistent with the vegetation zones previously identified during the Project BAR assessment. As such, the same vegetation zones have been used to provide consistency between the two assessments.

Table 3-1 presents all PCTs identified within both Project REF and Addendum REF boundary. It also presents the listing status under the BC Act or EPBC Act, patch size class and vegetation integrity score. As discussed above, the patch size and vegetation integrity score from the Project REF has been utilised for the additional areas assessed in the Addendum REF. Summary profiles for each of the vegetation zones are provided in Section 3.3 below.

[1] Following an update to PCT classifications in June 2022, the PCTs identified and assessed in the Project BAR were decommissioned. However, to maintain consistency between the Project and Addendum BARs, the decommissioned PCTs names and number have used in this assessment.

Table 3-1: Plant community types and vegetation zones including patch size and vegetation integrity (VI) score

Veg. zone	Condition	Plant community type (PCT)	Threatened ecological community (TEC)	Area (ha)		Patch size class	VI score
				Project REF	Addendum REF[1]		
Zone 1	Low	724: Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion	Endangered BC Act	0.51[2]	0.001[3]	<5 ha	33.9
Zone 2	Low	725: Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	Endangered BC Act	0.20	0.000	<5 ha	18.5
Zone 3	Low	835: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Endangered BC Act	0.37	0.066	<5 ha	39.2
Zone 4	Moderate	849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Critically Endangered BC Act	0.45	0.077	<5 ha	29
Zone 5	Low		Critically Endangered BC Act	2.96	0.050	<5 ha	21.4
Zone 6	Moderate	883: Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion	Vulnerable BC Act and Endangered EPBC Act	0.08	0.000	<5 ha	37.8
Zone 7	Low		Vulnerable BC Act	1.09	0.022	<5 ha	18.4

[1] Includes areas within the Project REF Boundary that were validated during the Addendum REF Survey
[2] Impacts presented to two decimal places as this is how impacts are presented in Project BAR
[3] Impacts presented to three decimal places as Addendum REF impact to PCT 724 is 0.001 ha and should be captured

3.3. Vegetation Zones

Table 3-2 to Table present the seven vegetation zones identified within the Project REF and Addendum REF Boundary and a summary of the information that determines the condition rating and VI score. For a detailed description of these vegetation zones, see Section 3.2 of the Project BAR.

Table 3-2: Detailed Description of Zone 1

Vegetation Zone 1 - Low condition PCT 724					
PCT ID	724				
PCT name	Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion				
Vegetation class	Cumberland Dry Sclerophyll Forests				
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub formation)				
Estimate of per cent cleared	75 %				
Area in Project REF Boundary	0.51 ha	Area in Addendum REF Boundary	0.001 ha	Total Area	0.511 ha
Threatened ecological community (TEC)	*Shale Gravel Transition Forest in the Sydney Basin Bioregion* - Endangered BC Act				
Vegetation zones (condition) and plots	Zone 1 (Low) – Plot P5				
Growth form	**Typical species**				
Trees	*Eucalyptus moluccana*				
Shrubs	*Melaleuca decora, Acacia falcata, Ozothamnus diosmifolius, Bursaria spinosa, Indigofera australis*				
Grass and grass-like	*Microlaena stipoides, Entolasia stricta, Panicum simile*				
Forb	*Dichondra repens, Brunoniella australis, Einadia hastata*				
Fern	*Cheilanthes seiberi*				
Other	*Glycine clandestina*				
Weeds	*Eragrostis curvula, Bidens pilosa, Solanum nigrum, Conyza bonariensis*				
Vegetation Integrity Scores					

Composition	Structure	Function	Total VI Score
20.1	43	44.9	33.9

Photograph 3-1: Vegetation Zone 1 - low condition PCT 724 within road boundary as within Project BAR (Jacobs, 2021)

Table 3-3: Detailed Description of Zone 2

Vegetation Zone 2 - Low condition PCT 725

PCT ID	725				
PCT name	Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion				
Vegetation class	Cumberland Dry Sclerophyll Forests				
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)				
Estimate of per cent cleared	95%				
Area in Project REF Boundary	0.20 ha	Area in Addendum REF Boundary	0.000 ha	Total Area	0.200 ha
Threatened ecological community (TEC)	*Shale Gravel Transition Forest in the Sydney Basin Bioregion* - Endangered BC Act				
Vegetation zones (condition) and plots	Zone 2 (Low) – Plot P4				

Growth form	Typical species
Trees	*Eucalyptus fibrosa*
Shrubs	*Melaleuca nodosa, Daviesia latifolia, Cassinia sp. Melaleuca decora*
Grass and grass-like	-
Forb	-
Fern	*Cheilanthes seiberi*
Other	-
Weeds	*Eragrostis curvula, Kalanchoe longiflora*

Vegetation Integrity Scores

Composition	Structure	Function	Total VI Score
9.5	21.8	30.9	18.5

Photograph 3-2: Vegetation Zone 2 - low condition PCT 725 within road boundary (Jacobs, 2021)

Table 3-4: Detailed Description of Zone 3

Vegetation Zone 3 - Low condition PCT 835	
PCT ID	835
PCT name	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
Vegetation class	Coastal Floodplain Wetlands

Vegetation formation	Forested Wetlands				
Estimate of per cent cleared	93%				
Area in **Project REF Boundary**	0.37 ha	Area in **Addendum REF Boundary**	0.066 ha	Total Area	0.436 ha
Threatened ecological community (TEC)	*Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion* - Endangered BC Act				
Vegetation zones **(condition) and plots**	Zone 3 (Low) – Plot P8				

Growth form	**Typical species**
Trees	*Eucalyptus tereticornis, Acacia decurrens, Angophora floribunda, Angophora subvelutina*
Shrubs	*Exocarpos cupressiformis, Melaleuca linariifolia, Melaleuca nodosa, Acacia falcata, Acacia ulicifolia, Pimelea linifolia, Dillwynia tenuifolia, Daviesia ulicifolia, Grevillea mucronulata Kunzea ambigua*
Grass and grass-like	*Microlaena stipoides, Lomandra longifolia, Themeda triandra*
Forb	*Solanum prinophyllum, Pomax umbellata, Hypericum gramineum, Dianella longifolia*
Fern	*Cheilanthes sieberi*
Other	*Calystegia marginata*
Weeds	*Eragrostis curvula, Conyza bonariensis, Setaria pumila, Senecio madagascarensis, Plantago lanceolata, Solanum nigrum, Verbena bonariensis*

Vegetation Integrity Scores			
Composition	**Structure**	**Function**	**Total VI Score**
68.2	19.6	45	39.2

Photograph 3-3: Vegetation Zone 3 – low condition PCT 835 (Jacobs, 2021)

Table 3-5: Detailed Description of Zone 4

Vegetation Zone 4 - Moderate condition PCT 849

PCT ID	849				
PCT name	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion				
Vegetation class	Coastal Valley Grassy Woodlands				
Vegetation formation	Grassy Woodlands				
Estimate of per cent cleared	93%				
Area in **Project REF Boundary**	0.45 ha	Area in **Addendum REF Boundary**	0.077 ha	Total Area	0.527 ha
Threatened ecological community (TEC)	*River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* - Critically Endangered BC Act				
Vegetation zones (condition) and plots	Zone 4 (Moderate) – Plots P1, P2, P6				

Growth form	**Typical species**
Trees	*Angophora subvelutina, Eucalyptus tereticornis, Acacia decurrens, Alphitonia excelsa*
Shrubs	*Melaleuca decora, Melaleuca linariifolia, Breynia oblongifolia*
Grass and grass-like	*Microlaena stipoides*
Forb	*Dianella longifolia, Tricoryne simplex, Brunoniella australis*
Fern	*Cheilanthes seiberi*
Other	-
Weeds	*Megathyrus maximus, Eragrostis curvula, Paspalum dilatatum, Setaria pumila, Sida rhombifolia, Conyza bonariensis, Verbena bonariensis, Solanum nigrum, Chloris gayana, Hieracium murorum, Rubus fruticosus agg., Bidens pilosa, Ligustrum sinense*

Vegetation Integrity Scores			
Composition	**Structure**	**Function**	**Total VI Score**
21.6	24.6	45.9	29

Photograph 3-4: Vegetation Zone 4 – moderate condition PCT 849 (Jacobs, 2021)

Table 3-6: Detailed Description of Zone 5

Vegetation Zone 5 - Low condition PCT 849	
PCT ID	849
PCT name	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Vegetation class	Coastal Valley Grassy Woodlands
Vegetation formation	Grassy Woodlands

Estimate of per cent cleared	93%				
Area in **Project REF Boundary**	2.96 ha	Area in **Addendum REF Boundary**	0.050 ha	Total Area	3.01 ha
Threatened ecological community (TEC)	*Cumberland Plain Woodland in the Sydney Basin Bioregion* - Critically Endangered BC Act				
Vegetation zones (condition) and **plots**	Zone 5 (Low) – Plots P1, P2, P6				

Growth form	**Typical species**
Trees	*Eucalyptus moluccana*
Shrubs	*Bursaria spinosa, Melaleuca decora*
Grass and grass-like	*Cynodon dactylon, Rytidosperma fulvum, Juncus sp.*
Forb	*Commelina cyanea Dichondra repens*
Fern	-
Other	*Glycine microphylla*
Weeds	*Solanum pseudocapsicum, Paspalum dilatatum, Eragrostis curvula, Sida rhombifolia, Asparagus asparagoides, Acetosa sagittata, Araujia sericifera, Nothoscordum gracile, Lantana camara, Chloris gayana, Rubus fruticosus agg., Cyperus eragrostis*

Vegetation Integrity Scores			
Composition	**Structure**	**Function**	**Total VI Score**
3.9	33	74.9	21.4

Photograph 3-5: Vegetation Zone 5 – low condition PCT 849 (Jacobs, 2021)

Table 3-7: Detailed Description of Zone 6

Vegetation Zone 6 – moderate condition PCT 883	
PCT ID	883
PCT name	Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion
Vegetation class	Sydney Sand Flats Dry Sclerophyll Forests

Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)				
Estimate of per cent cleared	50%				
Area in Project REF Boundary	0.08 ha	Area in Addendum REF Boundary	0.000 ha	Total Area	0.080 ha
Threatened ecological community (TEC)	*Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion* - Vulnerable BC Act *Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion* - Endangered EPBC Act				
Vegetation zones (condition) and plots	Zone 6 (Moderate) – Plots P7, P9				

Growth form	**Typical species**
Trees	*Eucalyptus parramattensis subsp parramattensis, Grevillea robusta*
Shrubs	*Melaleuca decora, Melaleuca nodosa, Bursaria spinosa, Dodonaea triquetra, Pimelea linifolia, Breynia oblongifolia*
Grass and grass-like	*Imperata cylindrica, Microlaena stipoides, Entolasia stricta*
Forb	*Pseuderanthemum variabile*
Fern	*Adiantum aethiopicum, Cheilanthes seiberi*
Other	*Hardenbergia violacea, Xanthorrhoea minor, Cassytha sp.*
Weeds	*Ligustrum sinense, Eragrostis curvula, Solanum nigrum, Phytolacca octandra, Senecio madagascarensis, Conyza bonariensis, Bidens pilosa, Verbena bonariensis, Sida rhombifolia, Plantago lanceolata*

Vegetation Integrity Scores			
Composition	**Structure**	**Function**	**Total VI Score**
26.9	36.7	54.7	37.8

Photograph 3-6: Vegetation Zone 6 – moderate condition PCT 883 (Jacobs, 2021)

Table 3-8: Detailed Description of Zone 7

Vegetation Zone 7 - Low condition PCT 883					
PCT ID	883				
PCT name	Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion				
Vegetation class	Sydney Sand Flats Dry Sclerophyll Forests				
Vegetation formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)				
Estimate of per cent cleared	50%				
Area in Project REF Boundary	1.09 ha	Area in Addendum REF Boundary	0.022 ha	Total Area	1.112 ha
Threatened ecological community (TEC)	*Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion* - Vulnerable BC Act *Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion* - Endangered EPBC Act				
Vegetation zones (condition) and plots	Zone 7 (Moderate) – Plots P7, P9				
Growth form	**Typical species**				
Trees	*Eucalyptus parramattensis subsp. parramattensis*				
Shrubs	*Melaleuca decora, Melaleuca nodosa, Breynia oblongifolia, Hakea sericea, Acacia falcata*				
Grass and grass-like	*Paspalidium distans, Lomandra longifolia*				
Forb	*Einadia hastata, Dianella longifolia*				
Fern	-				
Other	*Hardenbergia violacea, Glycine clandestina*				
Weeds	*Eragrostis curvula, Chloris gayana, Ehrharta longiflora, Conyza bonariensis, Plantago lanceolata, Verbena bonariensis, Solanum nigrum, Asparagus aethiopicus, Crocosmia x crocosmiiflora, Senecio madagascarensis*				
Vegetation Integrity Scores					
Composition	**Structure**	**Function**	**Total VI Score**		
16	9.3	41.6	18.4		

Photograph 3-7: Vegetation Zone 7 – low condition PCT 883 (Jacobs, 2021)

Figure 3-1 Plant Community Types and vegetation zone mapping

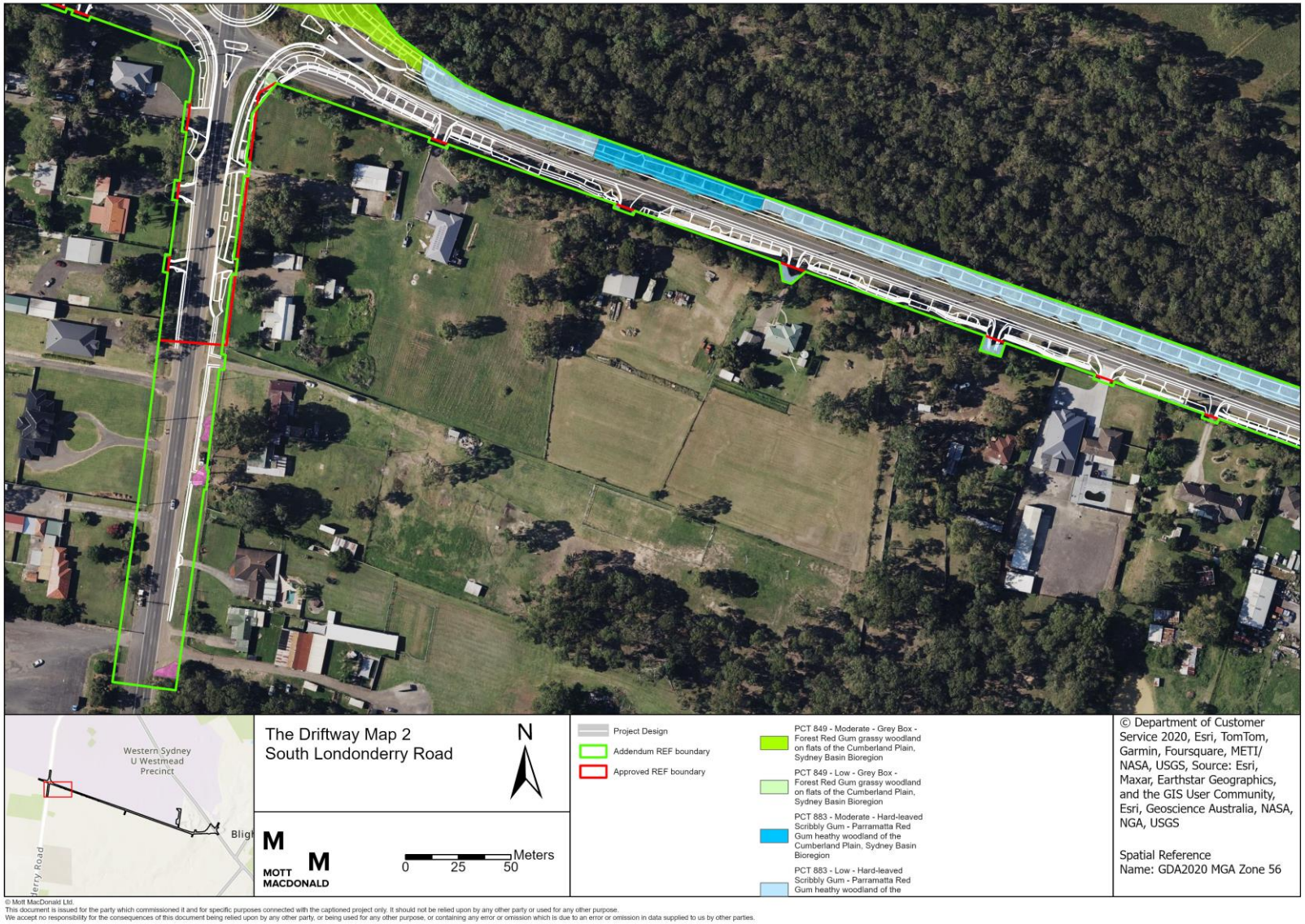

Figure 3-2 Plant Community Types and vegetation zone mapping

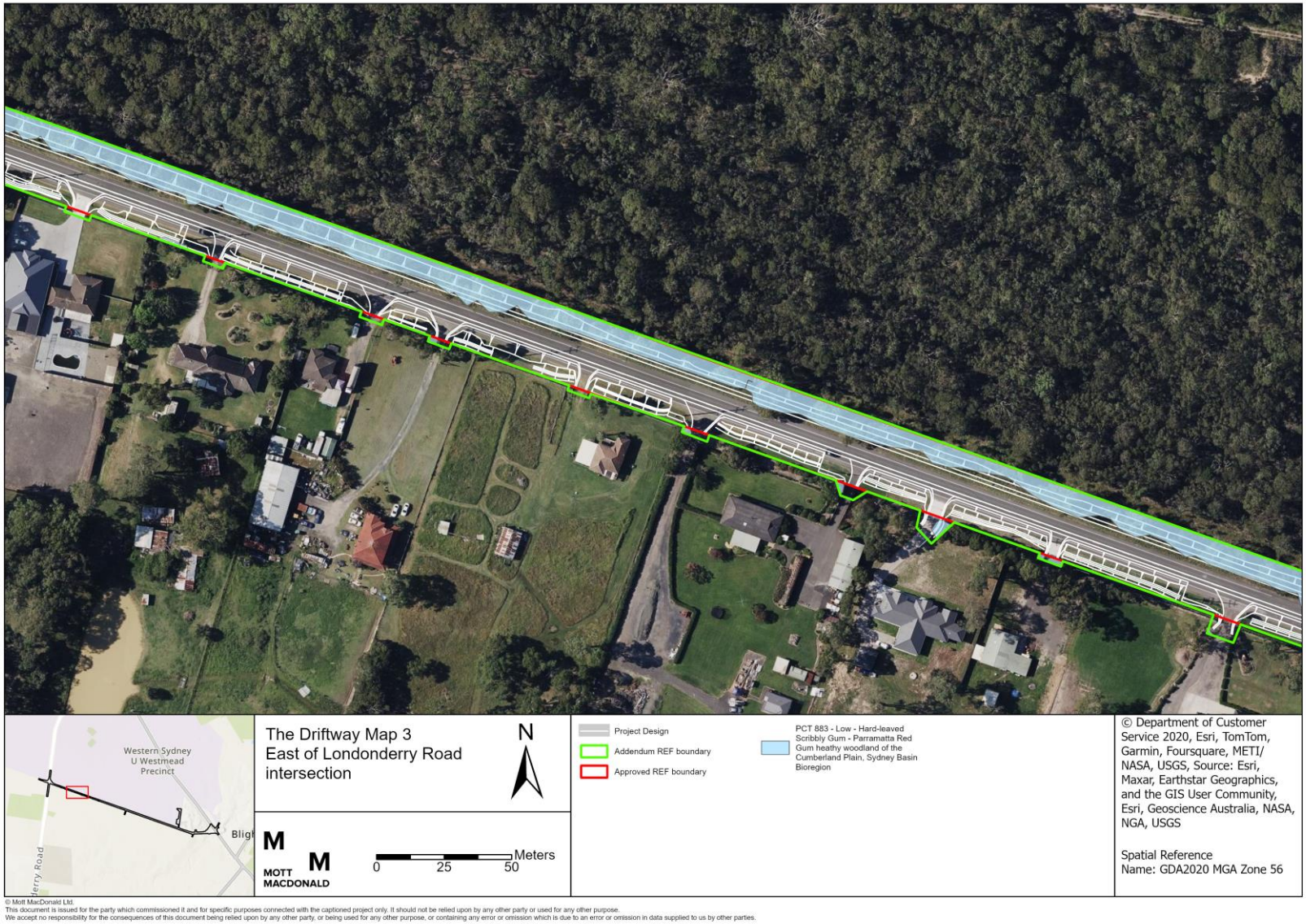

Figure 3-3 Plant Community Types and vegetation zone mapping

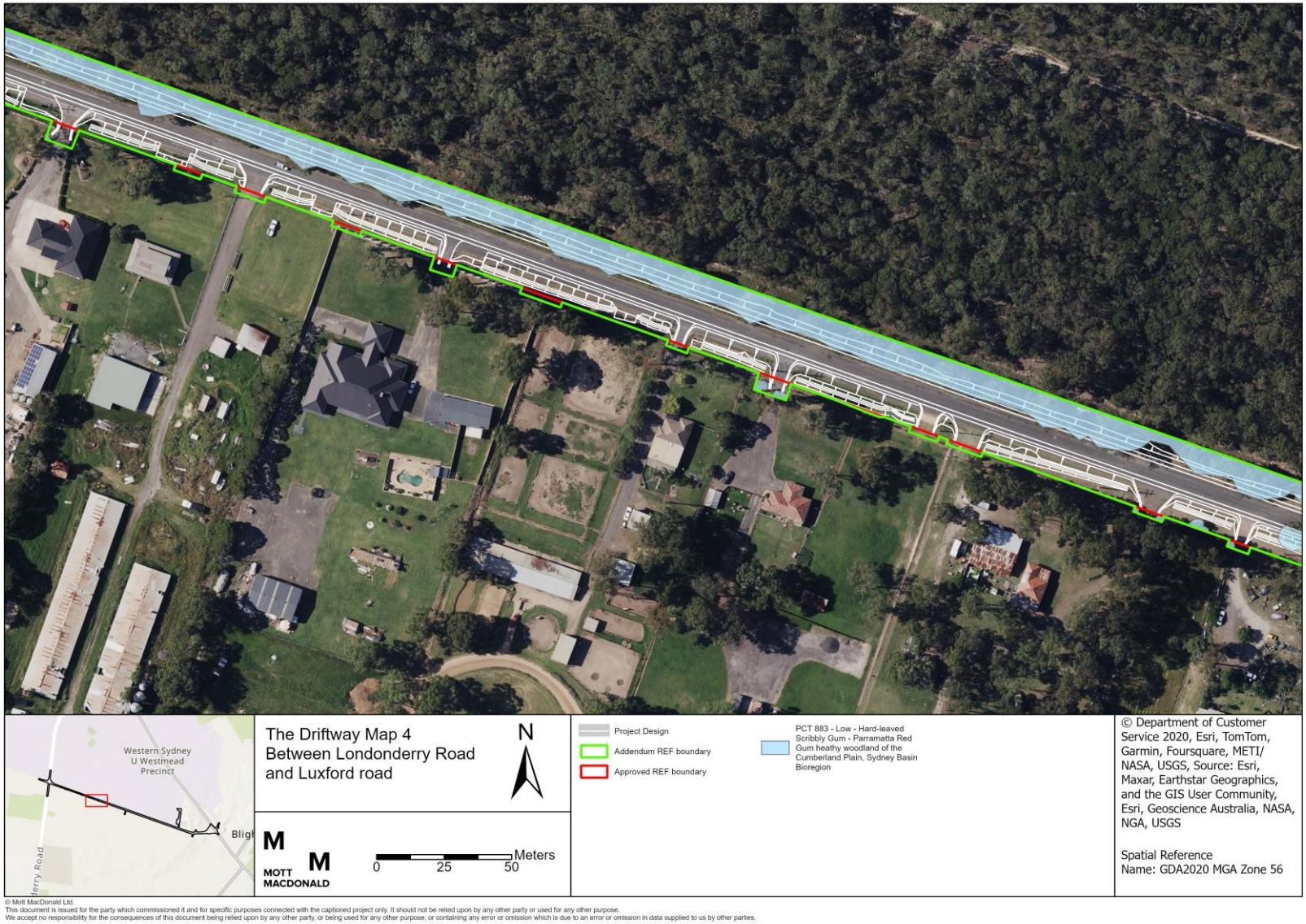

Figure 3-4 Plant Community Types and vegetation zone mapping

Figure 3-5 Plant Community Types and vegetation zone mapping

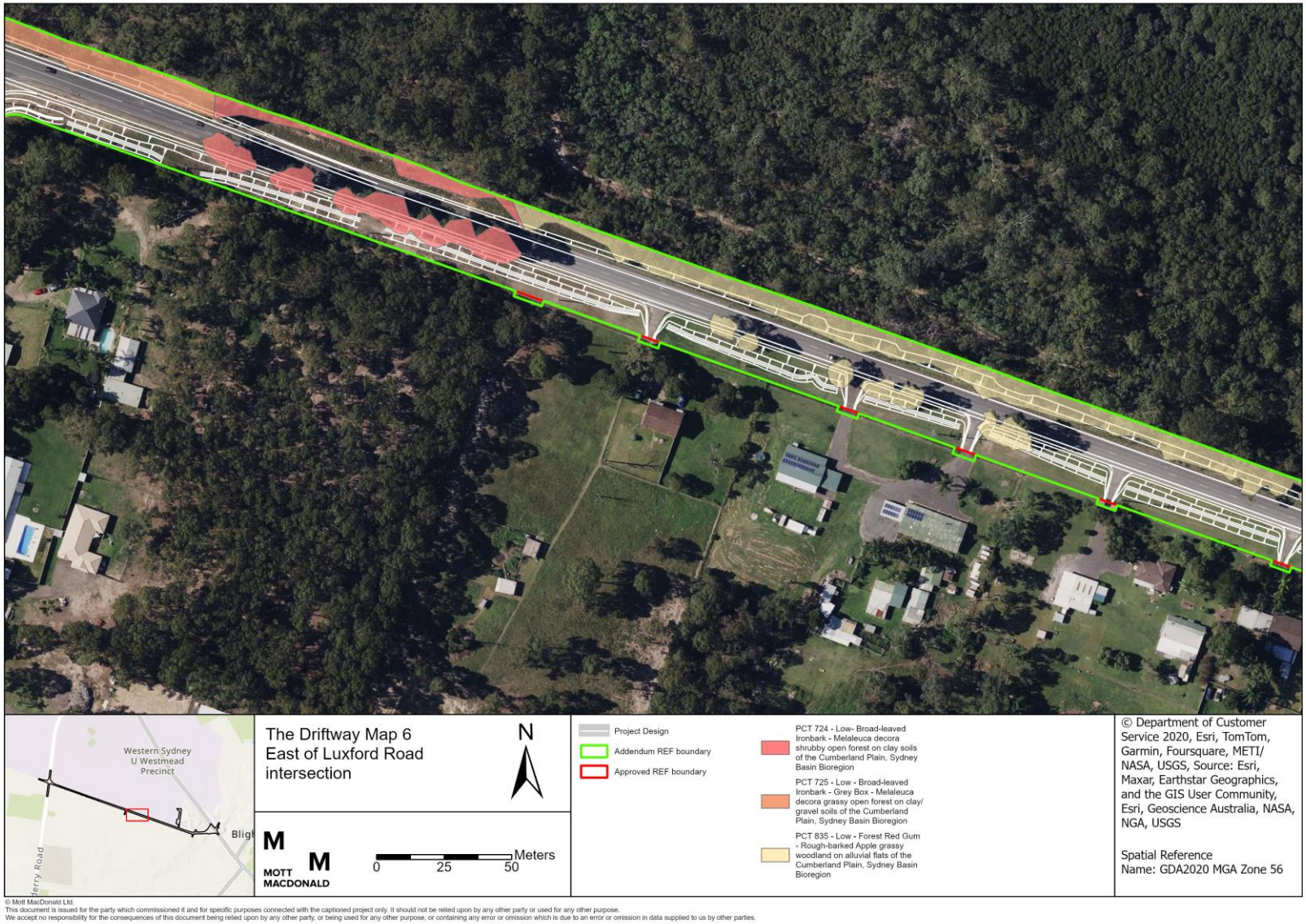

Figure 3-6 Plant Community Types and vegetation zone mapping

Figure 3-7 Plant Community Types and vegetation zone mapping

Figure 3-8 Plant Community Types and vegetation zone mapping

Figure 3-9 Plant Community Types and vegetation zone mapping

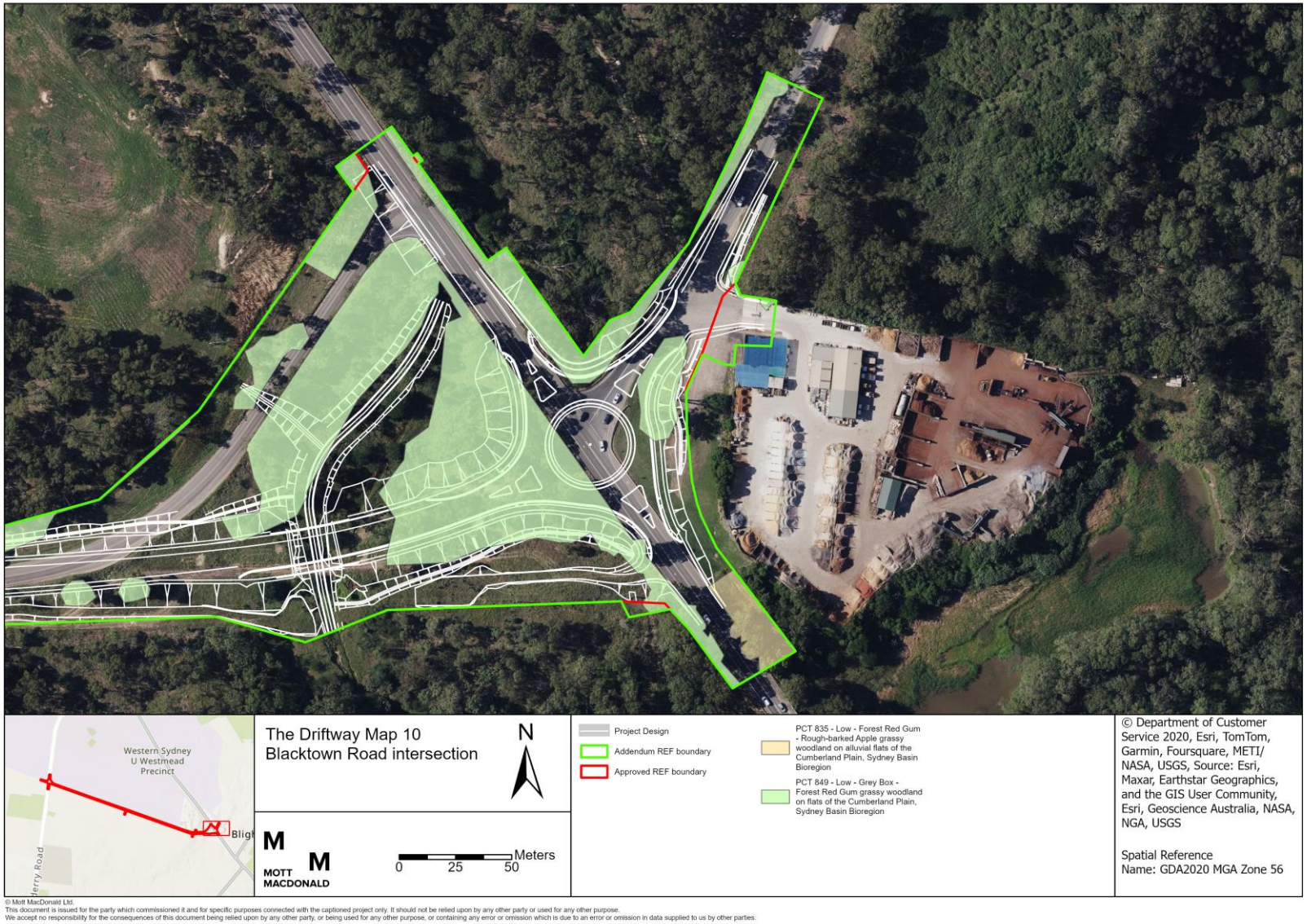

Figure 3-10 Plant Community Types and vegetation zone mapping

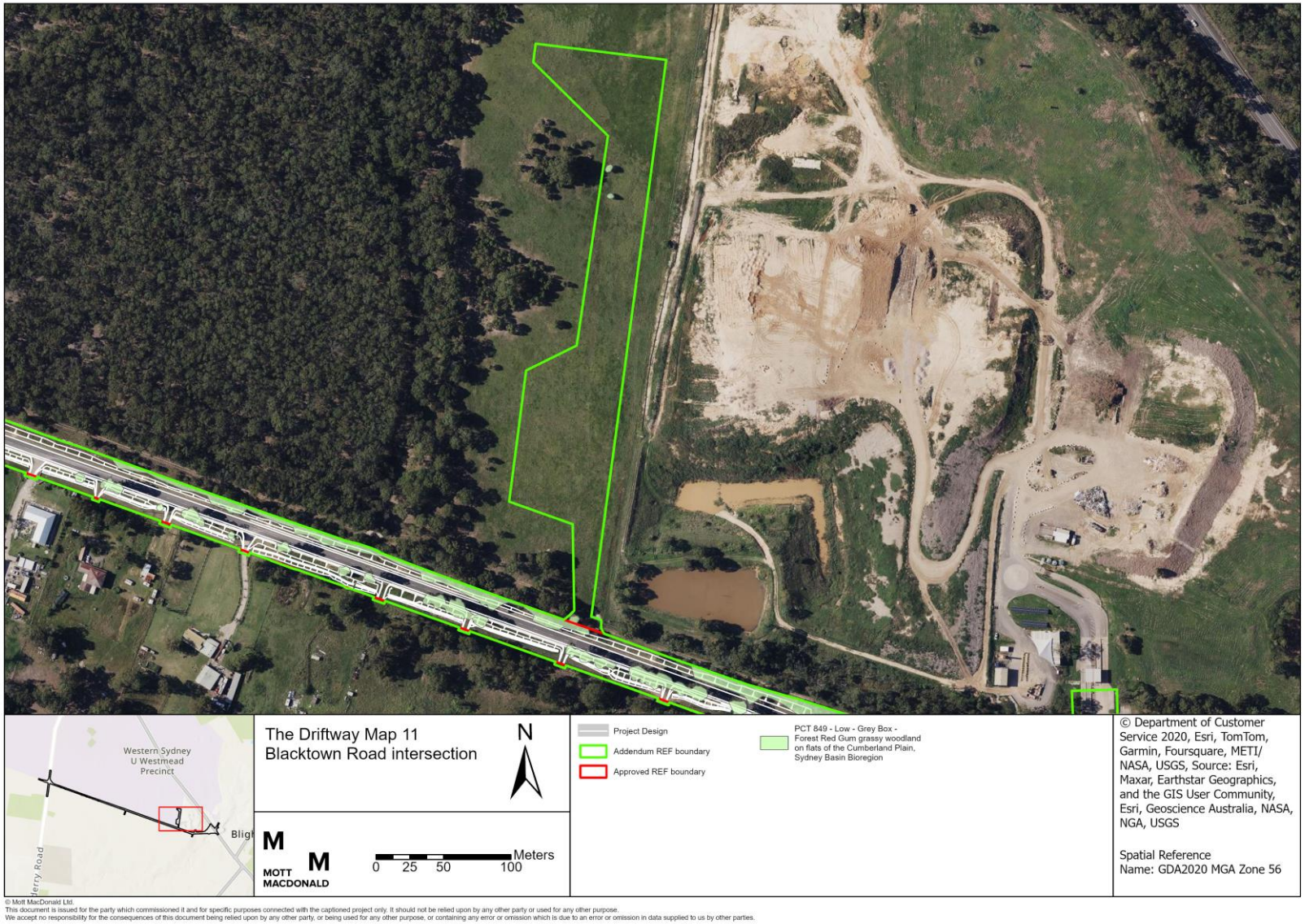

Figure 3-11 Plant Community Types and vegetation zone mapping

3.4. Threatened ecological communities

Five TECs were identified within the Project REF boundary. Four of the five TECs identified within the Project REF boundary were also identified in the additional area associated with the Addendum REF Boundary:

- *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion* (Endangered)
- *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered)
- *Cumberland Plain Woodland in the Sydney Basin Bioregion* (Critically Endangered)
- *Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion* (Vulnerable)

The fifth TEC identified in the Project REF boundary, *Shale Gravel Transition Forest in the Sydney Basin Bioregion* (endangered), was not found within the proposed modifications area. The distribution and extent of TECs in the study area are mapped in Figure 3-12 to Figure 3-22.

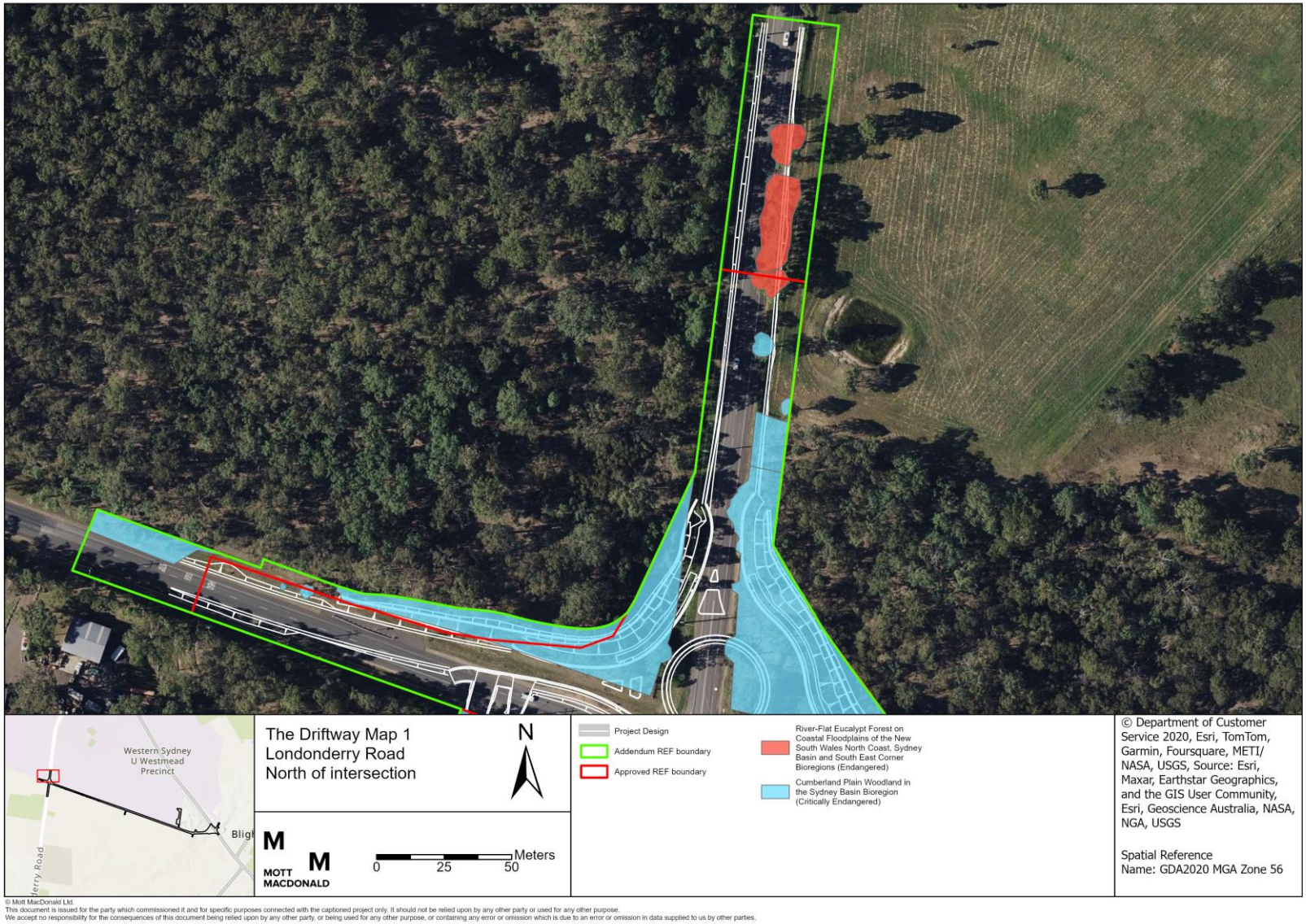

Figure 3-12 Threatened ecological communities listed in the BC Act

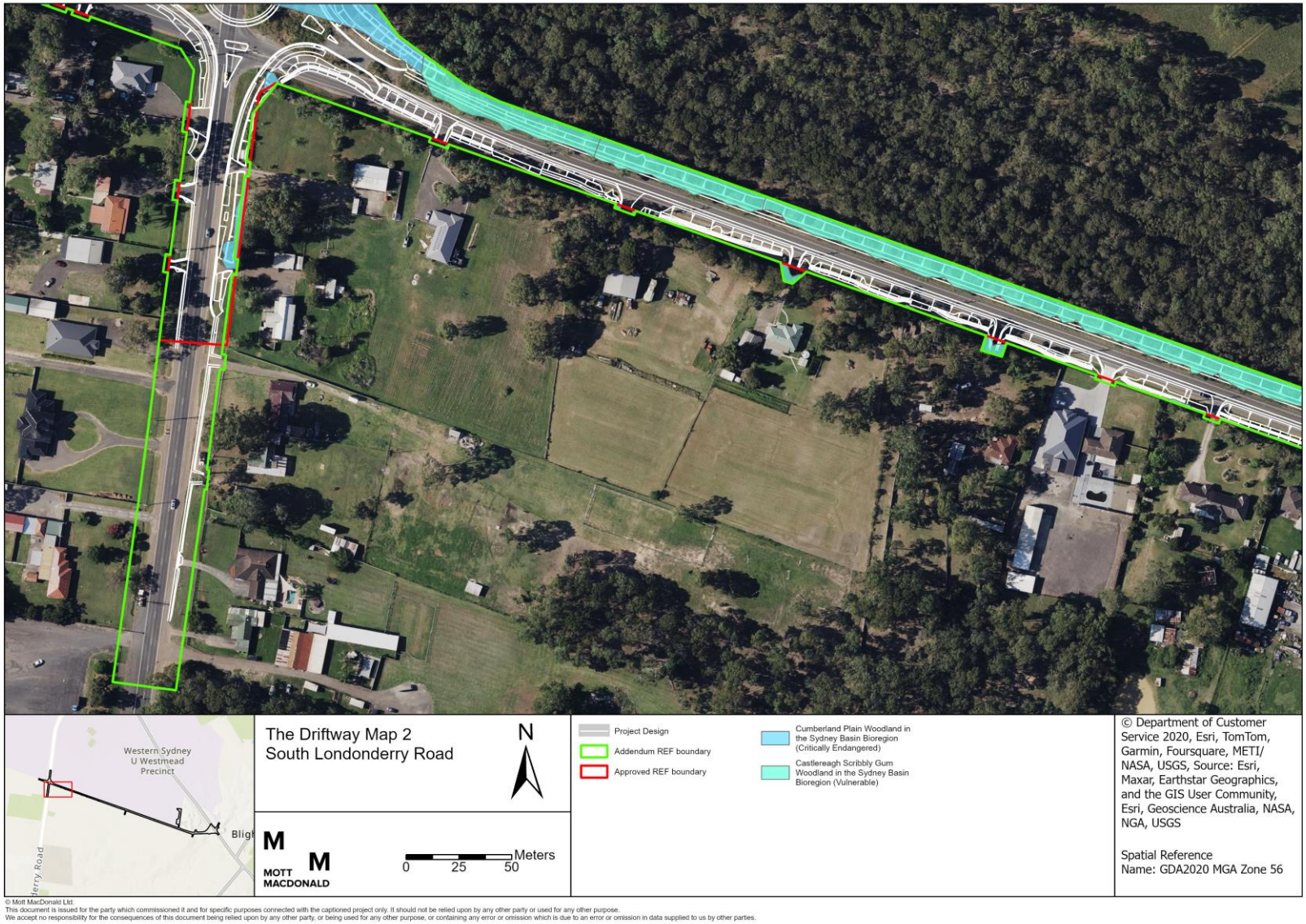

Figure 3-13 Threatened ecological communities listed in the BC Act

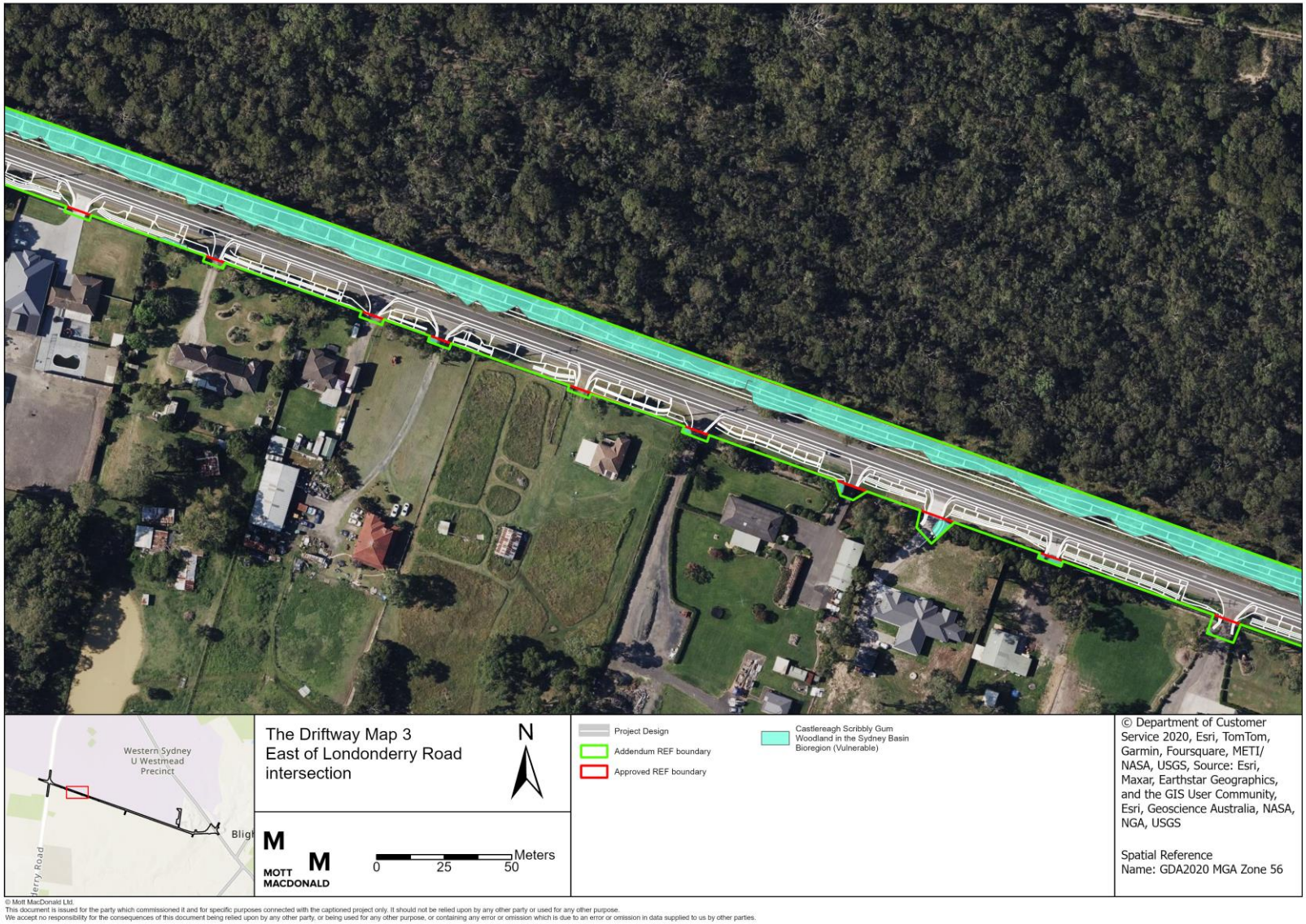

Figure 3-14 Threatened ecological communities listed in the BC Act

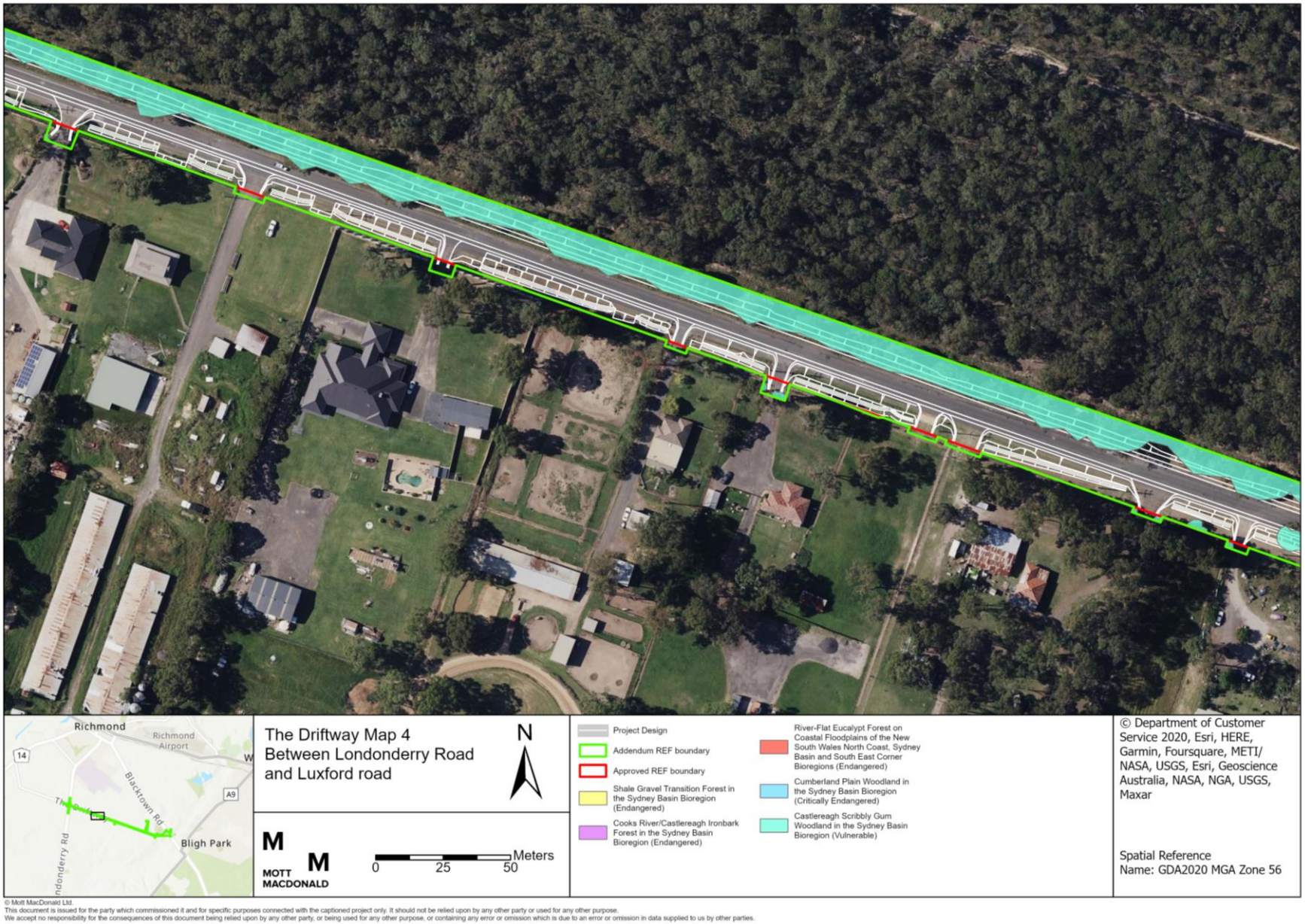

Figure 3-15 Threatened Ecological Communities Listed in the BC Act

Figure 3-16 Threatened Ecological Communities Listed in the BC Act

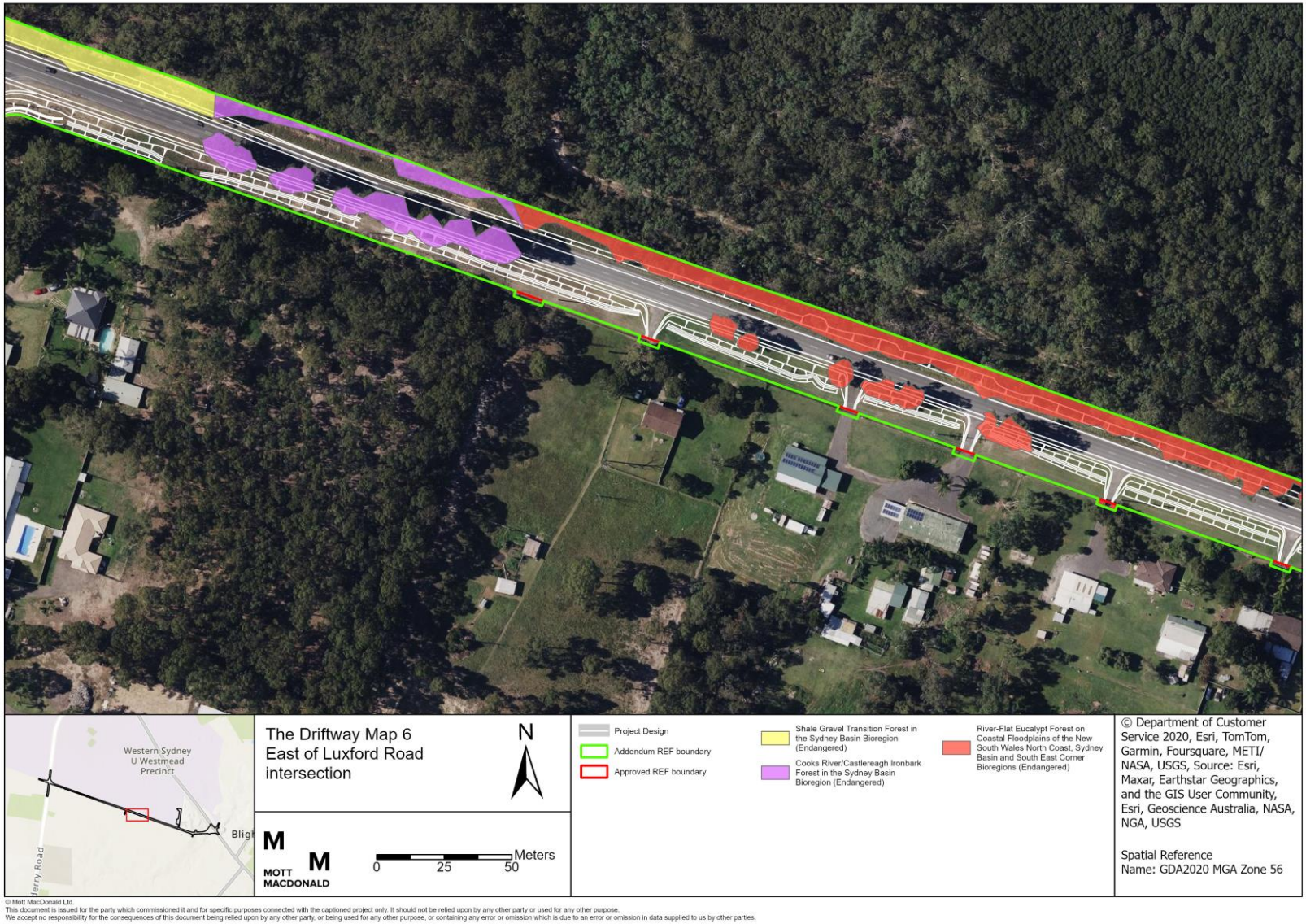

Figure 3-17 Threatened Ecological Communities Listed in the BC Act

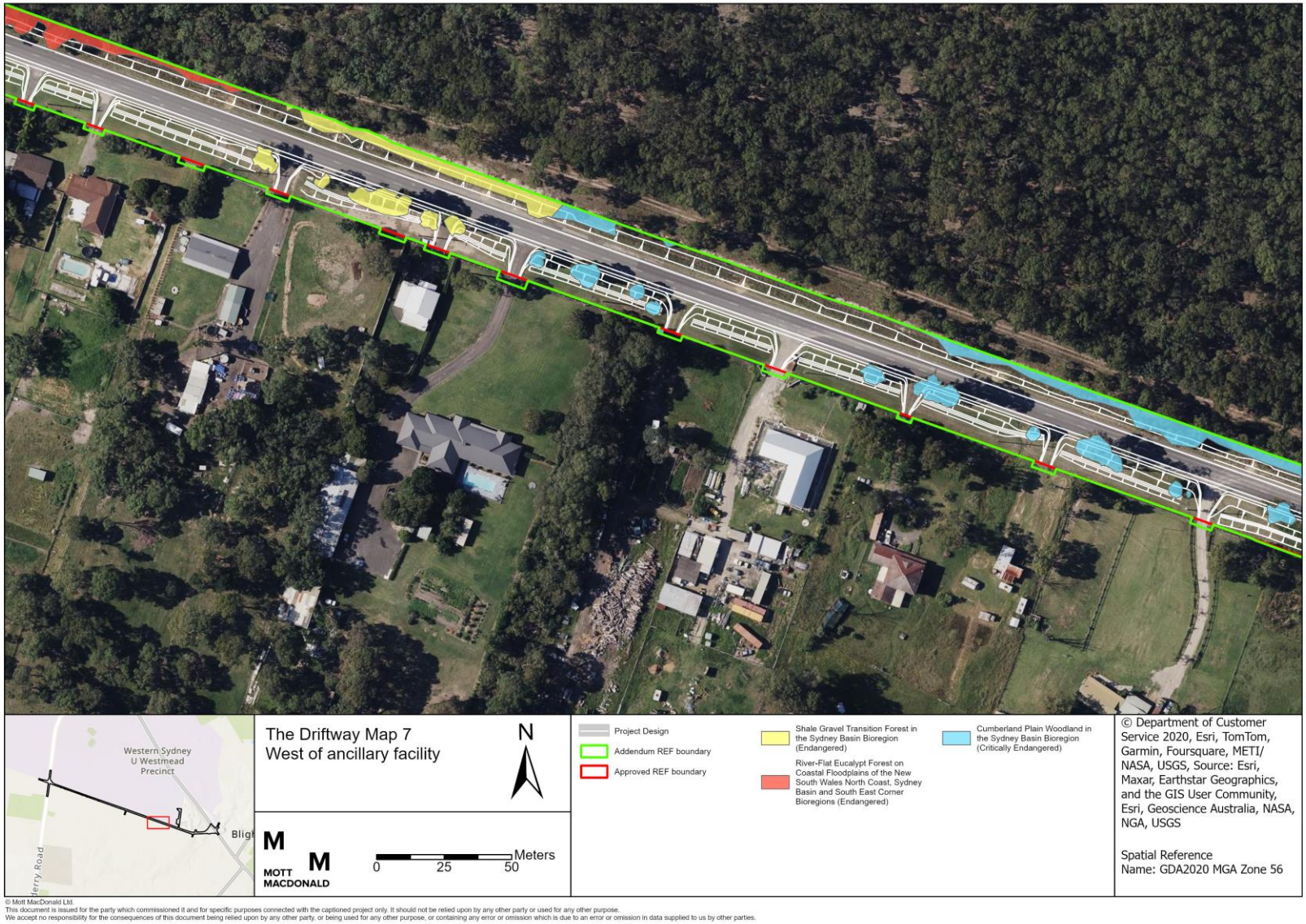

Figure 3-18 Threatened Ecological Communities Listed in the BC Act

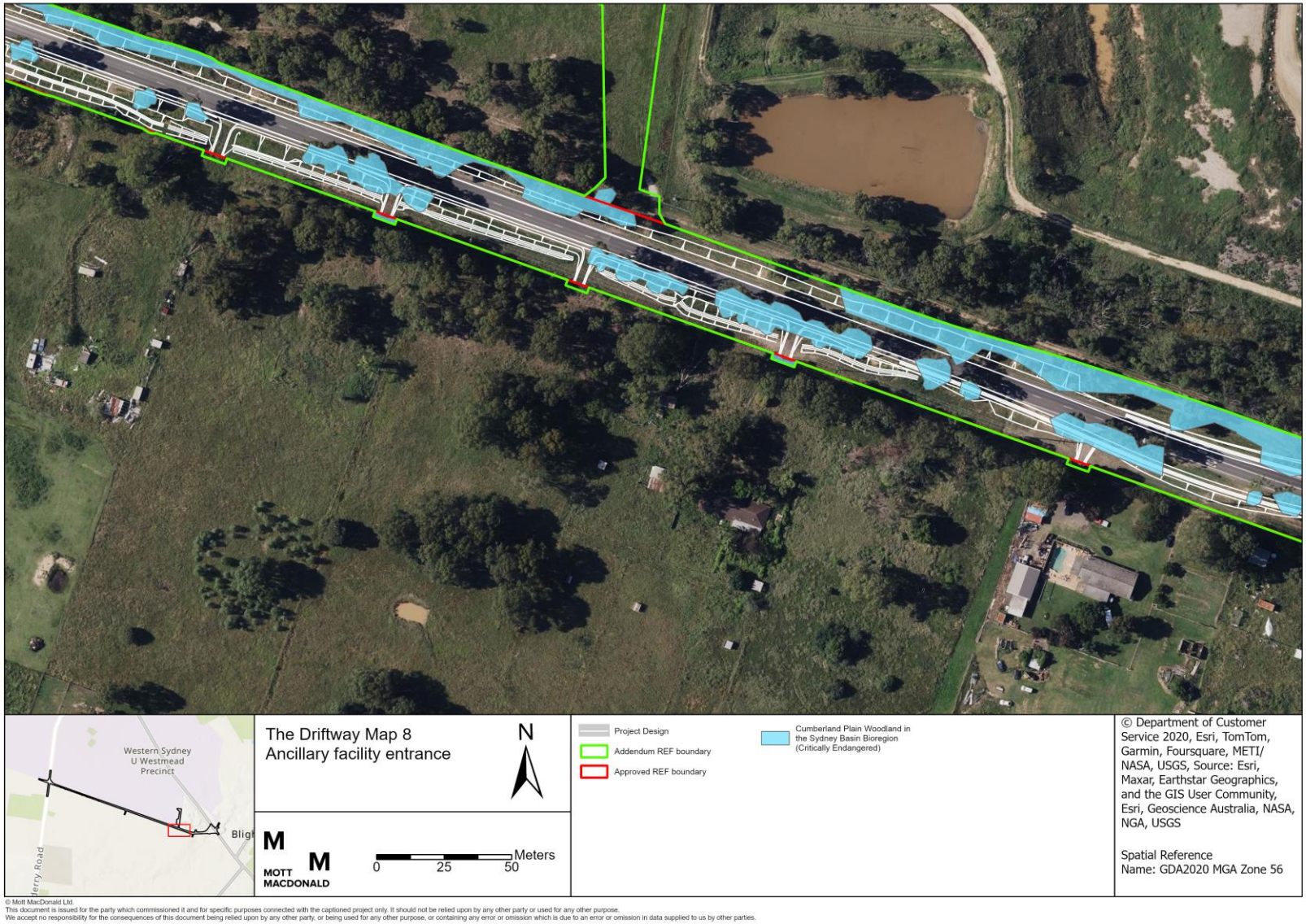

Figure 3-19 Threatened Ecological Communities Listed in the BC Act

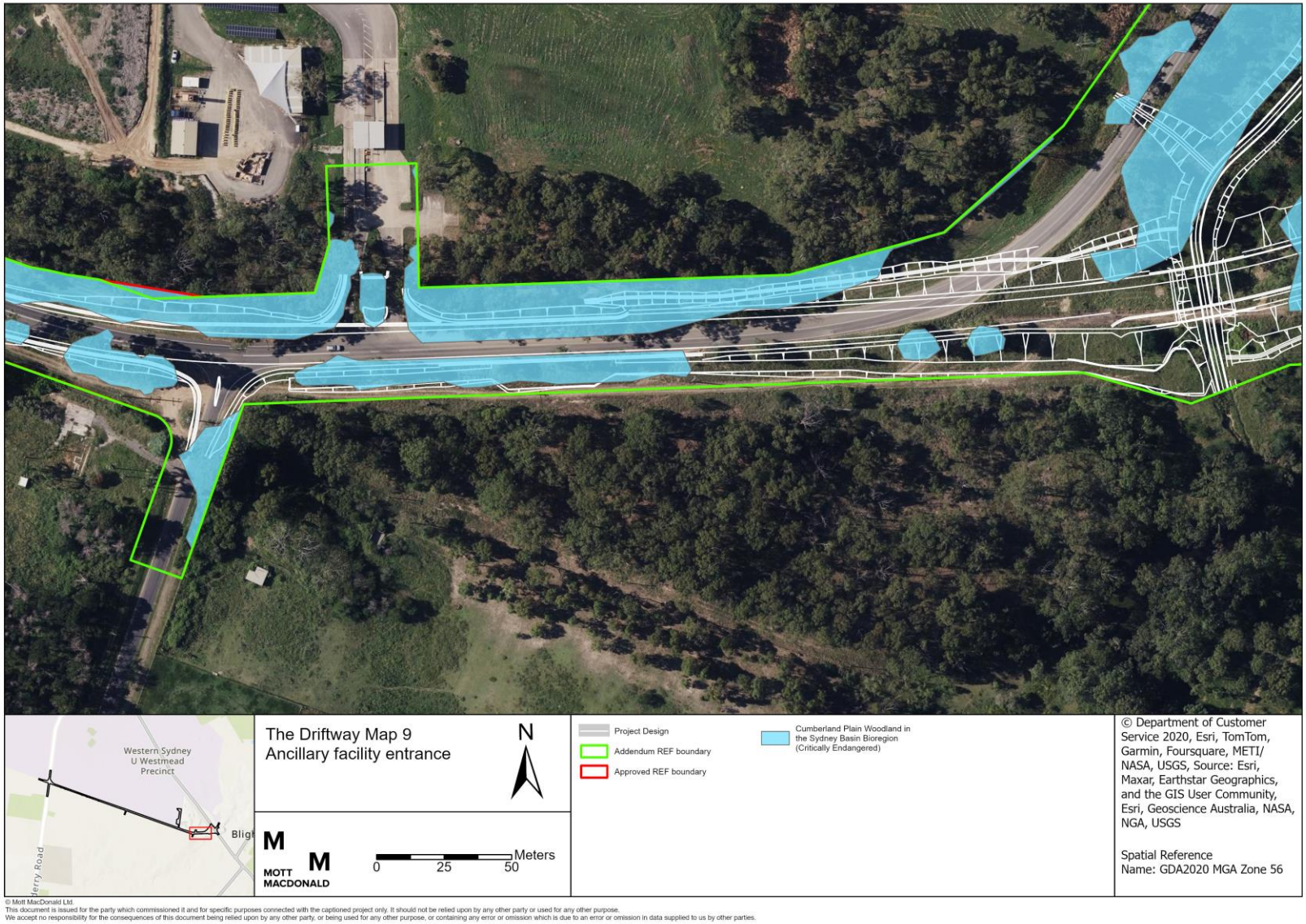

Figure 3-20 Threatened Ecological Communities Listed in the BC Act

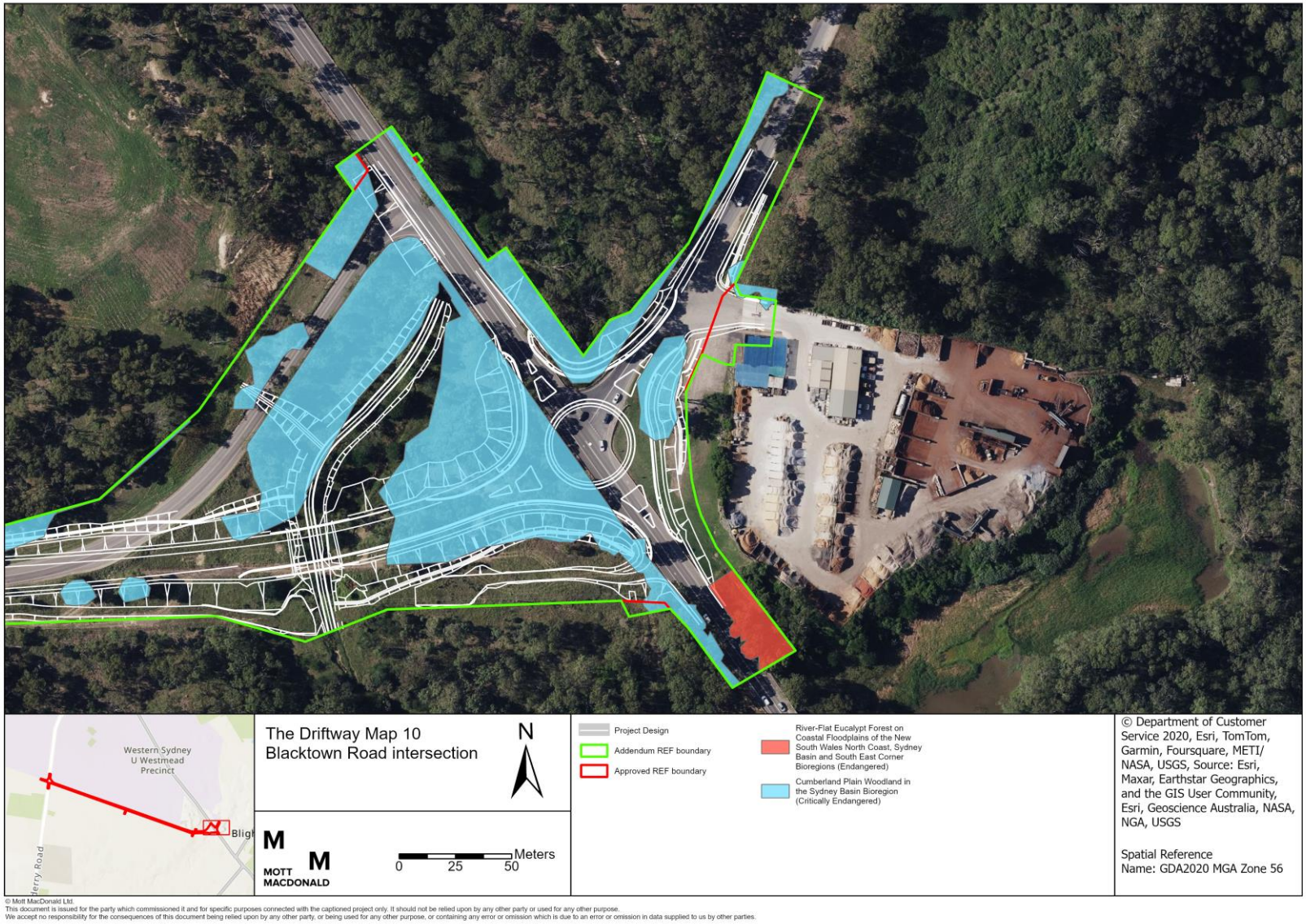

Figure 3-21 Threatened Ecological Communities Listed in the BC Act

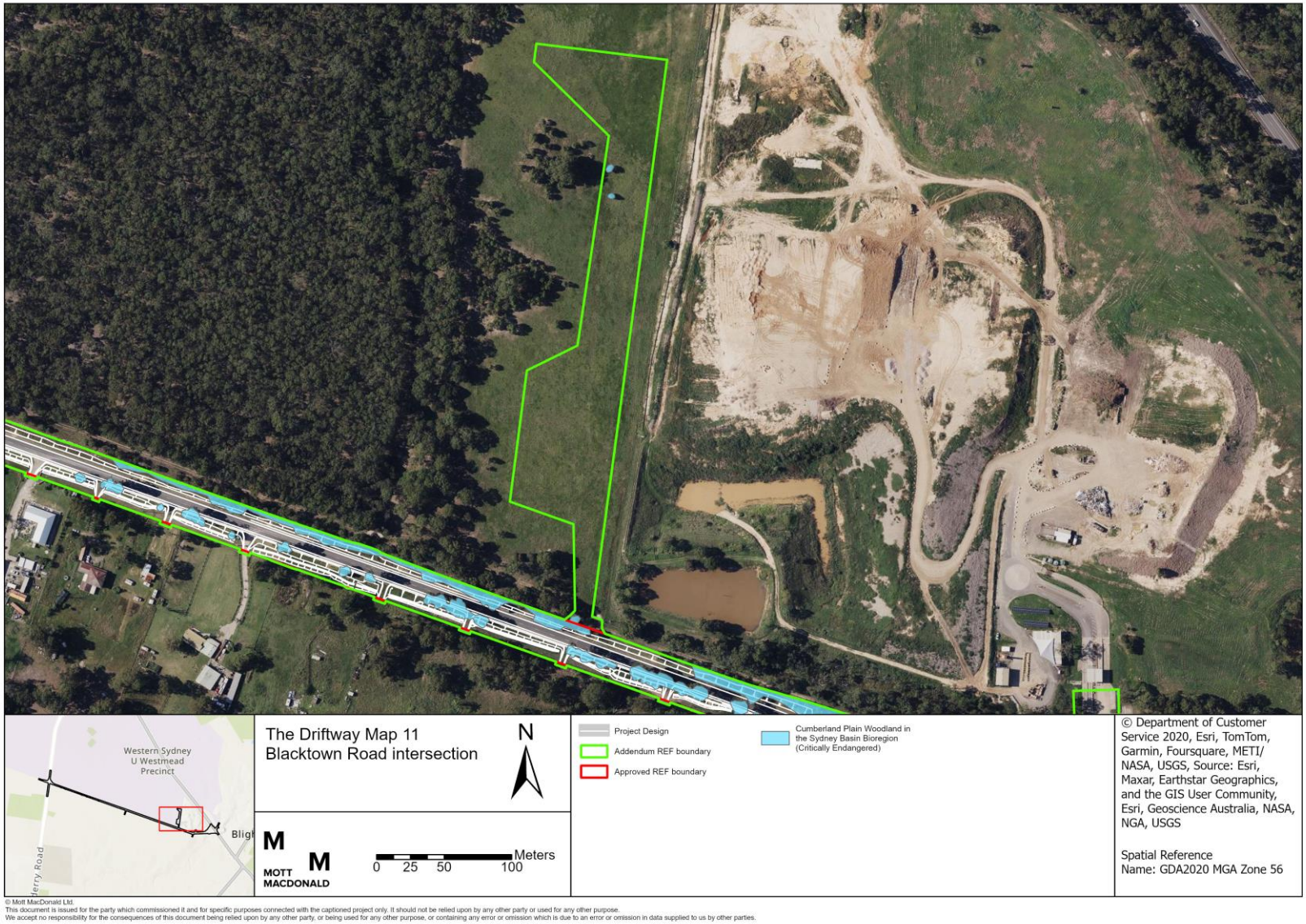

Figure 3-22 Threatened Ecological Communities Listed in the BC Act

3.5. Threatened Species

3.5.1. Threatened flora species

The Project BAR identified 25 threatened flora species as recorded or modelled as having potential to occur within a 10km radius of the Project. Updated databases search for the Addendum BAR identified three additional threatened flora species recorded or modelled as having potential to occur within a 10km radius of the Project (see Figure 3-23) since the Project BAR was completed. This includes:

- *Hibbertia fumana*
- *Hibbertia sp. Bankstown*
- *Grevillea parviflora subsp. parviflora*

The habitat suitability assessment, presented in Appendix B:, found these species to have a low likelihood of occurring within the area impacted by the proposed modifications. The habitat suitability assessment was initially undertaken prior to the field survey and then updated to consider the findings of the field survey.

Only one threatened flora species, *Dillwynia tenuifolia* listed as vulnerable under the BC Act, was recorded in the construction footprint during the project BAR field survey. Some plants in the construction footprint during the survey were in flower and were thus able to be positively identified as *Dillwynia tenuifolia*, see Figure 3-24.

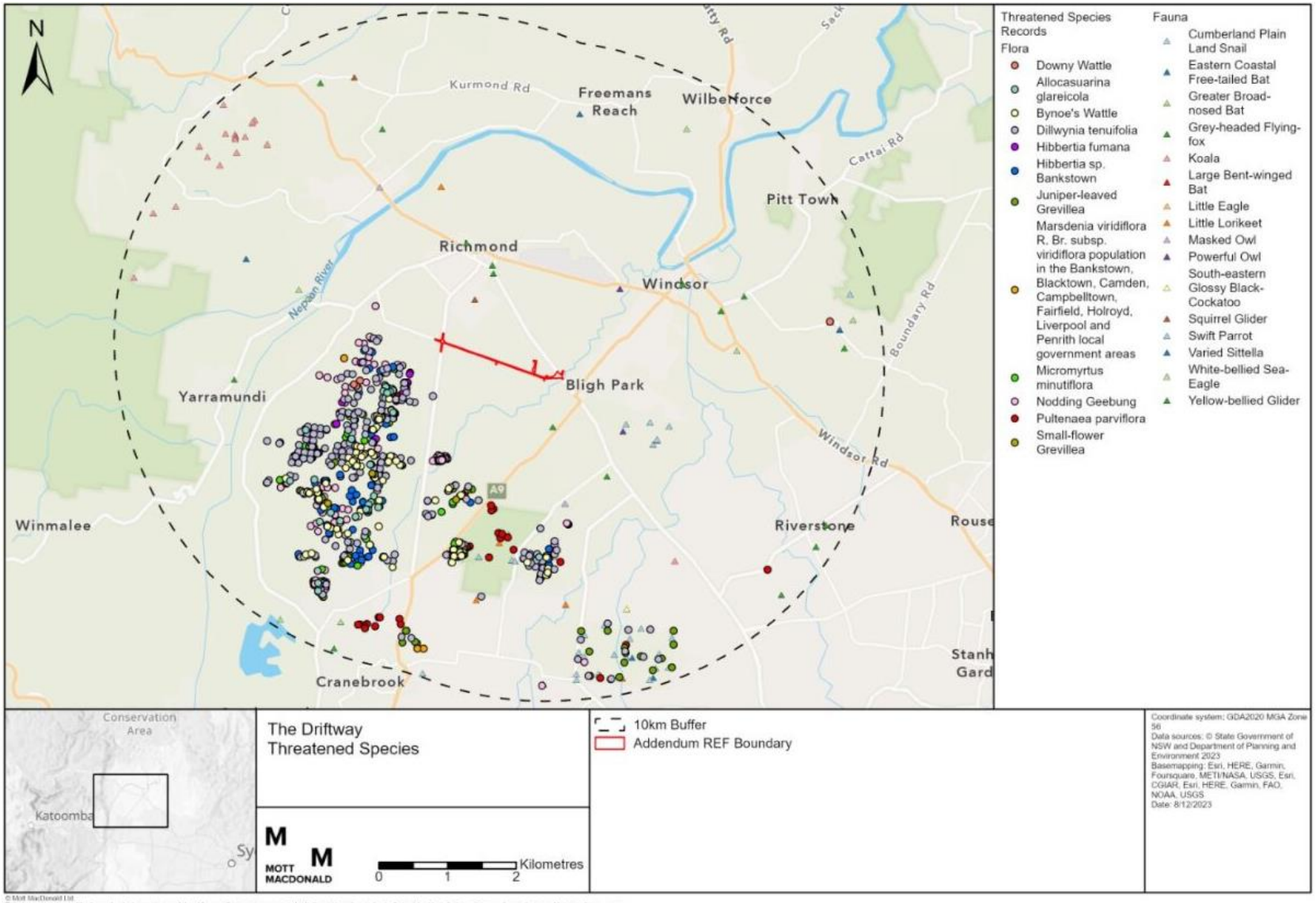

Figure 3-23 Threatened species records since the 8th June 2021

Figure 3-24 *Dillwynia tenuifolia* growing with flower within the project boundary

The remaining threatened flora species listed in Appendix B: were not considered likely to occur within the area to be impacted by the Proposed Modification as targeted surveys were undertaken during the Project BAR and did not identify any other threatened flora species. In addition, no threatened flora species were identified during the vegetation validation for the Addendum BAR. It should also be noted that the Project BAR identified historical land use change to have caused vegetation degradation, disturbance to the soil, introduction and spread exotic plant species, further reducing the habitat potential for threatened flora species.

Dillwynia tenuifolia

The Project BAR found that the local *Dillwynia tenuifolia* population (not including any plants occurring on the south side of the Driftway) has an estimated area of occupancy of 67 hectares, with approximately 1.3 hectares occurring in the project boundary. Dense patches were observed in parts of the roadside in low condition patches of PCT 724 and PCT 849. The species is generally sparser in other parts of the project boundary within these PCTs. Only one isolated dense cluster was observed in PCT 835.

The Project REF boundary is estimated to contain about 5,000 individuals comprised of mature plants and seedlings found mostly in dense patches in localised disturbed areas. This estimate is based on one square metre density quadrats showing an average of 0.5 plants/square metre. There is likely to be >100,000 individuals in the entire population in the broader study area to the north based on data from BioNet (DPIE, 2021), Niche (2021) and site observations. It is worth noting that the land adjoining the north of The Driftway, and containing the largest portion of the population, has recently been approved for a Biodiversity Stewardship Agreement Site, which would see the conservation of the local population in perpetuity.

3.5.2. Threatened fauna species

One threatened fauna species, *Meridolum corneovirens* listed under the BC Act, was found within the study area during the field surveys undertaken for the Project BAR. This species was identified through empty shells located with the Project REF Boundary. A further 14 threatened fauna species previously recorded within 10km of the Proposed Modifications area are

predicted to have a moderate or high likelihood to occur[1]. The habitats within the study area are generally moderate to low quality and do not possess the features required for many of the threatened species to complete their life cycles. However, some threatened fauna are still considered moderately or highly likely to occur (see Table 3-9). The study area does not contain suitable habitat for the other species listed in Appendix B.

[1] As discussed in Section 2.2 revised database searches were undertaken on the 8th of December 2023. No additional fauna species from those identified during the Project BAR were identified during this search.

Table 3-9 Habitat assessment for fauna and likelihood of occurrence

Species name (Scientific Name)	BC Act	EPBC Act	Potential occurrence	Habitat within the study area	Associated PCTs Project REF	Associated PCTs Addendum REF	Total Area
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	V	-	Moderate	Species was not recorded within the study area. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Little Eagle (*Hieraaetus morphnoides*)	V	-	Moderate	Species was not recorded within the study area. Specific habitat is not present within the study area, however there is potential foraging habitat present within the study area. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Little Lorikeet (*Glossopsitta pusilla*)	V	-	Moderate	Marginal habitat associated within the study area. May occasionally utilise habitat for foraging. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Swift Parrot (*Lathamus discolor*)	E	CE	Moderate	Marginal habitat associated within the study area. May occasionally utilise habitat for foraging. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha

Species name (Scientific Name)	BC Act	EPBC Act	Potential occurrence	Habitat within the study area	Associated PCTs Project REF	Associated PCTs Addendum REF	Total Area
Varied Sittella (*Daphoenositta chrysoptera*)	V	-	Moderate	It may be an occasional visitor as there is potential foraging habitat within the study area. However, habitat similar to the study area is widely distributed in the local area. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Cumberland Plain Land Snail (*Meridolum corneovirens*)	E	-	Recorded	Recorded within the study area during surveys. Suitable habitat is present. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Eastern Coastal Free-tailed Bat (*Micronomus norfolkensisI*)	V	-	Moderate	The study area is suitable for foraging, although no roosting habitat present. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	V	-	Moderate	The study area is suitable for foraging, although no roosting habitat present. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	V	-	Moderate	The study area is suitable for foraging, although no roosting habitat present. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha

Species name (Scientific Name)	BC Act	EPBC Act	Potential occurrence	Habitat within the study area	Associated PCTs Project REF	Associated PCTs Addendum REF	Total Area
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	V	Moderate	This species is likely to forage in the study area on occasion. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Large Bent-winged Bat (*Miniopterus orianae oceansis*)	V	-	Moderate	The study area is suitable for foraging, and culverts are available for roosting. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	Moderate	The study area is suitable for foraging, although no roosting habitat present. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Little Bent-winged Bat (*Miniopterus australis*)	V	-	Moderate	The study area is suitable for foraging, and culverts are available for roosting. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha
Southern Myotis (*Myotis macropus*)	V	-	Moderate	The study area is suitable for foraging, and culverts are available for roosting. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha

Species name (Scientific Name)	BC Act	EPBC Act	Potential occurrence	Habitat within the study area	Associated PCTs Project REF	Associated PCTs Addendum REF	Total Area
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	V	-	Moderate	The study area is suitable for foraging, although no roosting habitat present. Habitat has been calculated by the area of associated PCTs within the Project REF and Addendum REF area.	PCT 724 - 0.51 ha PCT 725 - 0.2 ha PCT 835 - 0.37 ha PCT 849 - 3.41 ha PCT 883 - 1.17 ha.	PCT 724 - 0.001 ha PCT 725 - N/A PCT 835 - 0.066 ha PCT 849 – 0.127 ha PCT 883 – 0.022 ha.	PCT 724 – 0.511 ha PCT 725 – 0.2 ha PCT 835 – 0.436 ha PCT 849 – 3.537 ha PCT 883 – 1.192 ha Total – 5.876 ha

Cumberland Plain Land Snail

Evidence of Cumberland Plain Land Snail (endangered: BC Act) via empty shells was found during the Project BAR field surveys (See Figure 3-25 - Figure 3-28). These specimens were found under roadside refuse and leaf litter in the roadside fragment of low condition PCT 849 (veg zone - 3_low) within the REF Boundary. An assessment was made on the potential presence of Cumberland Plain Snail (*Meridolum corneovirens*) (CPLS) using the criteria described in Table 3-10 to rate the value of the habitat in the Project boundary for the species. Veg zone - 3_low was considered moderate condition habitat for CPLS and moderate to high condition habitat was used to map the remaining suitable habitat for CPLS in the study area. This approach was taken for the additional areas to be impacted in association to the Addendum REF.

Figure 3-25 Cumberland Plain Land Snail Shell

Figure 3-27 Cumberland Plain Land Snail Shell

Figure 3-26 Cumberland Plain Land Snail Shell

Figure 3-28 Cumberland Plain Land Snail Shell

Table 3-10 Habitat condition criteria for Cumberland Plain Land Snail

Condition	Sheltering	Leaf Litter	Naturalness	Patch size / Connectivity	Ground Cover
High	Abundant logs and / or buildings in refuse	Abundant	Remnant	Large patch or adjoins large remnant outside the road reserve	>10% open ground, low abundance of dense exotic grasses
Moderate	Low abundance of logs or	Moderate	Regrowth	Small patch in fragmented mosaic of woodland patches	<10% open ground, patchy mix of open ground and plant cover

Condition	Sheltering	Leaf Litter	Naturalness	Patch size / Connectivity	Ground Cover
	buildings refuse				
Poor	Logs or buildings refuse absent	None	Exotic grass	Small, isolated patch	100% cover of tall exotic grasses, no open patches of leaf litter

Other Threatened Fauna Species with Potential to Occur

The Project BAR identified that vegetation within the Project REF boundary has potential to provide habitat for the following species listed as vulnerable under BC Act:

- Large Bent-winged Bat
- Little Bent-winged Bat
- Eastern False Pipistrelle
- Yellow-bellied Sheathtail-bat
- Eastern Coastal Freetail-bat
- Southern Myotis
- Large-eared Pied Bat
- Greater Broad-nosed Bat

These species have either been recorded widely in the locality or have been predicted to occur based on suitable habitat in the locality and are likely to forage in the REF and Addendum REF Boundary. Tree hollows are not present, but the trees in the REF and Addendum REF Boundary are likely to be suitable as foraging habitat. Culverts located in proximity to the Driftway were assessed in the Project BAR as suitable habitat for the Large Bent-winged Bat, Little Bent-winged Bat and the Southern Myotis.

The Grey-headed Flying-fox (listed as vulnerable under the BC Act and EPBC Act) is considered moderately likely to forage in the mature Eucalypt and Melaleuca trees within the REF and Addendum REF Boundary, particularly *Eucalyptus moluccana*. No roost camps are present in the REF and Addendum REF Boundary but the bats from the Ropes Crossing, Emu Plains, Yarramundi and Penrith camps are moderately likely to use the study area to intermittently forage.

The Swift Parrot has been recorded in the locality and sporadically occurs in the urbanised areas of western Sydney during winter. The Little Lorikeet has also been recorded in the locality and within the adjacent patch of vegetation which is connected to the project boundary. These species may pass through the area during movements between larger foraging habitats (from vegetation patches to the north of The Driftway to Castlereagh Nature Reserve and other vegetation patches within the locality) where it may rest and forage in street trees or small vegetation remnants. Although no significant areas of foraging habitat are present, the Swift Parrot and Little Lorikeet are considered moderately likely to use vegetation within REF and Addendum REF Boundary on occasion.

The Dusky Woodswallow, Little Eagle and Varied Sittella may aerially forage over the locality and/or temporarily perch on trees within REF and Addendum REF Boundary. However, vegetation within the REF and Addendum REF Boundary is considered unlikely to form suitable breeding habitat for these species as the specific breeding habitats for these species are not found within the listed PCTs. Therefore, habitat use would be intermittent and minimal.

3.6. Groundwater dependent ecosystems

Five PCTs in the Project REF boundary were identified as potential Groundwater Dependent Ecosystems. Four of these PCTs (724, 725, 835 and 849) are considered likely to be opportunistic facultative groundwater dependent ecosystems (GDE). Opportunistic facultative GDEs depends on the subsurface presence of groundwater (often accessed via the capillary fringe – subsurface water just above the water table) in some locations but not in others, particularly where an alternative source of water (rainfall) cannot be accessed to maintain ecological function (Kuginis et al., 2012).

These PCTs listed above are not restricted to locations of groundwater discharge and are not located within aquifers. The plants within these PCTs would use shallow soil water before seeking deeper soil water or groundwater. The trees may take up groundwater from the capillary fringe when necessary (during dry seasons or in extended drought).

PCTs 724, 835 and 849 were also identified in the additional area of the Addendum REF. The following indicated groundwater dependent ecosystems have potential to occur within the additional areas of the Addendum REF:

- PCTs 724, 835 & 849 – High potential GDE (dark green)
- PCT 883 – Moderate potential GDE (light green)

Figure 3-29: Groundwater dependent ecosystems (Red Boxes indicate additional areas of impact associated with the additional areas of the Addendum REF)

3.7. Aquatic results

Consistent with the Project BAR the habitat characteristics observed in the Addendum BAR did not match the habitat characteristics of any threatened aquatic species known or predicted to occur in the locality, hence targeted surveys for aquatic species were not undertaken.

As detailed in the Project REF, the aquatic environment is limited to an unnamed creek (Strahler 3rd order stream) that is mapped as draining from the north of the Driftway to the south on to private property DP752061 before discharging into Rickabys Creek. The habitat quality for fish is poor. The Project REF area has mapped areas of the Coastal Management SEPP as 'coastal wetland area' and 'proximity to coastal wetlands', now mapped under the SEPP (Resilience and Hazards) 2021. The wetland and buffer occur around 85 metres to the north of the Project REF boundary.

3.8. Areas of outstanding biodiversity value

The Project REF and Addendum REF are not located in any declared areas of outstanding biodiversity value.

3.9. Wildlife connectivity corridors

Vegetation on the northern side of The Driftway maintains connectivity with native vegetated patches to the north, facilitating the movement of genes, individuals, species and populations and enabling the continuation of viable populations. The vegetation to the north also connects to a larger portion of vegetation to the west, albeit separated by a road corridor. This large portion of vegetation includes the Agnes Banks Nature Reserve and large areas of vegetated land publicly and privately owned.

To the south, The Driftway already restricts terrestrial and arboreal fauna movements. Fauna can, and would, cross the road using the fragmented and disturbed areas of habitat, but would do so less frequently than in natural habitats and would be at greater risk of mortality during movements. The permeability of landscapes for different fauna species varies and habitat connectivity is retained for more mobile species (birds, flying-foxes, insectivorous bats, insects, plants) remains. Connectivity for sedentary species and smaller species such as the Cumberland Plain Land Snail, frogs and reptiles is minimal.

The Biodiversity Investment Opportunities Map (BIO Map) (DCCEEW, 2015) identifies priority areas for investment in biodiversity outcomes. These are areas where funding for biodiversity management can make the greatest difference for biodiversity. The project adjoins land mapped as a Core Area of priority land investment for biodiversity, see Figure 3-30.

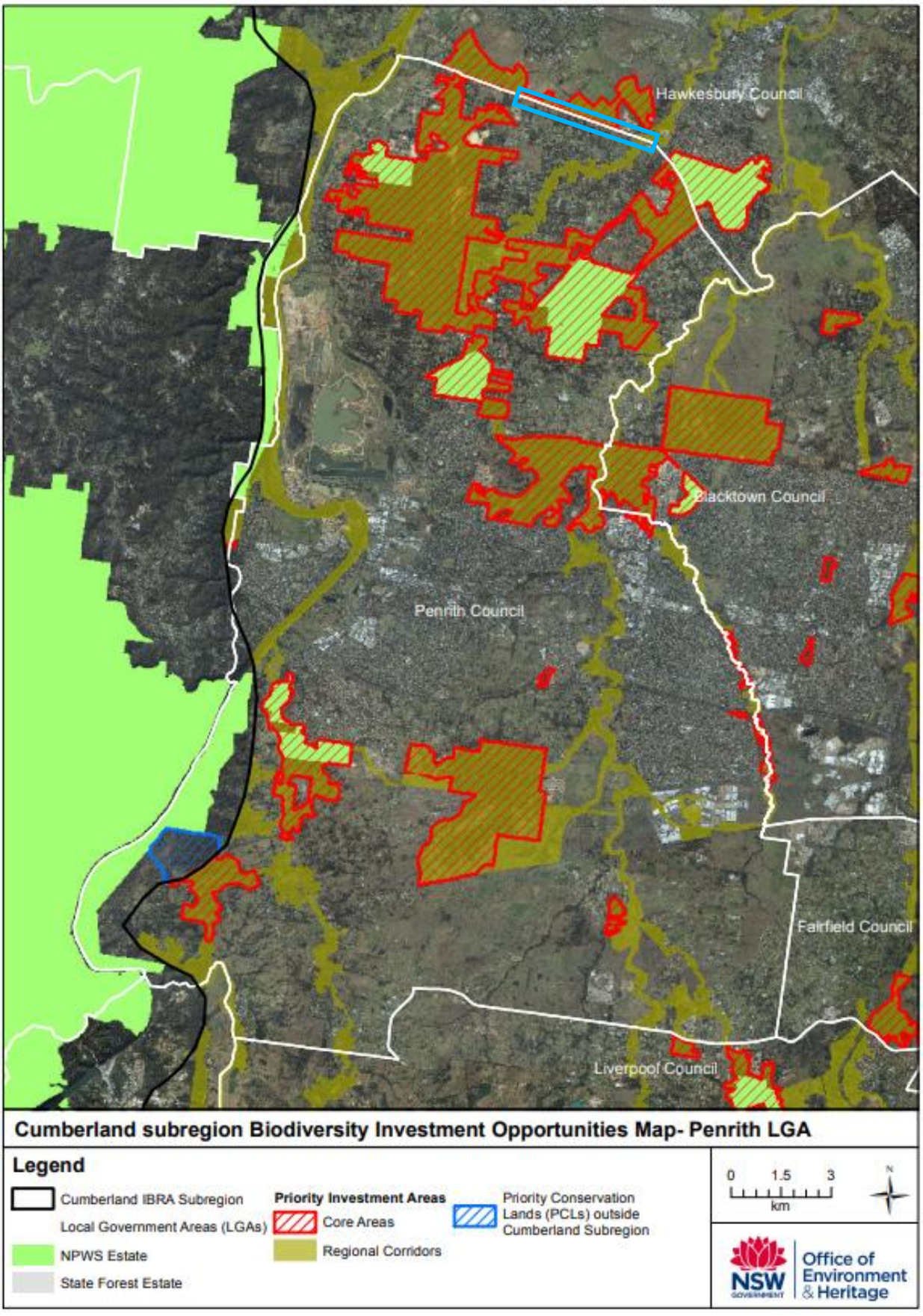

Figure 3-30 Biodiversity Investment Opportunities Map (OEH, 2015) (the Blue Rectangle presents the approximate location of the Project)

3.10. SEPPs

3.10.1. Coastal management areas identified by the Resilience and Hazard SEPP 2021

The Resilience and Hazard SEPP identifies specific areas as 'coastal wetland area' and 'proximity to coastal wetlands' and applies special provisions for activities proposed on these areas. The proximity to the coastal wetlands buffer occurs approximately 85 metres to the north of the Project REF boundary along the Driftway, approximately 350m east of Luxford Road intersection. The proximity to this area hasn't changed in relation to the proposed modification, see Figure 3-31.

The boundary extension on the western edge of the Driftway, as a result of the proposed modifications, will reduce the distance between the works and another identified coastal wetland approximately 270m to the west of the western extent of the Addendum REF Boundary see Figure 3-31. However, the works will not encroach on the wetland's proximity buffer zone, maintaining a 270m distance. The wetlands are not considered to be directly impacted by the construction or operation of the Project and Proposed Modifications due to the significant distance between the project and the mapped wetland, see Figure 3-31.

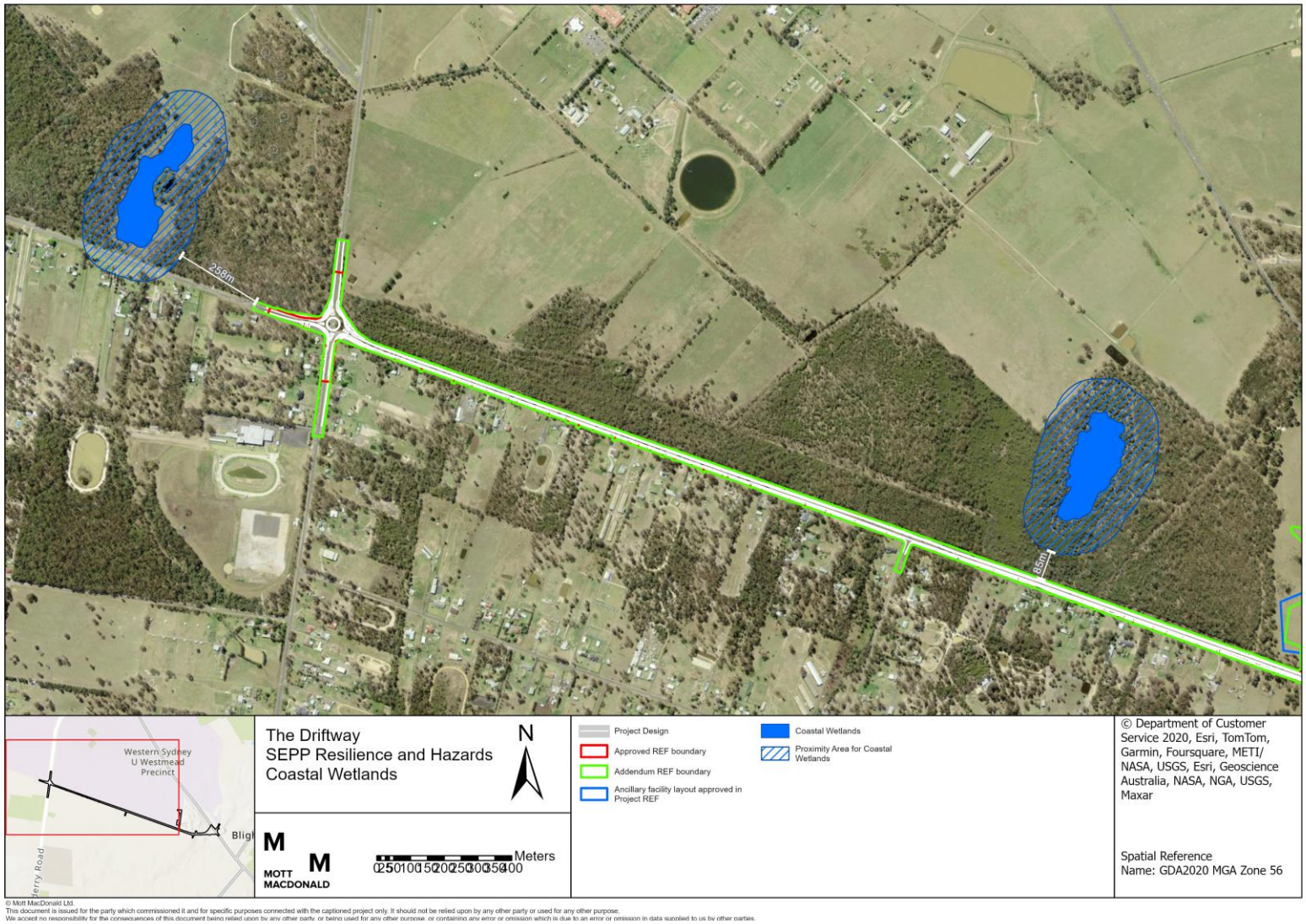

Figure 3-31 Mapped Coastal Wetlands (Hazard and Resilience SEPP 2021)

3.10.2. Core koala habitat identified under Chapter 4 of the Biodiversity and Conservation SEPP 2021

The Proposed Modifications area includes portions within the Hawkesbury LGA which is a listed local government area that Chapter 4 of the SEPP applies to. However, the provision under Chapter 4 of this SEPP only applies to development applications under Part 4 of the EP&A Act. Given this assessment is undertaken under Part 5 of the EP&A act the SEPP does not apply.

3.11. Matters of national environmental significance

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on 'matters of national environmental significance' undergo an assessment and approval process. Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Minister for the Environment.

This section identifies the Matters of National Environmental Significance (MNES) that are of relevance to the study area. An Assessment of Significance for each of these is provided in Appendix D:. The following discussion considers relevance of MNES.

Four TECs were identified in the Project REF and Addendum REF Boundary as potentially meeting the listing criteria under the EPBC Act and considered as MNES:

- *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (critically endangered)*
- *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion (critically endangered)*
- *River-Flat Eucalypt Forest on Coastal Floodplains of southern NSW and eastern Victoria (critically endangered)*
- *Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion (endangered).*

The Project BAR included an assessment aimed to confirm the presence of this community in the project boundary through desktop searches and field surveys. This involved a review of the Approved Conservation Advice for each community for correlation with the study area. Where a comparable vegetation type was identified further, consideration of key diagnostic characteristics and condition thresholds was assessed. The assessment of listing criteria for each TEC is presented in Section 3.9 of the Project BAR.

Only one TEC, *Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion* was identified as being consistent with the listing criteria. This TEC corresponds to Veg. Zone 6. There are no additional areas that correspond to Veg. Zone 6 within the additional areas to be impacted by the Addendum REF. See Figure 3-32 and Figure 3-33.

3.11.1. Threatened Species

Two threatened flora species listed as vulnerable under the EPBC Act have been considered moderately likely to occur within the Project REF and Addendum REF Boundary:

- *Pultenaea parviflora*
- *Acacia pubescens* (Downy Wattle).

There is potential habitat for these species to occur within PCT 724, PCT 725 and PCT 883 for *Pultenaea parviflora* and PCT 724, PCT 725, PCT 849 and PCT 883 for *Acacia pubescens*. A discussion assessing the suitability of available soil types and PCTs in the study area for these threatened species is available in Section 3.9.2 of the Project BAR.

Three threatened fauna species listed under the EPBC Act are considered moderately likely to use the habitats in the study area for foraging: The Swift Parrot (listed as critically endangered), the Grey-headed Flying-fox (listed as vulnerable) and the Large-eared Pied Bat (listed as vulnerable). There were no threatened species identified which were likely to have breeding habitat within the study area.

Assessment of Significance for these species are provided in Appendix D:.

3.11.2. Migratory species

Nineteen terrestrial migratory bird species were identified in the EPBC Act Protected Matters Search Tool as potentially occurring in the locality based on the distributional range of the species and modelled habitat. These migratory species

(excluding those found in aquatic habitat), along with their preferred habitat requirements and an assessment of their likely presence in the study area are listed in Appendix B:. There were no migratory bird species identified to be moderately likely, or higher, to occur within the Project REF and Addendum REF Boundary.

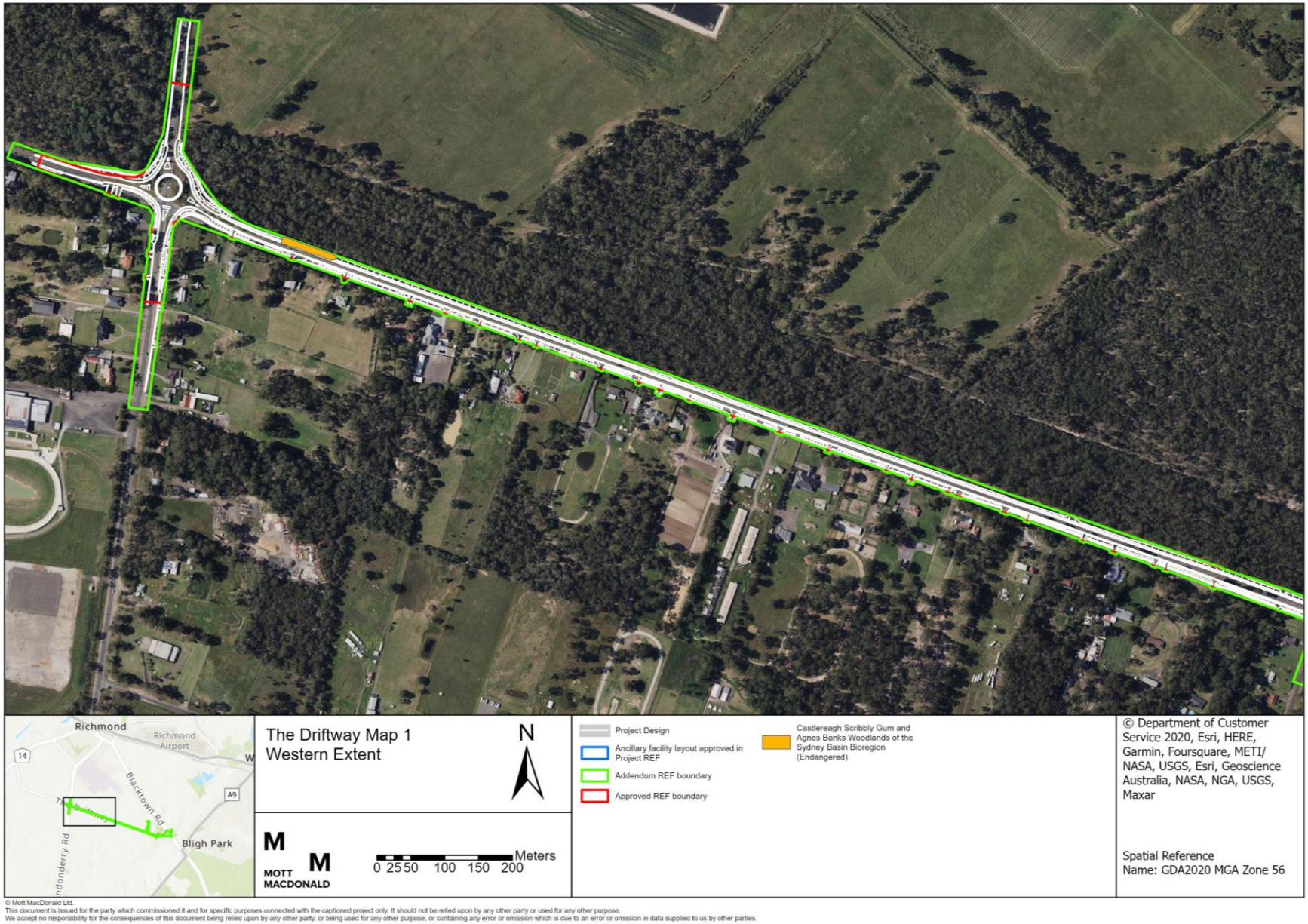

Figure 3-32 MNES list TECs

Figure 3-33 MNES list TECs

4. Avoidance and minimisation

A key part of Transport's management of biodiversity for these Proposed Modifications are the application of the 'avoid, minimise, mitigate and offset' hierarchy as follows:

1. Avoid and minimise impacts.
2. Mitigate impacts.
3. Offset impacts in accordance with Transport guidelines.

Section 4 of the Project BAR presents the avoidance and minimisation actions undertaken during the concept design of the Project.

This Addendum BAR is required to assess the additional impacts of the detailed design process for the Project. This section will discuss the actions undertaken during the detailed design process to avoid and minimise impacts to biodiversity. Actions will be discussed in relation to each specific design change, see Table 4-1.

It should be noted a range of proposed design changes identified by stakeholders were not considered due to the potential additional impacts on native vegetation and biodiversity values.

Table 4-1 Design changes and actions taken to avoid and minimise impacts to biodiversity

Design components extending beyond the Project REF Boundary	Actions taken to avoid impacts	Actions taken to minimise impacts
The additional southbound lane at the Londonderry Road / Driftway Roundabout and tie in works to accommodate this change. The required tie-ins extend beyond the Project REF Boundary.	The additional work at the roundabout was designed to be within the Project REF boundary but the additional tie-in related to the additional lane required additional impacts.	Additional impacts are located in areas where the native vegetation/threatened species habitat is in low condition.
Tie in works required for the realignment of the Driftway's western end at Blacktown Road. This is beyond the Project REF boundary.	Same as above.	Same as above.
Adjustment of driveways along Londonderry Road and the Driftway including a 2 m buffer for the movement of construction vehicles. Including new driveway tie-ins for the Turtle Landscape business on the corner of Racecourse and Blacktown Road.	The additional area of impact associated to construct tie-ins has been kept to a small 2m buffer around the driveway tie-ins to avoid impacts on vegetation.	Existing mitigation measures such as preparation of a Flora and Fauna Management Plan would ensure the retention of vegetation in these locations where ever possible.
An additional access track from Blacktown Road to Rickabys Creek tributary as the bridge crossing the creek has been removed from the design.	The extended maintenance access track from Blacktown Road has been located to enable the least impact while still providing the necessary infrastructure.	Additional impacts are located in areas where the native vegetation/threatened species habitat is in low condition.
Adjustment of the ancillary facility's layout to avoid areas mapped to have high flood potential. This has increased the area of vegetation required to be cleared from 1.9 ha to 2.0 ha.	Adjustments to the Ancillary Facility would avoid impacts against three paddock trees previously identified. However, the adjusted Ancillary Facility would now impact two different paddock trees.	Existing mitigation measures such as preparation of a Flora and Fauna Management Plan would minimise the impacts to other species within the ancillary facility.

5. Impact assessment

The Proposed Modifications likely to have direct and indirect impacts on biodiversity are summarised in this chapter. The direct impacts from the Proposed Modifications have been calculated using the Project REF and Addendum REF boundary as the extent of construction. The indirect impacts are discussed and the potential for indirect impacts on biodiversity values is considered low given that much of the adjoining lands, excluding the remnant vegetation along the northern boundary, are already cleared and modified and highly fragmented, as well as bordered by existing roads and barriers. The following potential impacts of the Proposed Modifications have been assessed:

- Construction impacts:
  - removal of native vegetation
  - removal of threatened fauna habitat
  - removal of threatened flora
  - aquatic impacts
  - injury and mortality
  - groundwater dependent ecosystems
- Indirect and operational impacts:
  - edge effects on adjacent native vegetation and habitat
  - wildlife connectivity and habitat fragmentation
  - injury and mortality
  - invasion and spread of weeds
  - invasion and spread of pests
  - invasion and spread of pathogens and disease
  - noise, light, dust, and vibration
- Cumulative impacts

5.1. Construction direct impacts

5.1.1. Removal of native vegetation

Field surveys were undertaken to ground-truth the desktop assessments of vegetation communities and to perform habitat assessments for the study area to determine the extent of vegetation affected by the Project and Proposed Modifications. The Proposed Modifications would directly impact 0.216 hectares of native vegetation. The cumulative total of impacts on native vegetation associated with the Project REF and Addendum REF is approximately 5.876 hectares. Direct impacts to PCTs, BC Act and EPBC Act listed TECs are provided in Table 5-1, as well as impacts associated with the Project REF and cumulative total of impacts.

Table 5-1 Vegetation impacts

Veg. zone	PCT	Condition	BC Act	EPBC Act	Area of impact Project REF (ha)	Area of impact Addendum REF (ha)	Total impact area (ha)
1	724	Low	Shale Gravel Transition Forest in the Sydney Basin Bioregion EEC	-	0.51	0.001	0.511

Veg. zone	PCT	Condition	BC Act	EPBC Act	Area of impact Project REF (ha)	Area of impact Addendum REF (ha)	Total impact area (ha)
2	725	Low	Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion EEC	-	0.20	0.000	0.200
3	835	Low	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC	-	0.37	0.066	0.436
4	849	Moderate	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC	-	0.45	0.077	0.527
5		Low	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC	-	2.96	0.050	3.01
6	883	Moderate	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion VEC	Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion EEC	0.08	0.000	0.080
7		Low	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion VEC	-	1.09	0.022	1.112
Total					5.66	0.216	5.876

5.1.2. Removal of threatened fauna habitat

The extent of native vegetation clearing estimated to result from the Proposed Modifications are outlined above in Section 5.1.1. This vegetation, with the addition of planted trees, provides suitable habitat for a range of threatened fauna species listed under the BC Act and EPBC Act. Table 5-2 presents fauna species that have been identified through the habitat assessment presented in Appendix B: as having a moderate or high potential of occurring within the study area. This has been informed by the field survey, known ranges of species and the presence of the appropriate habitat features for specific species.

As such, direct impacts through loss of habitat for threatened fauna species (although it is only moderate to low quality) would occur during construction. A summary of the direct impacts of the Proposed Modifications to habitat for threatened fauna is provided in Table 5-2.

A discussion of key habitat features impacted by the Proposed Modifications and key threatening processes (KTPs) with potential to be exacerbated is provided below.

Table 5-2: Summary of direct impacts on threatened fauna and habitat

Species name	EPBC Act	BC Act	Species Credit	Ecosystem Credit	Associated habitat in subject land	Area of impact Project REF (ha)	Area of impact Addendum REF (ha)	Total impact area (ha)
					Threatened bird species			
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	-	V		Yes	Foraging habitat including mature and native tree species. Impact has been calculated by the area of associated PCTs impacted within the Project REF and Addendum REF Boundary including PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883. No breeding habitat was identified within the Project REF and Addendum REF Boundary.	5.66	0.216	5.876
Little Lorikeet (*Glossopsitta pusilla*)	-	V		Yes				
Swift Parrot (*Lathamus discolor*)	CE	E	Yes	Yes				
Little Eagle (*Hieraaetus morphnoides*)	-	V	Yes	Yes				
Varied Sittella (*Daphoenositta chrysoptera*)	-	V		Yes				
					Threatened nectarivore/fungivore bat			
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	V	Yes	Yes	Foraging habitat including mature and native tree species. Impact has been calculated by the area of associated PCTs within the Project REF and Addendum REF Boundary, including PCT 724, PCT, 725, PCT 835, PCT 849 and PCT 883. Non-native vegetation and native plantings within the development footprint may also provide habitat for the Grey-headed Flying-fox. No roosting camps are present within the Project REF and Addendum REF Boundary.	5.66	0.216	5.876

Species name	EPBC Act	BC Act	Species Credit	Ecosystem Credit	Associated habitat in subject land	Area of impact Project REF (ha)	Area of impact Addendum REF (ha)	Total impact area (ha)
					Threatened Insectivorous bats (cave-roosting)			
Large Bent-winged Bat (*Miniopterus orianae oceanensis*)	V	V	Yes	Yes	Foraging habitat including mature and native tree species. Impact has been calculated by the area of associated PCTs within the Project REF and Addendum REF Boundary, including PCT 724, PCT, 725, PCT 835, PCT 849 and PCT 883. Culverts are available for potential roosting for the following species: • Large Bent-winged Bat (*Miniopterus orianae oceanensis*) • Little Bent-wing Bat (*Miniopterus australis*) • Southern Myotis (*Myotis macropus*)	5.66	0.216	5.876
Little Bent-wing Bat (*Miniopterus australis*)	-	V	Yes	Yes				
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	-	V		Yes				
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	-	V		Yes				
Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)	-	V		Yes				
Southern Myotis (*Myotis macropus*)	-	V	Yes					
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	Yes					
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	-	V		Yes				

Species name	EPBC Act	BC Act	Species Credit	Ecosystem Credit	Associated habitat in subject land	Area of impact Project REF (ha)	Area of impact Addendum REF (ha)	Total impact area (ha)
					Threatened invertebrates			
Cumberland Plain Land Snail (*Meridolum corneovirens*)	E	-	Yes		Foraging and breeding habitat within the Project REF and Addendum REF Boundary, including PCT 724, PCT, 725, PCT 835, PCT 849 and PCT 883.	5.66	0.216	5.876

Key habitat features

Key Habitat features are components of the environment that provide specific resource to fauna that inhabit an area. This can include habitat trees containing hollows, bush rock, caves, large logs and water bodies. Much of the vegetation subject to removal as a result of the Proposed Modifications was assessed as being of moderate to low condition and did not include key habitat features. No identified breeding habitats are being removed for any of the threatened fauna species identified as likely to occur in the area. Surveys did not identify any significant tree hollows or stick nests that would provide roosting or breeding habitat.

However, it should be noted that road culverts have potential to provide roosting habitats for threatened microbat species such as the Southern Myotis (*Myotis macropus*), Little Bent-winged Bat (*Miniopterus australis*) and Large Bent-winged Bat (*Miniopterus orianae oceanensis*).

The removal of ground cover throughout the amended Proposed Modifications boundary may impact the occurrence of the Cumberland Plain Land Snail in the area, however surveys found that the area to be impacted does not include the woody debris that forms this species breeding habitat.

While the loss of native vegetation would reduce the amount of foraging and general habitat by a small amount, when compared to the larger and higher quality vegetation remnants in the locality, the vegetation to be cleared is not considered as important for the long-term survival of these species.

Mitigation measures identified in Table 6-1 would further minimise the impacts of threatened fauna habitat removal.

Key Threating Processes

A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten the survival or evolutionary development of species, populations or an ecological community. KTPs are listed under the BC Act, FM Act and EPBC Act.

The Proposed Modifications may directly or indirectly have a high likelihood of contributing to the KTPs identified in Table 5-3. The project would have a moderate-low likelihood of directly or indirectly contributing to KTPs listed under the BC Act, FM Act and EPBC Act that are not identified in Table 5-3. Standard mitigation measures would be implemented to further reduce the chances of those KTPs occurring.

Table 5-3 Key threatening processes

Relevant Key Threatening Process	BC Act, EPBC Act, FM Act	Relevance of the KTP to the Proposed Modification
Clearing of native vegetation	BC Act, EPBC Act	The Proposed Modification requires the clearing of native vegetation. Clearing would be minimised as far as practicable.
Importation of Red Imported Fire Ants *Solenopsis invicta*	BC Act, EPBC Act	Importation of fill and use of dirty construction equipment has potential to introduce Red Imported Fire Ants *Solenopsis Invicta* into the locality. This can be mitigated through checking the provenance of imported fill and ensuring hygiene protocols are adhered to for construction equipment. In recent times the importance of this KTP has increased. In January 2024 A Biosecurity (Fire Ant) Emergency Order was put in place for the whole state of NSW due to identification of nests near the NSW border. This emergency order provides guidance on the use and procurement of equipment and construction materials that would be required for the scope of works outlined in the AREF. Therefore, any procurement and import of sensitive construction materials must align with guidance outlined in *the Biosecurity (Fire Ant) Emergency Order (No 1) 2024 under the Biosecurity Act 2015* (DPI, 2024).

5.1.3. Removal of threatened flora

For this Addendum BAR the same approach to assessing impacts on threatened flora has been undertaken as the Project BAR. It was assessed that the Project REF would have impacts on populations of *Dillwynia tenuifolia* within the Project boundary. During the assessment process the entirety of the *Dilwynia tenuifolia* area of occupancy was identified and mapped, this is presented in Figure 5-1. The identification of the area of occupancy was informed by targeted field surveys within the REF Boundary and outside of it to ground truth the known extent of the population as reported in the biodiversity stewardship site assessment report (BSSAR) (Niche Environment and Heritage, 2021). A detailed methodology for identification of the area of occupancy is presented in Section 2.4.3 of the Project BAR.

The Proposed Modifications are located in areas outside of the identified area of occupancy, see Figure 5-1. In addition, no *Dillwynia tenuifolia* were identified within the area of the Proposed Modifications during the Addendum BAR field survey. As such it has been assessed that there is no additional impacts on *Dillwynia tenuifolia* as a result of the Proposed Modifications.

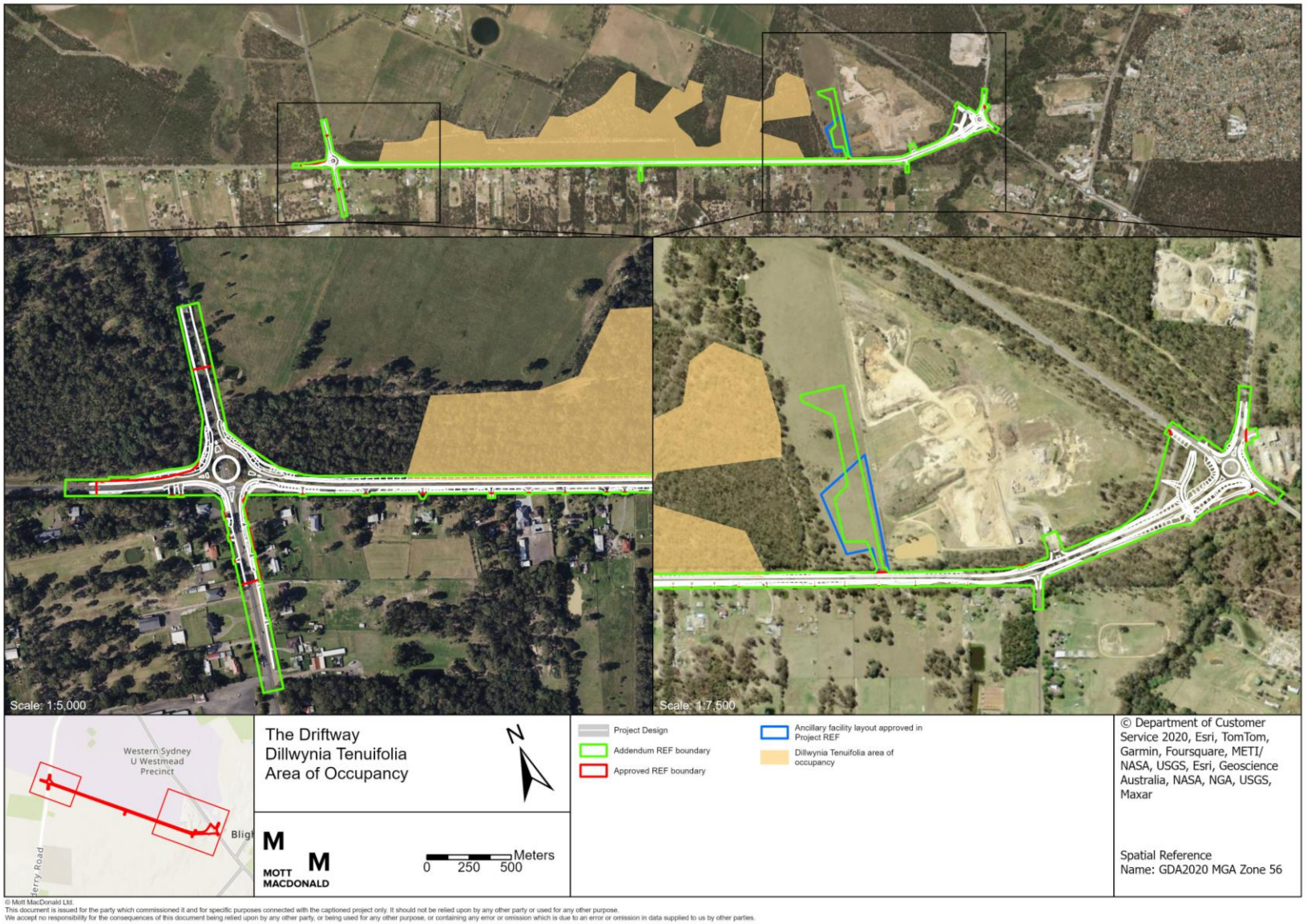

Figure 5-1 Occurrence of *Dillwynia Tenufolia*

5.1.4. Aquatic impacts

Section 5.1.4 of the Project BAR discusses the potential of the Project to impact on threatened fish species and aquatic habitat. The assessment found that no threatened fish are likely to occur and drainage improvements would result in road runoff not having a demonstrable impact on the aquatic ecology. These findings also apply to the Proposed Modifications as the Proposed Modifications are not located within waterfront land, defined by the Water Management Act 2000 as being within 40m of the top of bank of a watercourse, as such no additional consideration of aquatic impacts to biodiversity is considered for the Addendum BAR.

Section 3.10.1 of this report discusses the proximity of the boundary extension, as a result of the Proposed Modifications, to mapped coastal wetlands under the Resilience and Hazard SEPP. The boundary extension on the western edge of the Driftway, as a result of the Proposed Modifications, will reduce the distance between the works coastal wetland, however a 270m buffer will maintain. The wetlands are not considered to be directly impacted by the construction or operation of the Project and Proposed Modifications due to the significant distance between the project and the mapped wetland, see Figure 3-31.

5.1.5. Injury and mortality

Section 5.1.6 of the Project BAR discussed the potential of injury and mortality of fauna during construction activities. The potential impacts associated with the Addendum REF are consistent with those identified in the Project REF, additionally there is no change in construction methodology that would change the potential of the identified impacts to occur.

Mitigation measures have been provided in Section 6 of the Project BAR to reduce the potential for fauna injury and mortality to occur. There are no additional mitigation measures as a result of the Proposed Modifications.

5.1.6. Groundwater dependent ecosystems

Section 5.1.5 of the Project BAR found that the Project is not considered likely to intersect groundwater during construction given the shallow excavation required for the flood offset area, and existing drainage and the amount of filling required for the road construction. The extended project boundary associated with the Addendum REF is also not likely to intersect groundwater during construction, additionally there are no changes to the construction methodologies that would change the potential impacts that would occur as a result of the Proposed Modifications. Further, there are no mapped aquatic or subterranean GDEs within the Project REF or Addendum REF boundary.

5.2.Indirect and operational impacts

Section 5.2 of the Project BAR discusses indirect and operational impacts of the Project. The Proposed Modifications are not considered to cause any adjustment to the previously identified indirect and operational impacts as the Proposed Modifications would still be constructed and operated in the same manner as stipulated in the Project BAR. A summary of the assessment for the Project BAR is provided under the headings below.

5.2.1. Edge effects on adjacent native vegetation and habitat

Edge effects are described as changes to ecosystem functioning that occur as a result of sudden and artificial edges, increased light from the existing roadways, previous agricultural land use practices and urban development. The native vegetation surrounding the Driftway is currently subject to a high level of edge effect.

The vegetation patches are suffering from intense weed invasion and the habitats that would be impacted by the Proposed Modifications are edge habitats without any undisturbed core. As such, there is unlikely to be any further impacts from edge effects resulting from the Proposed Modifications as all vegetation is already suffering from edge effects in the form of weed invasion, increased light levels, increased wind speeds, and greater temperature fluctuations.

5.2.2. Wildlife connectivity and habitat fragmentation

Habitat fragmentation relates to the physical dividing up of once continuous habitats into separate smaller ‘fragments’ (Fahrig, 2002). Further habitat fragmentation is unlikely to occur from the Proposed Modifications as the work would largely involve removing vegetation from patch edges, in the road reserve, rather than breaking apart large blocks of vegetation into many smaller patches.

The introduction of highway barriers within the Addendum REF boundary is unlikely to impact wildlife connectivity across the Driftway. The barriers erected will have limited impacts on the mobility of fauna as a result of the raised structure of the

barriers that allow space for fauna to pass underneath. As such, no barrier effects are expected beyond what already exists as a result of the existing road.

Isolation of habitats is likely to increase by a small extent as the distance between patches on either side of road would be increased. This increase is caused by the inclusion of an auxiliary turning lane, modification of driveway tie-ins, and new inclusion of an additional roundabout lane. However, functional habitat connectivity for more mobile species (birds, flying-foxes, insectivorous bats, insects, plants) is still present. The current roadways do not totally prevent fauna movement between habitat fragments (fauna can and likely do cross the road) but the roads do create a considerable hazard.

The predicted level of isolation from the Proposed Modifications are not likely to be enough to prevent the breeding and dispersal of plant pollinators or the dispersal of plant propagules (seed or other vegetative reproductive material) between habitat patches. Functional connectivity for many species would remain in the study area. However, local division of some wildlife populations, isolation of key habitat resources, loss of genetic interchange, and loss of population viability for some species may result.

This impact was assessed as being of low magnitude and no specific mitigation measures are required. The Proposed Modification would not change the potential impacts or mitigation measures identified in the Project BAR.

5.2.3. Injury and mortality

There is potential for fauna mortality to occur during the operation of the Project through vehicle collision (roadkill). Vehicle collision is a direct impact that reduces local population numbers. Mammals, reptiles, amphibians and birds are all at risk of vehicle strike. As there are no definitive data on current rates of roadkill or fauna population densities in the study area, the consequences of vehicle strike on local populations is unknown.

The Project BAR found that a significant increase in roadkill is unlikely to occur. The impact on threatened species is expected to be minimal. The Project BAR found that data from other roadways in the locality, that most vehicle strike impacts can be expected to occur to common birds and mammals such as possums and exotic animals including foxes.

The proposed modification would not change the potential impacts or mitigation measures identified in the Project BAR.

5.2.4. Invasion and spread of weeds

Three species are listed as Weeds of National Significance (WONs) were identified within the Project REF and Addendum REF Boundary. Under the Biosecurity Act, land managers are required to follow the regional and non-regional duties which have been allocated to each Priority Weed. The WONs recorded within the Project REF and Addendum REF Boundary include:

- *Asparagus aethiopicus* (Ground Asparagus)
- *Lantana camara* (Lantana)
- *Rubus fruticosus* (Blackberry).

Proliferation of weeds is considered likely to occur during construction and operation, although impacts would be greatest because of vegetation clearing during the construction phase. The most likely causes of weed dispersal and importation associated with the Proposed Modifications include earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery during all phases. The study area contains significant weed growth and no undisturbed weed free habitat exists. Weeds should be managed during and post-construction to ensure potential for weed incursions into surrounding intact native vegetation is minimised.

Mitigation measures designed to limit the spread and germination of weeds are provided in Section 6 of the Project BAR and would be applied to the additional areas impacted by the Addendum REF. The Proposed Modification would not change the potential impacts or mitigation measures identified in the Project BAR.

5.2.5. Invasion and spread of pests

The Project BAR identified the Study area as providing habitat for rabbits. In addition, Western Sydney University have produced a Pest Management Plan that has identified the following pest animal species as a potential threat within the Greater Sydney area:

- Wild dogs
- Feral pigs

- Foxes
- Feral cats
- Wild deer
- Feral goats
- Common Myna
- Common Carp
- Cane Toads

Activities from the Proposed Modifications have the potential to disperse pest species out of the project boundary across the surrounding landscape, but the magnitude of this impact would be low and mitigation measures are not deemed necessary. The proposed modification would not change the potential of the impacts or mitigation measures identified in the BAR.

A Biosecurity (Fire Ant) Emergency Order was put in place in January 2024 for the whole state of NSW, as a result of nests being detected within proximity of the state border. This emergency order provides guidance on the use and procurement of equipment and construction materials that would be required for the scope of works outlined in the Addendum REF. Therefore, any procurement and import of sensitive construction materials must align with guidance outlined in *the Biosecurity (Fire Ant) Emergency Order (No 1) 2024 under the Biosecurity Act 2015* (DPI, 2024).

5.2.6. Invasion and spread of pathogens and disease

Several pathogens known from NSW have potential to impact on biodiversity as a result of their movement and infection during construction. Common types of pathogens and disease that may be relevant to a road Proposed Modifications include:

- Phytophthora (*Phytophthoraacropusci*).
- Myrtle Rust (*Austropuccinia psidii*).
- Chytrid Fungus (*Batrachochytrium dendrobatidis*).

Pathogens can reduce the health of vegetation communities and lead to the death of infected plants. During the field survey there was no evidence of pathogens or other diseases within the Project REF and Addendum REF Boundary. The most likely causes of pathogen dispersal and importation associated with the Proposed Modifications include earthworks, movement of soil, and attachment of plant matter to vehicles and machinery.

Mitigation measures designed to limit the introduction of pathogens are provided in Section 6 of the Project BAR and would be applied to the additional areas impacted by the Addendum REF. The Proposed Modification would not change the potential of the impacts or mitigation measures identified in the BAR.

5.2.7. Noise, light, dust and vibration

Considering the existing environment, the operation of the Project and Proposed Modifications is unlikely to have significant noise, light and dust impacts on biodiversity values. However, there are potential for impacts to common fauna within the locality from noise and vibration during construction, which may result in fauna temporarily avoiding habitats next to the construction area, however the existing traffic noise is likely to be significant deterrent to most fauna groups already. The magnitude of this impact would be low and mitigation measures are not deemed necessary.

Construction lighting required during night work has potential to impact nocturnal fauna. Common nocturnal species such as possums and microbats may avoid the habitat in the study area during construction as temporary ‘daylight’ conditions could be created by construction lighting. However, this impact is considered temporary and would not have long lasting effects on the biodiversity values. As such no additional mitigation measures have been provided.

5.3. Cumulative impacts

This section of the report provides an analysis of the contribution of the combined Project and Proposed Modifications to ecological impacts in a local and regional context in relation to other developments occurring. This includes the impact of other Transport proposals, major proposals and other large-scale proposals. Quantitative details have been provided where information is readily available (i.e., published).

Table 5-4 presents a list of projects and the cumulative impacts of the projects by considering the impact of vegetation and habitat removal, impacts on threatened species and ecological communities.

Table 5-4: Known project/proposals

Project/proposal	Proximity to the Project	Biodiversity value impacted	Project Status
Centre of Excellence in Agricultural Education at Richmond	800 m to the north	Removal of 4.76ha of low quality PCT 835.	Under construction
Rezoning of the Kellyville Precinct	22 km to the east	5.42 ha of vegetation from threatened ecological communities and 1.93 ha of riparian corridor vegetation to be cleared	Rezoning completed
M4 Smart Motorway	17 km to the south	3.82 hectares of remnant vegetation to cleared	Stage 1 of construction has been completed
Great Western Highway and Reservoir Road intersection upgrade, Blacktown	25 km to the south east	0.48 hectares of threatened ecological communities to be cleared	Project completed

When considered together, these projects combine to remove approximately 16.41 hectares of remnant native vegetation from the Cumberland Plain. This is a large cumulative impact in terms of the over-cleared landscape of the region. The impacts from the Project REF and Addendum REF add 5.876 hectares of vegetation clearance to the region-wide vegetation clearance that has occurred across the Cumberland Plain.

However, the vegetation to be impacted is in a low to moderate condition, along the existing road verge with large areas of exotic species. There are larger areas of intact native vegetation directly adjacent to the Project and there a range of regional and national parks within the regional context that provided higher quality habitat potential. As such, the proposed vegetation clearance is not considered to significantly impact the regional landscape or this community. The areas of higher quality vegetation that require clearing have been minimised to reduce the impact of edge effects and severing any corridors. Further, an area north of the Proposed Modifications area has been established as a Biodiversity Stewardship Site that will maintain the integrity and conservation of key vegetation areas surrounding the Project and Proposed Modifications area.

In addition to the above, the Hawkesbury-Nepean Road Resilience Program is going through the concept design phase to upgrade roads in proximity to the Project. All improvements are located around existing roads but have potential to impact to Biodiversity values. Figure 5-2 presents the location of proposed improvements as part of this program. Other projects have been identified in the area surrounding the Project and are in various stages of planning:

- Garfield Road East at Riverstone for widening and duplication works as a key evacuation route
- Pitt Town Bypass
- Richmond Road between Townson Road and the M7
- New Richmond Bridge stage 2

The projects listed above have not been included in the table as the potential impact associated with these has not yet been assessed.

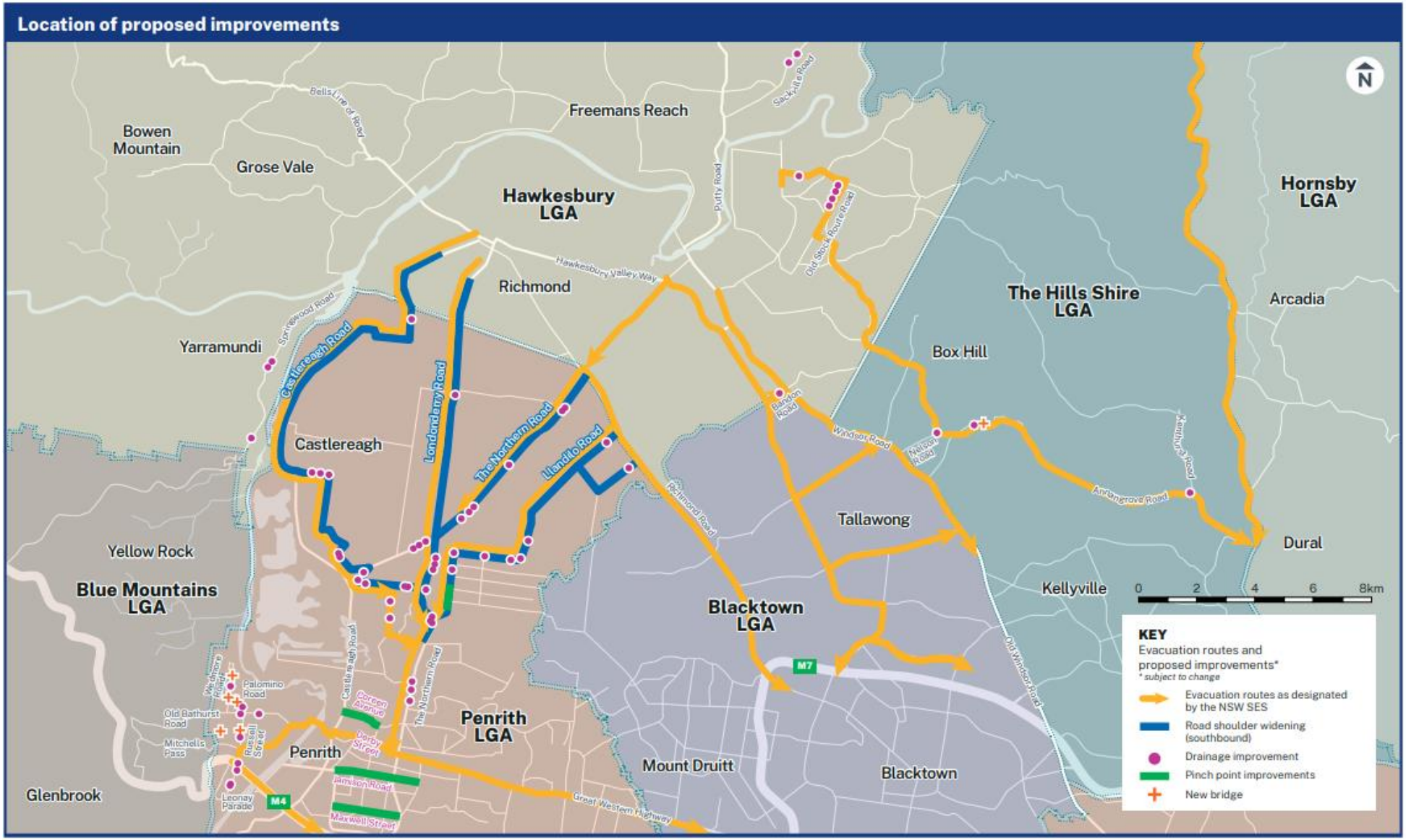

Figure 5-2 Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program

5.4. Assessments of significance

Assessments of significance have been undertaken for each threatened species, population or ecological community that have been recorded in the study area or are assumed present as they have a moderate to high likelihood of occurrence, see Appendix C:. These assessments have taken a holistic approach by considering the additional impacts of the Proposed Modifications, as well the previously assessed impact areas associated with the Project REF. For consistency, the same reference areas, reports, and research articles from the Project BAR have been utilised for these revised assessments.

Section 7.3 of the BC Act outlines the 'test of significance' that is to be undertaken to assess the likelihood of significant impact upon threatened species, populations or ecological communities listed under the BC Act. These tests of significance have been undertaken in accordance with the guidelines provided in the *Threatened Species Test of Significance Guidelines* (Office of Environment and Heritage, 2018), which outlines a set of guidelines to help applicants/proponents of a development or activity with interpreting and applying the factors of the assessment process.

The results of the Assessments of Significance under the BC Act concluded that the cumulative impact of the Project REF and Addendum REF are unlikely to significantly impact any of the threatened entities. Species have been grouped into a single assessment where the species share similar life history characteristics and habitat requirements (e.g., threatened woodland birds, cave-roosting microbats, large forest owls, etc.). A summary of the assessments for these species are provided in Table 5-6.

For threatened biodiversity listed under the EPBC Act, significance assessments have been completed in accordance with *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of Environment, 2013). The conclusions of the assessments under the EPBC Act are provided in Table 5-6. The results of the Assessments of Significance under the EPBC Act concluded that the cumulative impact of the Project REF and the Addendum REF are unlikely to significantly impact any of the threatened entities.

Table 5-5: Summary of BC Act significance assessments findings

Significance assessment question *(per Section 7.2 of the BC Act and Threatened Species Test of Significance Guidelines (OEH 2018))*						
Threatened species, or communities	a	b	c	d	e	Likely significant impact?
Threatened Ecological Communities						
Cumberland Plain Woodland in the Sydney Basin Bioregion	x	N	N	N	Y	No
Shale Gravel Transition Forest in the Sydney Basin Bioregion	x	N	N	N	Y	No
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	x	N	N	N	Y	No
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	x	N	N	N	Y	No
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	x	N	N	N	Y	No
Threatened Flora						
Dillwynia tenuifolia	N	x	Y	N	Y	No
Pultenaea parviflora	N	x	Y	N	Y	No
Acacia pubescens (Downy Wattle)	N	x	Y	N	Y	No
Grevillea juniperina subsp. juniperina (Juniper-leaf Grevillea)	N	x	Y	N	Y	No
Nectarivore/frugivore bat						
Grey-headed Flying-fox (*Pteropus poliocephalus*)	N	x	Y	N	Y	No
Insectivorous bats						

Large Bent-winged Bat (*Miniopterus orianae oceanensis*)	N	x	Y	N	Y	No
Little Bent-wing Bat (*Miniopterus australis*)	N	x	Y	N	Y	No
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	N	x	Y	N	Y	No
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	N	x	Y	N	Y	No
Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)	N	x	Y	N	Y	No
Southern Myotis (*Myotis macropuss*)	N	x	Y	N	Y	No
Large-eared Pied Bat (*Chalinolobus dwyeri*)	N	x	Y	N	Y	No
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	N	x	Y	N	Y	No
Invertebrates						
Cumberland Plain Land Snail (*Meridolum corneovirens*)	N	x	Y	N	Y	No

***Y** = Yes (negative impact), **N** = No (no or positive impact), **X** = Yes/No answer not applicable, **?** = unknown impact.*

Table 5-6: Summary of EPBC Act significance assessments findings

Threatened species, or communities	1	2	3	4	5	6	7	8	9	Important population *(per Significant Impact Guidelines 1.1 (DoE 2013))*	Likely significant impact?
Threatened Ecological Communities											
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion (Endangered)	y	N	N	N	N	N	Y	x	x	x	No
Threatened Flora											
Pultenaea parviflora	N	N	N	N	N	N	N	N	N	Yes	No
Acacia pubescens (Downy Wattle)	N	N	N	N	N	N	N	N	N	Yes	No
Threatened Fauna											
Swift parrot *(Lathamus discolor)*	N	N	N	N	N	N	N	N	N	Yes	No
Grey-headed Flying-fox (*Pteropus poliocephalus)*	N	N	N	N	N	N	N	N	N	Yes	No
Large-eared Pied Bat (*Chalinolobus dwyeri*)	N	N	N	N	N	N	N	N	N	Yes	No

***Y** = Yes (negative impact), **N** = No (no or positive impact), **X** = Yes/No answer not applicable, **?** = unknown impact.*

6. Mitigation

The additional works associated with the Proposed Modifications do not require further mitigation measures beyond what has been identified in the Submissions Report for the Project REF. Section 4 of the Project Submissions Report presents mitigation measures to be implemented during construction and operation to lessen the potential ecological impacts of the Project. The mitigation measures related to the Project and Proposed Modifications have been reproduced in Table 6-1 below for completeness and to ensure they are implemented during construction and operation. One additional mitigation measure has been included as a result of the Biodiversity (Fire Ant) Emergency Order (No 1) 2024 which has been highlighted in bold for clarity in Table 6-1.

Table 6-1 Summary of biodiversity environmental safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
B1	Removal of vegetation	A Flora and Fauna Management Plan will be prepared in accordance with *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011a) and implemented as part of the CEMP. It will include, but not be limited to: • Pre-clearing survey • Unexpected find procedure • Inductions • Vegetation removal protocols • Exclusion zones.	Contractor	Detailed design / Pre-construction
B2	Removal of vegetation	Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011b).* * Section 4.6.2 and Appendix B of the Urban Design Report (RBS1-MOTTM-NWW-LA-RPT-100001) presents a range of species to be replanted which are consistent with those within locally occurring PCT.	Contractor	Post-construction
B3	Removal of vegetation	Vegetation removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011c)	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B4	Removal of threatened species habitat and habitat features	Habitat will be replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bush rock and Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011d)	Contractor	Construction / Post-construction
B5	Unexpected finds	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011e) if Threatened Ecological Communities (TECs), threatened flora and fauna not assessed in the biodiversity assessment, are identified in the construction footprint	Contractor	Construction
B6	Induction	All personnel working on site will receive training to ensure awareness of requirements of the Flora and Fauna Management Plan and relevant statutory responsibilities during inductions. Site specific training will be given to personnel when working in the vicinity of areas with identified biodiversity values that are to be protected.	Contractor	Detailed design / Pre-construction
B7	Pre-clearance surveys	Pre-clearance surveys will be undertaken in accordance with *Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011f)	Contractor	Pre-construction
B8	Exclusion zones	Exclusion zones will be set up at the limit of clearing (the edge of the impact area) in accordance with *Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011g)	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B9	Aquatic habitat	Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines (RTA, 2011)* and Section 3.3.2 *Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013* (DPI (Fisheries NSW) 2013h)	Contractor	Construction
B10	Fauna injury	*Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines* (RTA, 2011i)	Contractor	Construction
B11	Weed and pathogens	Any soil or other materials imported to the site for use in restoration or rehabilitation will be certified free from weeds and pathogens or obtained from sources that demonstrate best practice management to minimise weed and pathogen risks.	Contractor	Construction
B12	Weed and pathogens	Pathogens will be managed in accordance with *Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011j)	Contractor	Construction
B13	Weed and pathogens	Weed species will be managed in accordance with *Guide 6: Weed management of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011k)	Contractor	Construction
B14	Pests	Procurement of construction materials identified as high risk will align with the guidance provided in the *Biosecurity (Fire Ant) Emergency Order (No 1) 2024* under the *Biosecurity Act 2015* (DPI, 2024). (See Section 5.2.5).	Contractor	Pre-construction / Construction

7. Offsets and other measures

Transport for NSW Guideline for Biodiversity Offsets (Roads and Maritime, 2016) was used to consider biodiversity offsets to compensate for impacts to threatened biodiversity resulting from the Project. As such for the additional areas of impact associated to the Addendum REF the same approach to offsetting would be undertaken as was undertaken for the Project BAR. The relevant triggers for offsetting thresholds met by the original Project, include:

- Works involving the clearing of 0.45 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion (listed critically endangered under the BC Act) in moderate condition
- Works involving the clearing of >1 hectares of NSW listed threatened species habitat where the species is a species credit such as Cumberland Plain Land Snail and *Dillwynia tenuifolia*
- Works involving the clearing of >5 ha of NSW listed threatened species habitat that are ecosystem credit species.

Vegetation that has been categorised as low condition does not require offsetting.

To avoid offset duplication, once a particular area of threatened ecological community or threatened species habitat has been considered for offsets that area cannot be counted again with a different threatened ecological community or threatened species habitat.

The Addendum BAR identified that the Proposed Modifications are not likely to have a significant impact on threatened biodiversity listed under the NSW BC Act or the EPBC Act and therefore no like-for-like offsets for MNES are required.

7.1. Preliminary offset calculations

Table 7-1 presents the residual impacts associated with the area of impact for the Project REF and Addendum REF. For the purpose of this section the cumulative total of the Project REF and Addendum REF will be discussed. According to Transport guidelines for offset ratios, a suitable offset for the loss of 0.527 hectares of the critically endangered ecological community Cumberland Plain Woodland, would be a 4:1 ratio, or 8:1 where offset sites are in a poor condition. This would result in an offset requirement of 2.108 hectares for the Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC in moderate to good condition.

The direct impact to species credit species habitat for the Cumberland Plain Land Snail is a loss of 5.349 hectares. A suitable offset for this loss would be at a ratio of 3:1 and would result in an offset requirement of 16.047 hectares. As stated above, to avoid offset duplication, once a particular area of threatened ecological community or threatened species habitat has been considered for offsets that area cannot be counted again with a different threatened ecological community or threatened species habitat, and therefore does not require to be offset twice. .

The direct impact to ecosystem credit species habitat is 5.349 hectares. A suitable offset for this loss would be at a ratio of 3:1 and would result in an offset requirement of 16.047 hectares.

There is no changes to the direct impact on *Dillwynia tenuifolia* from the Proposed Modification and as such there is no change to the required offsetting for this species.

These totals and breakdowns between the Project REF and Addendum REF are presented in Table 7-2.

Table 7-1 Biodiversity residual impacts

Veg. zone / Condition	PCT	Threatened Ecological Communities (BC Act and/or EPBC Act)	Area of impact Project REF (ha)	Area of impact Addendum REF (ha)	Total impact area (ha)	Threatened species habitat of species credit species	Threatened species habitat of ecosystem credit species	Revised offset threshold and applicability
1 / Low	724	Shale Gravel Transition Forest in the Sydney Basin Bioregion EEC (BC Act)	0.51	0.001	0.511	*Dillwynia tenuifolia* (0.35ha) Cumberland Plain Land Snail (0.511 ha)	0.511 ha Refer to Table 5-2 for species.	Applies to 0.511 ha of fauna species credit species habitat Applies to 0.511 ha of ecosystem credit species habitat
2 / Low	725	Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion EEC (BC Act)	0.20	0.000	0.20	*Dillwynia tenuifolia* (0.04ha) Cumberland Plain Land Snail (0.20 ha)	0.20 ha Refer to Table 5-2 for species.	0.2 – No change
3 / Low	835	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC (BC Act)	0.37	0.066	0.436	Cumberland Plain Land Snail (0.436 ha)	0.436 ha Refer to Table 5-2 for species.	Applies to 0.436 ha of fauna species credit species habitat Applies to 0.436 ha of ecosystem credit species habitat
4 / Moderate	849	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC (BC Act)	0.45	0.077	0.527	N/A	N/A	Applies to 0.527 ha of Cumberland Plain Woodland in the Sydney Basin Bioregion listed as Critically endangered under the BC Act.
5 / Low			2.96	0.050	3.01	*Dillwynia tenuifolia* (0.06ha) Cumberland Plain Land Snail (3.01 ha)	3.01 ha Refer to Table 5-2 for species.	Applies to 3.01 ha of fauna species credit species habitat Applies to 3.01 ha of ecosystem credit species habitat

Veg. zone / Condition	PCT	Threatened Ecological Communities (BC Act and/or EPBC Act)	Area of impact Project REF (ha)	Area of impact Addendum REF (ha)	Total impact area (ha)	Threatened species habitat of species credit species	Threatened species habitat of ecosystem credit species	Revised offset threshold and applicability
6 / Moderate	883	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion VEC (BC Act) Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion EEC (EPBC Act)	0.08	0.000	0.080	Cumberland Plain Land Snail (0.08 ha)	0.08 ha Refer to Table 5-2 for species.	0.80 – No change
7 / low			1.09	0.022	1.112	*Dillwynia tenuifolia* (0.85ha) Cumberland Plain Land Snail (1.112 ha)	1.112 ha Refer to Table 5-2 for species.	Applies to 1.112 ha of fauna species credit species habitat Applies to 1.112ha of ecosystem credit species habitat
Subtotal of impacts			5.66	0.216	5.876 ha	*Dillwynia tenuifolia* (0.85ha) Cumberland Plain Land Snail (5.349 ha)	5.349 ha Refer to Table 5-2 for species.	Applies to 10.698 ha of fauna species credit species habitat 0.527 ha of CEEC

*CEEC area deducted from threatened species habitat to avoid offset duplication

Table 7-2 Transport for NSW offset ratios and summary of Proposed Modifications offset requirement

Impact type	Impact ha			Offset Ration	Previous Offset Requirement (Project BAR)	Revised Offset Requirement (Addendum BAR)
	Project	Addendum	Total			
Loss of NSW listed critically endangered ecological communities (CEEC)	0.45	0.077	0.527	Offset at a ratio of 4:1 where the offset sites are in moderate to good condition Offset at a ratio of 8:1 where the offset sites are in poor condition including rehabilitation sites	1.8 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC in moderate to good condition (ratio of 4:1) Or 3.2 hectares of Cumberland Plain Woodland in the Sydney Basin	2.108 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC in moderate to good condition (ratio of 4:1) Or 4.216 hectares of Cumberland Plain Woodland in the Sydney Basin

					Bioregion CEEC in poor condition (ratio of 8:1)	Bioregion CEEC in poor condition (ratio of 8:1)
Loss of threatened fauna species	5.21	0.139	5.349	Offset area of habitat lost at a ratio of 3:1	15.63 hectares of Cumberland Plain Land Snail habitat (ratio of 3:1) 15.63 hectares of ecosystem credit species habitat	16.047 hectares of Cumberland Plain Land Snail habitat (ratio of 3:1) 16.047 hectares of ecosystem credit species habitat
Loss of threatened flora species	1.3	0	0	Offset individuals lost at a ratio of 3:1	3.9 hectares of *Dillwynia tenuifolia* habitat. Under the BAM, offsets are calculated by area rather than number of individuals for this species.	No change

8. Conclusion

The native vegetation in the Project REF and Addendum REF boundary is comprised of five separate PCTs, occupying seven vegetation zones. Given the position of the vegetation being adjacent to a cleared road corridor, the condition of the vegetation is generally low, with some moderate condition areas near the Londonderry Road intersection.

The Project REF and Addendum REF would have direct and indirect impacts on biodiversity during the construction and operational phases of the upgrade. It is important to note that the vegetation clearing is adjacent to or within close proximity to an existing road that is already subject to indirect disturbance, as evidenced by weed invasion. This indirect impact may be extended to a newly created edge where clearing is required for the Project The Project REF would require removal of around 5.66 hectares of native vegetation and the additional areas associated with the Addendum REF would require an additional removal of 0.216 hectares of native vegetation required for the upgrade works. This is a total of 5.876 hectares of vegetation clearing including:

- Shale Gravel Transition Forest in the Sydney Basin Bioregion (Endangered BC Act) (PCT 724) – 0.511 hectares
- Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion (Endangered) (PCT 725) – 0.200 hectares
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered) (PCT 835) – 0.436 hectares
- Cumberland Plain Woodland in the Sydney Basin Bioregion (Critically Endangered) (PCT 849) – 3.537 hectares
- Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion (Vulnerable) (PCT 883) – 1.192 hectares.

A total of 0.08 hectares of the TEC associated with PCT 883–- Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion Community which occurs within the Project REF Boundary meets the condition criteria for the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) listed *Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion endangered ecological community*. No additional impacts would occur to this community as a result of the Proposed Modifications.

One threatened flora species was recorded in the Project REF Boundary during targeted surveys for the Project BAR, *Dillwynia tenuifolia* listed as vulnerable under the BC Act. The extent of this local population is 67 hectares with about 1.3 hectares (1.9 %) occurring in the Project REF Boundary and would be directly impacted, this equates to an estimated 5,000 plants, many of which are juvenile. The remainder of the population within the study area occupies a proposed biodiversity stewardship site adjoining to the north of the road reserve. The Proposed Modifications are located in areas outside of the identified area of occupancy and no *Dillwynia tenuifolia* were identified within the area of the Proposed Modifications during the Addendum BAR field survey. As such it has been assessed that there is no additional impacts on *Dillwynia tenuifolia* as a result of the Proposed Modification.

Evidence of Cumberland Plain Land Snail (vulnerable BC Act) was confirmed via empty shells found in the study area and associated with *Grey Box–- Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion* (PCT 849). Surveys for the Addendum REF also identified evidence of the Cumberland Plain Land Snail via empty shells. Habitat in all PCTs is considered suitable for the Cumberland Plain Land Snail. The habitats within the Proposed Modifications area were confirmed as moderate to low quality and do not possess important habitat features required for many of the threatened fauna species predicted to occur within the locality. Given the degree of connectivity with woodland and forest habitats in adjoining land to the north some threatened fauna species could be considered moderately likely to occur, at least on occasion.

Transport's first priority is to avoid impacts to the environment and this has been achieved through the early consideration of biodiversity constraints on the Project at the inception and through options analysis of proposed modification to select design refinements with least impact on biodiversity.

The Project BAR presents appropriate mitigation measures to be implemented that would minimise the impacts of construction and operation. The additional works associated with the Proposed Modifications do not require further mitigation measures beyond what has been identified in Section 6 of the Project BAR. These mitigation measures presented in Section 6 of the Project BAR would also apply to the areas to be impacted by the Addendum REF and as such, it is considered that existing safeguards would be sufficient in managing potential impacts.

Residual impacts are to be offset in accordance with the Transport *Guideline for Biodiversity Offsets* (Roads and Maritime, 2016). The guideline indicates that offsets are to be considered where there is any clearing of national or NSW listed critically endangered ecological communities in moderate to good condition or clearing of threatened species habitat.

There would be clearing of a critically endangered ecological community for these Proposed Modifications in moderate condition, comprising 0.077 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion (listed critically endangered under the BC Act). Beyond the Project REF, the Proposed Modifications would include clearing of habitat for one threatened fauna species credit species (Cumberland Plain Land Snail) with the clearing area being above the threshold set for applying an offset under the RMS policy (>1 ha) for both species. Therefore, biodiversity offsets are also required for the Cumberland Plain Land Snail. The Proposed Modifications are not likely to have a significant impact on threatened biodiversity listed under EPBC Act and no like-for-like offsets for MNES are required.

9. Glossary

Term	Definition
Accredited person or assessor	Means as person accredited under section 6.10 (of the BC Act) to prepare reports in accordance with the BAM.
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity Assessment Method Calculator	Biodiversity Assessment Method Calculator (BAM-C) – the online computer program that provides decision support to assessors and proponents by applying the BAM and referred to as the BAM-C. The BAM-C contains biodiversity data from the BioNet Vegetation Classification and the Threatened Biodiversity Data Collection that the assessor is required to use in a BAM assessment. The BAM-C applies the equations used in the BAM, including those to determine the number and class of biodiversity credits required to offset the impacts of a development, or created at a biodiversity stewardship site. It is published by the Department (DPIE 2020a).
Biodiversity credit report	The report produced by the BAM-C that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site (DPIE 2020a).
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (DPIE 2020a).
Biodiversity Offsets and Agreement Management System	The online system used to administer the Biodiversity Offsets Scheme. The BOAMS is used by accredited assessors (to carry out specific BAM-related tasks involving access to the BAM-C to perform assessments, submit data, generate credits and calculate a credit price), by landholders (to apply for a Biodiversity Stewardship Agreement and manage ongoing reporting obligations for their agreement) and by proponents of developments (to view their credit obligation or the payment required to the Biodiversity Conservation Fund).
Biodiversity risk weighting	A factor of the formulas used by the BAM to calculate credits. The biodiversity risk weighting (BRW) is a score given to each vegetation zone and species based on the 'sensitivity to loss' versus the 'sensitivity to gain'. The value is set for threatened species and listed in the TBDC. The BRW for vegetation is calculated for each vegetation zone by the BAM-C using a factor of the 'sensitivity to loss' of the PCT or TEC (located in the BioNet vegetation classification) and the 'sensitivity to gain' of the ecosystem credit species (in the TBDC) that are predicted to occur.
Biodiversity Stewardship site	Refers to land which is the subject to a Biodiversity Stewardship Agreement under the BC Act.
BioNet Atlas	The DPIE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish (DPIE 2020a).
BioNet Vegetation classification	Refers to the vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. Refer About BioNet Vegetation Classification | NSW Environment and Heritage (DPE 2020a).
Project boundary	The area to be directly impacted by the proposal during construction activities. See also definition for subject land.

Term	Definition
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation) (DPIE 2020a).
Ecosystem credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for ecosystem credits. This is analogous with the definition of 'predicted species'.
Ecosystem credits	A measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site (DPIE 2020a).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (DPIE 2020a).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (DPIE 2020a).
Landscape assessment area	The area which includes the subject land and a 1500 m buffer surrounding the outside edge of the boundary of the subject land or 500 m along each side of the centre line of a linear-shaped proposal
Local population	The population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: • The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area. • The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. • The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year (OEH 2018).
Matter of national environmental significance	A matter of national environmental significance (MNES) is any of the nine defined components protected by a provision of Part 3 of the EPBC Act (Commonwealth).
Mitigation	Action to reduce the severity of an impact.
Native vegetation	Has the same meaning as in section 1.6 of the BC Act and section 60B of the LLS Act. In summary, • trees (including any sapling or shrub or any scrub)

Term	Definition
	• understorey plants • groundcover (being any type of herbaceous vegetation) • plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act). Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). Marine vegetation is covered by the provisions of the FM Act.
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (DPIE 2020a).
Operational footprint	The area that would be subject to ongoing operational impacts from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Patch size	An area of native vegetation that: • occurs on the development site or biodiversity stewardship site • includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site (DPIE 2020a).
PlantNET	An online database of the flora of New South Wales which contains currently accepted taxonomy for plants found in the State, both native and exotic.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020a).
Spatial datasets	Spatial databases required to prepare a BAR • BioNet NSW (Mitchell) Landscapes – Version 3.1 • NSW Interim Biogeographic Regions of Australia (IBRA region and sub-regions) – Version 7 • NSW soil profiles • hydrogeological landscapes • acid sulfate soils risk • digital cadastral database • Vegetation Information Systems maps • Geological sites of NSW.
Species credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits (DPIE 2020a). This is analogous with the definition of 'candidate species'.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection (DPIE 2020a).
Species polygon	An area of land identified in Chapter 5 (of the BAM) that contains habitat or is occupied by a threatened species (DPIE 2020a).
Study area	The area directly affected by the proposal (subject land or project boundary) and any additional areas likely to be affected by the proposal, either directly or indirectly.
Subject land	Land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the landscape assessment area which surrounds the subject

Term	Definition
	land (i.e., the area of land in the 1500 m buffer zone around the subject land or 500m buffer zone for linear proposals). In the case of a biodiversity certification proposal, subject land includes the biodiversity certification assessment area (DPIE 2020a). See also definition for project boundary.
Threatened Biodiversity Data Collection	A publicly assessable online database (registration required) which contains information for listed threatened species, populations and ecological communities (DPIE 2020a). Part of the BioNet database, published by the EHG and accessible from the BioNet website at www.bionet.nsw.gov.au.
Vegetation integrity (score)	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT. The vegetation integrity score is the quantitative measure of vegetation condition calculated by the BAM-C (DPIE 2020a).
Vegetation zone	A relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state (DPIE 2020a).

10. Abbreviations

Term	Definition
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method calculator
BC Act	Biodiversity Conservation Act 2016 (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offset Scheme
BRW	Biodiversity risk weighting
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DIWA	Directory of Important Wetlands in Australia
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
EEC	Endangered ecological community
EHG	NSW Environment and Heritage Group within the Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	*Environment Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
Fisheries NSW Policy and guidelines	Fisheries NSW Policy and guidelines for fish habitat conservation and management (Update 2013)
FM Act	Fisheries Management Act 1994 (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of national environmental significance
PCT	Plant community type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SAII	Serious and Irreversible Impacts
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened ecological communities (VECs, EECs and CEECs)
Transport	Transport for NSW
VEC	Vulnerable Ecological Community

11. References

Commonwealth of Australia (2010a), Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the EPBC Act - DCCEEW.

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Appendix A: Species recorded

Table A-1 presents all flora species recored during the Project BAR field survey. In additon species present within addendum REF areas alos identifed.

Table A-1 Recorded plant species, PCT presence and % cover estimates based on field plot data

Scientific name	Growth Form Code1	Cover Estimate2							Present
		PCT 724 – Low Plot 1	PCT 725 – Low Plot 2	PCT 835 – Low Plot 3	PCT 849 – Moderate Plot 4	PCT 849 – Low Plot 5	PCT 883 – Moderate Plot 6	PCT 883 – Low Plot 7	Addendum REF - Survey3
Acacia decurrens	TG			1	0.2				
Acacia falcata	SG	0.1		0.1				0.1	
Acacia ulicifolia	SG			2					
Acetosa sagittata	HT					0.1			
Adiantum aethiopicum	EG						4		
Alphitonia excelsa	TG				2				
Angophora floribunda	TG			0.1					
Angophora subvelutina	TG			0.1	8				
Araujia sericifera	HT					0.1			

[1] GF code: TG = Tree, SG = Shrub, GG = Grass and grass-like, FG = Forb, EG = Fern, OG = Other, HT = High Threat weed, EX = Exotic
[2] Cover has been determined in accordance with the BAM.

[3] Species identified in additional area survey for the Addendum REF

Scientific name	Growth Form Code1	Cover Estimate2							Present
		PCT 724 – Low Plot 1	PCT 725 – Low Plot 2	PCT 835 – Low Plot 3	PCT 849 – Moderate Plot 4	PCT 849 – Low Plot 5	PCT 883 – Moderate Plot 6	PCT 883 – Low Plot 7	Addendum REF - Survey3
Asparagus aethiopicus	HT							0.1	Y
Asparagus asparagoides	HT					0.1			
Bidens pilosa	EX	0.1			0.2		0.1		Y
Breynia oblongifolia	SG				1		0.1	0.1	Y
Brunoniella australis	FG	2			1				Y
Bursaria spinosa	SG	0.1				0.1	0.2		Y
Calystegia marginata	OG			0.1					
Cassinia spp.	SG		0.1						Y
Cassytha spp.	OG						0.1		Y
Cheilanthes seiberi	EG	0.2	1	1	1		0.2		Y
Chloris gayana	HT				3			2	Y
Conyza bonariensis	EX	0.5		0.2	0.5		0.2	0.2	Y
Crocosmia x crocosmiiflora	HT							1	
Cynodon dactylon	GG					0.3			
Daviesia latifolia	SG		1						Y
Daviesia ulicifolia	SG			0.1					
Dianella longifolia	FG			0.1	0.2			0.5	Y

Scientific name	Growth Form Code1	Cover Estimate2							Present
		PCT 724 – Low Plot 1	PCT 725 – Low Plot 2	PCT 835 – Low Plot 3	PCT 849 – Moderate Plot 4	PCT 849 – Low Plot 5	PCT 883 – Moderate Plot 6	PCT 883 – Low Plot 7	Addendum REF - Survey3
Dichondra repens	FG	2							Y
Dillwynia tenuifolia	SG			0.2					
Dodonaea triquetra	SG						0.1		Y
Ehrharta longiflora	EX							3	Y
Einadia hastata	FG	1						0.1	Y
Entolasia stricta	GG	5					1.5		Y
Eragrostis curvula	HT	30	45	70	20	80	20	75	Y
Eucalyptus fibrosa	TG		12						Y
Eucalyptus moluccana	TG	40				60			Y
Eucalyptus parramattensis	TG						8	2	Y
Eucalyptus tereticornis	TG			15	15				Y
Exocarpos cupressiformis	SG			0.1					
Glycine clandestina	OG	2						0.1	Y
Glycine microphylla	OG					0.1			
Grevillea mucronulata	SG			0.1					
Grevillea robusta	TG						0.1		Y
Hakea sericea	SG							0.1	Y

Scientific name	Growth Form Code1	Cover Estimate2							Present
		PCT 724 – Low Plot 1	PCT 725 – Low Plot 2	PCT 835 – Low Plot 3	PCT 849 – Moderate Plot 4	PCT 849 – Low Plot 5	PCT 883 – Moderate Plot 6	PCT 883 – Low Plot 7	Addendum REF - Survey3
Hardenbergia violacea	OG						0.1	0.1	Y
Hieracium murorum	EX				0.1				
Hypericum gramineum	FG			0.1					
Imperata cylindrica	GG						20		Y
Indigofera australis	SG	0.1							Y
Juncus spp.	GG					0.1			Y
Kalanchoe longiflora	EX		1						Y
Kunzea ambigua	SG			0.1					
Ligustrum sinense	HT				0.1		0.1		
Lomandra longifolia	GG			0.3				0.1	Y
Megathyrus maximus	HT				1				
Melaleuca decora	SG	10	10		2	1	15	20	Y
Melaleuca linariifolia	SG			0.5	3				
Melaleuca nodosa	SG		8	1.5			5	3	Y
Microlaena stipoides	GG	2		2	5		15		Y
Nothoscordum gracile	EX					0.1			
Ozothamnus diosmifolius	SG	0.3							Y

Scientific name	Growth Form Code1	Cover Estimate2							Present
		PCT 724 – Low Plot 1	PCT 725 – Low Plot 2	PCT 835 – Low Plot 3	PCT 849 – Moderate Plot 4	PCT 849 – Low Plot 5	PCT 883 – Moderate Plot 6	PCT 883 – Low Plot 7	Addendum REF - Survey3
panicum simile	GG	0.2							Y
Paspalidium distans	GG							0.1	Y
Paspalum dilatatum	HT				5	0.3			
Phytolacca octandra	EX								
Pimelea linifolia	SG			0.3			0.2		Y
Plantago lanceolata	EX			0.3			0.5	0.1	Y
Pomax umbellata	FG			0.1					
Pseuderanthemum variabile	FG						1		Y
Rubus fruticosus agg.	HT				1				
Rytidosperma fulvum	GG					0.1			
Senecio madagascarensis	HT			0.1			0.1	0.1	Y
Setaria pumila	EX			0.1	25				
Sida rhombifolia	EX				6	0.1	0.1		Y
Solanum nigrum	EX	0.5		0.1	0.5		0.1	0.1	Y
Solanum prinophyllum	FG			0.1					
Solanum pseudocapsicum	EX					0.3			
Themeda triandra	GG			0.5					

Scientific name	Growth Form Code1	Cover Estimate2							Present
		PCT 724 – Low Plot 1	PCT 725 – Low Plot 2	PCT 835 – Low Plot 3	PCT 849 – Moderate Plot 4	PCT 849 – Low Plot 5	PCT 883 – Moderate Plot 6	PCT 883 – Low Plot 7	Addendum REF - Survey3
Tricoryne simplex	FG				0.1				
Verbena bonariensis	EX			0.1	2		0.2	0.1	Y
Xanthorrhoea minor	OG						0.1		Y

*Note: *Cover determined in accordance with the BAM.*

Appendix B: Habitat suitability assessment

Table B-1 Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	A species is considered highly likely to occur in the study area if: There is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	A species is considered moderately likely to occur in the study area if: Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	A species is considered to have a low likelihood of occurring in the study area if: • For highly mobile species, the species may be an occasional visitor, but habitat similar to the study area is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the study area and the species has not been recorded in the locality in the last 10 years on BioNet. **OR** • The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has not been recorded in the locality in the last 10 years on BioNet. **OR** • For flora species that are associated with PCTs in the study area (see TBDC) and the species was not identified following targeted surveys in accordance with the BAM and relevant survey guidelines. Flora species that have been recorded in the locality on BioNet at any time, associated suitable habitat (see the TBDC) is not present in the study area, though similar habitats of the same vegetation formation is present in the study area.
Unlikely	Suitable habitat for the species is absent from the study area.

Table B-2 Likelihood of occurrence for threatened flora

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Allocasuarina glareicola	E	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland with *Eucalyptus parramattensis*, *Eucalyptus fibrosa, Angophora bakeri*, *Eucalyptus sclerophylla* and *Melaleuca decora*. Common associated understorey species include *Melaleuca nodosa*, *Hakea dactyloides*, *Hakea sericea*, *Dillwynia tenuifolia*, *Micromyrtus minutiflora*, *Acacia elongata*, *Acacia brownei*, *Themeda australis* and *Xanthorrhoea minor*.	BioNet – 76, PMST	Low. The species was not recorded during surveys.
Austral Toadflax (*Thesium australe*)	V	V	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	PTMS	Low. No records in the locality.
Brown Pomaderris (*Pomaderris brunnea*)	V	E	Found in a very limited area around the Nepean and Hawkesbury Rivers, including the Bargo area. It also occurs at Walcha on the New England tablelands and in far eastern Gippsland in Victoria. Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	PMST	Low. No records in the locality.
Bynoe's Wattle (*Acacia bynoeana*)	V	E	Found in central eastern NSW, from the Hunter District south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood (*Corymbia gummifera*), Scribbly Gum (*Eucalyptus haemastoma*), Drooping Red Gum (*E. parramattensis*), Old Man Banksia (*Banksia serrata*) and Small-leaved Apple (*Angophora bakeri*).	BioNet – 27, PMST	Low. The species was not recorded during surveys.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Camden White Gum (*Eucalyptus benthamii*)	V	V	Occurs on the alluvial flats of the Nepean River and its tributaries. There are two major subpopulations: in the Kedumba Valley of the Blue Mountains National Park and at Bents Basin State Recreation Area. A further 18 trees are scattered along the Nepean River, south to The Oaks. Requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment. Occurs in open forest. Associated species at the Bents Basin site include *Eucalyptus elata*, *E. baueriana*, *E. amplifolia, E. deanei* and *Angophora subvelutina*. Understorey species include *Bursaria spinosa*, *Pteridium esculentum* and a wide variety of agricultural weeds. The Kedumba Valley site lists *E. crebra*, *E. deanei*, *E. punctata*, *Leptospermum flavescens*, *Acacia filicifolia* and *Pteridium esculentum* among its associated species	BioNet - 2	Low. Specific habitat is not present in the study area and the species was not recorded during surveys.
Deane's Paperbark (*Melaleuca deanei*)	V	V	The distribution of the species extends from St. Albans (Hawkesbury LGA) in the north, Nowra (Shoalhaven LGA) in the south, and west to Faulconbridge (Blue Mountains LGA). It mostly occupies broad flat ridgetops, dry ridges and slopes between 20 and 410 metres above sea level. It is strongly associated with sandy loam soils that are low in nutrients, sometimes with ironstone present. In southern Sydney, the species most frequently occurs on deep and well developed lateritic soils (soils where an indurated iron-rich layer usually overlies a mottled clay and a pallid clay).It occurs in a wide range of vegetation communities, but is most often found in Coastal Sandstone Ridgetop Woodland and to a lesser extent, Hinterland Sandstone Gully Forest, Sydney Hinterland Transition Woodland and Coastal Sandstone Gully Forest and other communities on sandstone and transitional geology	PMST	Low. No records in the locality.
Dillwynia tenuifolia	-	V	Core distribution is the Cumberland Plain from Windsor to Penrith east to Deans Park. Other populations in Western Sydney are recorded at Voyger Point and Kemps Creek in the Liverpool LGA, Luddenham in the Penrith LGA and South Maroota in the Baulkham Hills Shire. Disjunct localities include the Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains. In western Sydney, it may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. At Yengo, is reported to occur in disturbed escarpment woodland on Narrabeen sandstone.	BioNet - 1449	Recorded within the study area.
Downy Wattle (*Acacia pubescens*)	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone.	BioNet – 4, PMST	Moderate. Suitable habitat in the study area.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Eastern Australian Underground Orchid (*Rhizanthella slateri*)	E	V	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Habitat requirements are poorly understood, and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	PMST	Low. No records in the locality
Grevillea parviflora subsp. parviflora	V	V	Occurs in a range of vegetation types from heath and shrubby woodland to open forest. In Sydney it has been recorded from Shale Sandstone Transition Forest and in the Hunter in Kurri Sand Swamp Woodland. However, other communities occupied include *Corymbia maculata* - *Angophora costata* open forest in the Dooralong area, in Sydney Sandstone Ridgetop Woodland at Wedderburn and in Cooks River / Castlereagh Ironbark Forest at Kemps Creek.	BioNet - 6	Moderate – marginal suitable habitat. Low – field survey identified potential habitat was in poor condition and unlikely to support the spectes
Hairy Geebung (*Persoonia hirsuta*)	E	E	*Persoonia hirsuta* is patchily distributed on the Central Coast and Tablelands of NSW, in an area bounded by Putty, Glen Davis and Gosford in the north, and Royal National Park (NP) and Hill Top in the south. It occurs in the Sydney coastal area (Gosford, Berowra, Manly and Royal NP), the Blue Mountains area (Springwood, Lithgow and Putty) and the Southern Highlands (Balmoral, Buxton, Yanderra and Hill Top). It is frequently found on ridge tops and the mid slopes of hills and rises in dry sclerophyll forest and woodland with a shrubby understorey, heath, shrubby thickets and sandstone scrubs from near sea level to 600 m altitude. Associated canopy species include *Eucalyptus sclerophylla*, *Corymbia gummifera*, *Leptospermum trinervium*, *Eucalyptus sieberi*, *Eucalyptus punctata*, *Eucalyptus sparsifolia*, *Corymbia eximia* and *Banksia ericifolia*. It grows on sandy to stony soils derived from sandstone or very rarely on shale and is often found in disturbed areas, like along track edges.	BioNet - 8, PMST	Low. Specific habitat is not present in the study area and the species was not recorded during surveys.
Hibbertia fumana	CE	-	The habitat of *Hibbertia fumana* is varied and includes open areas, disturbed sites and areas with sedges, rushes and grasses. The only known population of this plant is within the Moorebank Intermodal Terminal Precinct, which is a disturbed site traversed by a railway line. This population was rediscovered in October 2016, after the plant was thought to be extinct. The plant was also recorded in the past from locations near Sydney, Western Sydney and near South Head, but is presumed to be locally extinct.	BioNet - 34	Low. Specific habitat is not present in the study area and the species was not recorded during surveys.
Hibbertia sp. Bankstown	E	CE	Only known to be located at Bankstown Airport, in Liverpool (Bill Anderson Reserve, Riverside Park Reserve, and East Hills Footbridge Reserve) and in Canterbury-Bankstown (East Hills Reserve and Voyager Point Reserve). The plant assemblage is attributable to “Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion".	BioNet - 146	Low. Specific habitat is not present in the study area and the species was not recorded during surveys.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Isotoma fluviatilis subsp. fluviatilis	-	-	Currently known from only two adjacent sites on a single private property at Erskine Park in the Penrith LGA. Previous sightings are all from western Sydney, at Homebush and at Agnes Banks. Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland ecotone.	BioNet - 1	Low. Specific habitat is not present in the study area and the species was not recorded during surveys.
Juniper-leaved Grevillea (*Grevillea juniperina subsp. juniperina*)	-	V	Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels. Recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest.	BioNet - 1017	Moderate. Suitable habitat in the study area.
Leafless Tongue-orchid (*Cryptostylis hunteriana*)	V	V	The Leafless Tongue Orchid has been recorded from as far north as Gibraltar Range National Park, south into Victoria around the coast as far as Orbost. Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	PMST	Low. No records in the locality.
Magenta Lilly Pilly (*Syzygium paniculatum*)	V	E	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast it occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	PMST	Low. No records in the locality.
Marsdenia viridiflora subsp. viridiflora	-	E	Endangered population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas. Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Grows in vine thickets and open shale woodland.	BioNet - 1	Low. Specific habitat is not present in the study area and the species was not recorded during surveys.
Micromyrtus minutiflora	V	E	Restricted between Richmond and Penrith of western Sydney. Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest and open forest on sandy clay or gravelly soils tertiary alluvium.	BioNet – 63, PMST	Moderate – found on adjacent land. Low – following field habitat assessment

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Nodding Geebung (*Persoonia nutans*)	E	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Core distribution occurs within the Penrith, and to a lesser extent, Hawkesbury LGAs, with isolated and relatively small populations also occurring in the Liverpool, Campbelltown, Bankstown and Blacktown LGAs. Confined to aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland.	BioNet - 1129, PMST	Moderate – found on adjacent land. Low – following field habitat assessment
Pimelea curviflora var. curviflora	V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots.	BioNet - 16, PMST	Moderate – found on nearby land. Low – following field habitat assessment
Pultenaea parviflora	V	E	Endemic to the Cumberland Plain the core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce. May be locally abundant, particularly within scrubby/dry heath areas of Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. *Eucalyptus fibrosa* is usually the dominant canopy species. *Eucalyptus globoidea*, *E. longifolia*, *E. parramattensis*, *E. sclerophylla* and *E. sideroxylon* may also be present or co-dominant, with *Melaleuca decora* frequently forming a secondary canopy layer. Associated species may include *Allocasuarina littoralis*, *Angophora bakeri*, *Aristida spp.*, *Banksia spinulosa*, *Cryptandra spp.*, *Daviesia ulicifolia*, *Entolasia stricta*, *Hakea sericea, Lissanthe strigosa*, *Melaleuca nodosa*, *Ozothamnus diosmifolius* and *Themeda australis*.	BioNet - 50, PMST	Moderate – found on adjacent land.
Scrub Turpentine (*Rhodamnia rubescens*)	-	CE	*Rhodamnia rubescens* is currently known to occur in coastal districts north from Batemans Bay in New South Wales (NSW), approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m in areas with rainfall of 1,000- 1,600 mm (Benson and McDougall 1998).	PMST	Low. No records in the locality.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Spiked-rice Flower (*Pimelea spicata*)	E	E	Broad distribution in western Sydney, occurring on the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas). Another smaller population is recorded in districts (Landsdowne to Shellharbour to northern Kiama) Illawarra. It grows on well-structured clay soils. On the inland Cumberland Plain sites, it is associated with Grey Box and Ironbark. In the coastal Illawarra it occurs commonly in Coastal Banksia open woodland with a more well-developed shrub and grass understorey.	PMST	Moderate. Suitable habitat in the study area. Low – following field habitat assessment
Sydney Plains Greenhood (*Pterostylis saxicola*)	E	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Only one population occurs within a conservation reserve at Georges River National Park. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where it occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	BioNet – 5, PMST	Low. Specific habitat is not present in the study area and the species was not recorded during surveys.
Tall Knotweed (*Persicaria elatior*)	V	V	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	PMST	Low. No records in the locality.
White-flowered Wax Plant (*Cynanchum elegans*)	E	E	Occurs from the Gloucester district to the Wollongong area and inland to Mt Dangar. Typically occurs in rainforest gullies, scrub and scree slopes and at the ecotone between dry rainforest vegetation and dry subtropical forest/woodland communities. Other associated vegetation types include littoral rainforest; Coastal Tea-tree (*Leptospermum laevigatum*) – Coastal Banksia (*Banksia integrifolia subsp. integrifolia*) coastal scrub; Forest Red Gum (*Eucalyptus tereticornis*) aligned open forest and woodland; Spotted Gum (*Corymbia maculata*) aligned open forest and woodland; and Bracelet Honey Myrtle (*Melaleuca armillaris*) scrub to open scrub.	PMST	Low. No records in the locality.
Wingless Raspwort (*Haloragis exalata subsp. exalata*)	V	V	Square Raspwort occurs in 4 widely scattered localities in eastern NSW. It is disjunct distributed in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Square Raspwort appears to require protected and shaded damp situations in riparian habitats. Flowering specimens in NSW are recorded from November to January.	PMST	Low. No records in the locality.

Table B-3 Likelihood of occurrence for threatened fauna

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Bird Species					
Australasian Bittern (Botaurus poiciloptilus*)*	E	E	Occurs from south-east Queensland to south-east South Australia, Tasmania and the south-west of Western Australia. The Australasian Bittern's preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (*Phragmites*, *Cyperus*, *Eleocharis*, *Juncus*, *Typha*, *Baumea*, *Bolboschoenus*) or cutting grass (*Gahnia*) growing over a muddy or peaty substrate.	BioNet - 1, PMST	Low. Specific habitat is not present in the study area.
Australian Painted Snipe (*Rostratula australis*)	E	E	Most records are from south east Australia, particularly the Murray Darling Basin, with scattered records across northern Australia. They generally inhabit shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum, *Muehlenbeckia* or canegrass. Breeding habitat requirements may be quite specific; shallow wetlands with areas of bare wet mud and both low cover and canopy cover nearby; nest records nearly all from or near small islands in freshwater wetlands. Has also been recorded nesting in and near swamps, canegrass swamps, flooded areas including samphire, grazing land, among cumbungi, sedges and grasses; one nest has been found in the centre of a cow-pat in a clump of long grass.	BioNet - 1, PMST	Low. Specific habitat is not present in the study area.
Barking Owl (*Ninox connivens*)	-	V	Found throughout continental Australia except for the central arid regions. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas.	BioNet - 4	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.
Barn Swallow (*Hirundo rustica*)	M	-	The Barn Swallow is a non-breeding visitor and usually occurs in northern Australia, on Cocos-Keeling Island, Christmas Island, Ashmore Reef, and patchily along the north coast of the mainland from the Pilbara region, Western Australia, to Fraser Island in Queensland. In Australia, the Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on	BioNet - 6	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
			overhead wires, and also in or over freshwater wetlands, paperbark Melaleuca woodland, mesophyll shrub thickets and tussock grassland.		
Black Falcon (*Falco subniger*)	-	V	Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referrable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993). The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring.	BioNet - 5	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.
Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*)	-	V	Extends south from central Queensland, through NSW, Victoria into south eastern South Australia, though it is very rare in the last state. In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (E. microcarpa), Yellow Box (E. melliodora), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees.	BioNet - 1	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.
Black-eared Cuckoo (*Chrysococcyx osculans*)	M	-	Common in most areas of Australia except wet coastal forested areas, basically inland side of Great Dividing Range in Victoria, New South Wales and Queensland. Vagrants found in Tasmania. Breeds in southern Australia. Some birds will stay in southern Australia during winter, while many will migrate to Northern Australia and further north into Indonesia and PNG. Habitat: Dry open forests, scrublands, mallee, mulga, lignum, saltbush and riverside thickets. They prefers to fly direct between low trees and shrubs, rather than large trees, and are rare in subhumid areas.	PMST	Low. No records in the locality.
Comb-crested Jacana (*Irediparra gallinacea*)	-	V	Occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW, with stragglers recorded in southeastern NSW (possibly in response to unfavourable conditions further north). Inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation.	BioNet - 3	Low. Specific habitat is not present in the study area.
Common Greenshank (*Tringa nebularia*)	M	-	The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia.	BioNet - 2, PMST	Low. Specific habitat is not present in the study area.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Common Sandpiper (*Actitis hypoleucos*)	M	-	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	BioNet - 3, PMST	Low. Specific habitat is not present in the study area.
Curlew Sandpiper (*Calidris ferruginea*)	CE	E	In Australia, Curlew Sandpipers occur around the coasts of all states and are also quite widespread inland, though in smaller numbers. They occur in Australia mainly during the non-breeding period but also during the breeding season when many non-breeding one year old birds remain. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh and in mangroves.	BioNet - 3, PMST	Low. Specific habitat is not present in the study area.
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	-	V	The Dusky Woodswallow has two separate populations. The eastern population is found from Atherton Tableland, Queensland south to Tasmania and west to Eyre Peninsula, South Australia. The other population is found in south-west Western Australia. The Dusky Woodswallow is found in open forests and woodlands and may be seen along roadsides and on golf courses.	BioNet - 14	Moderate. It may be an occasional visitor.
Flame Robin (*Petroica phoenicea*)	-	V	The Flame Robin ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes.	BioNet - 20	Low. Specific habitat is not present in the study area.
Fork-tailed Swift (*Apus pacificus*)	M	-	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher.	BioNet - 2, PMST	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Freckled Duck (*Stictonetta naevosa*)	-	V	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	BioNet - 2	Low. Specific habitat is not present in the study area.
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	-	E	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of Sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of Sheoaks, including Drooping Sheoak, *Allocasuarina diminuta*, and *A. gymnanthera*. *Belah* is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (*Casuarina cristata*).	BioNet - 5	Low. Specific habitat is not present in the study area.
Grey Falcon (*Falco hypoleucos*)	-	E	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	PMST	Low. No records in the locality.
Grey Plover (*Pluvialis squatarola*)	M	-	Non-breeding visitor to Australia, Grey Plovers usually forage on large areas of exposed mudflats and beaches of sheltered coastal shores such as inlets, estuaries and lagoons. They usually roost in sandy areas, such as on unvegetated sandbanks or sand-spits on sheltered beaches or other sheltered environments such as estuaries or lagoons.	BioNet - 1	Low. Specific habitat is not present in the study area.
Latham's Snipe (*Gallinago hardwickii*)	M	-	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level.	BioNet - 101, PMST	Low. Specific habitat is not present in the study area
Little Curlew (*Numenius minutus*)	M	-	Little Curlews generally spend the non-breeding season in northern Australia from Port Hedland in Western Australia to the Queensland coast. The Little Curlew is most often found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated.	BioNet - 3	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.
Little Eagle (*Hieraaetus morphnoides*)	-	V	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	BioNet - 3	Moderate. It may be an occasional visitor.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Little Lorikeet (*Glossopsitta pusilla*)	-	V	In NSW it is found from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. The species forages primarily in the canopy of dry open eucalypt forest and woodland but also utilises paperbark (*Melaleuca sp.*) dominated forests. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country (paddocks, roadside remnants) and urban trees also help sustain viable populations of the species. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked eucalypts. Entrance is small (3 cm) and usually high above the ground (2– 15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited; riparian trees are often chosen, including non-eucalypt species such as she-oaks.	BioNet - 7	Moderate. Marginal habitat associated within the study area. May occasionally utilise habitat for foraging.
Long-toed Stint (*Calidris subminuta*)	M	-	The Long-toed Stint is a regular summer visitor to Australia, but uncommon in the east. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire.	BioNet - 1	Low. Specific habitat is not present in the study area.
Major Mitchell's Cockatoo (*Lophochroa leadbeateri*)	-	V	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres.	BioNet - 1	Low. Specific habitat is not present in the study area.
Marsh Sandpiper (*Tringa stagnatilis*)	M	-	Fresh or brackish (slightly salty) wetlands such as rivers, water meadows, sewage farms, drains, lagoons and swamps.	BioNet - 8	Low. Specific habitat is not present in the study area.
Masked Owl (*Tyto novaehollandiae*)	-	V	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Dry eucalypt forests and woodland typically prefers open forest with low shrub density. Requires old trees for roosting and nesting.	BioNet - 1	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.
Nunivak Bar-tailed Godwit (*Limosa lapponica baueri*)	V	-	The bar-tailed godwit (both subspecies combined) has been recorded in the coastal areas of all Australian states. During the non-breeding period, the distribution of bar-tailed godwit (western Alaskan) is predominately New Zealand, northern and eastern Australia. The migratory bar-tailed godwit (western Alaskan) does not breed in Australia. The bar-tailed godwit (western Alaskan) occurs mainly in coastal habitats	PMST	Low. No records in the locality.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
			such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.		
Oriental Cuckoo (*Cuculus optatus*)	M	-	The Oriental cuckoo is a non-breeding visitor to Australia. Inhabits rainforest margins, monsoon forest, vine scrub and mangroves, wet sclerophyll forest or open Casuarina, Acacia or Eucalyptus woodlands. It frequently occurs at edges or ecotones between habitat types.	PMST	Low. No records in the locality.
Pacific Golden Plover (*Pluvialis fulva*)	M	-	Most Pacific Golden Plovers occur along the east coast and are especially widespread along the Queensland and NSW coastlines. In non-breeding grounds in Australia this species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sand flats (sometimes in vegetation such as mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in salt works.	BioNet - 3	Low. Specific habitat is not present in the study area.
Painted Honeyeater (*Grantiella picta*)	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of birds, and almost all breeding, occur on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	BioNet - 1, PMST	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.
Pectoral Sandpiper (*Calidris melanotos*)	M	-	In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	BioNet - 10, PMST	Low. Specific habitat is not present in the study area.
Powerful Owl (*Ninox strenua*)	-	V	In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover. The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine (*Syncarpia glomulifera*), Black She-oak	BioNet - 2	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
			(*Allocasuarina littoralis*), Blackwood (*Acacia melanoxylon*), Rough-barked Apple (*Angophora floribunda*), Cherry Ballart (*Exocarpus cupressiformis*) and a number of eucalypt species.		
Rainbow Bee-eater (*Merops ornatus*)	M	-	Distributed across much of mainland Australia and occurs on several near-shore islands. Occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation.	PMST	Low. No records in the locality.
Regent Honeyeater (*Anthochaera phrygia*)	CE	CE	The Regent Honeyeater that has a patchy distribution between south-east Queensland and central Victoria. It mostly inhabits inland slopes of the Great Dividing Range, in areas of low to moderate relief with moist, fertile soils. It is most commonly associated with box-ironbark eucalypt woodland and dry sclerophyll forest, but also inhabits riparian vegetation such as Sheoak (*Casuarina spp*) where it feeds on needle-leaved mistletoe and sometimes breeds. It sometimes utilises lowland coastal forest, which may act as a refuge when its usual habitat is affected by drought. It also uses a range of disturbed habitats within these landscapes including remnant patches in farmland and urban areas and roadside vegetation. It feeds primarily on the nectar of eucalypts and mistletoes and, to a lesser extent, lerps and honeydew; it prefers taller and larger diameter trees for foraging. It is nomadic and partly migratory with its movement through the landscape being governed by the flowering of select eucalypt species. There are four known key breeding areas: three in NSW and one in Victoria. Breeding varies between regions and corresponds with flowering of key eucalypt and mistletoe species. It usually nests in horizontal branches or forks in tall mature eucalypts and Sheoaks.	BioNet - 8, PMST	Low. The Regent Honeyeater is a rare visitor to the locality and has not been recorded since 2010 when it was found in Windsor Downs. This species is a sporadic visitor to the area and would focus habitat use on larger areas of flowering eucalypts in winter.
Ruff (*Philomachus pugnax*)	M	-	The Ruff is a rare but regular non-breeding visitor to Australia, being recorded in all States and Territories. In NSW the species has been recorded at Kurnell, Tomki, Casino, Ballina, Kooragang Island, Broadwater Lagoon and Little Cattai Creek. The Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges.	BioNet - 7	Low. Specific habitat is not present in the study area.
Scarlet Robin (*Petroica boodang*)	-	V	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and re-growth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. This species' nest is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub	BioNet - 7	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.
Sharp-tailed Sandpiper (*Calidris acuminata*)	M	-	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds	BioNet - 6, PMST	Low. Specific habitat is not present in the study area.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
			on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation; this includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. Sometimes they occur on rocky shores and rarely on exposed reefs.		
Speckled Warbler (*Chthonicola sagittata*)	-	V	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt re-growth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter. A side entrance allows the bird to walk directly inside.	BioNet - 11	Low. Specific habitat is not present in the study area.
Spotted Harrier (*Circus assimilis*)	-	V	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	BioNet - 2	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.
Square-tailed Kite (*Lophoictinia isura*)	-	V	Typically inhabits coastal forested and wooded lands of 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.	BioNet - 6	Low. Specific habitat is not present in the study area.
Superb Parrot (*Polytelis swainsonii*)	V	V	Found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Inhabit Box-Gum, Box Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of	BioNet - 2	Low. Specific habitat is not present in the study area.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
			large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree.		
Swift Parrot (*Lathamus discolor*)	CE	E	The swift parrot breeds in Tasmania during the summer and the entire population migrates north to mainland Australia for the winter. Whilst on the mainland the swift parrot disperses widely to forage on flowers and psyllid lerps in eucalypt species, with the majority being found in Victoria and NSW. In NSW they forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought. Nonbreeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal swamp mahogany (*E. robusta*) and spotted gum (*Corymbia maculata*) woodland when in flower, otherwise often in coastal forests. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon, and E. albens. Commonly used lerp infested trees include E. microcarpa, E. moluccana and E. pilularis.*	BioNet - 18, PMST	Moderate. Marginal habitat associated within the study area. May occasionally utilise habitat for foraging.
Turquoise Parrot (*Neophema pulchella*)	-	V	Range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	BioNet - 1	Low. It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area.
Varied Sittella (*Daphoenositta chrysoptera*)	-	V	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Nests in an upright tree fork high in the living tree canopy.	BioNet - 29	Moderate. It may be an occasional visitor.
White-bellied Sea Eagle (*Haliaeetus leucogaster*)	M	N	Distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. Found in coastal habitats (especially those close to the seashore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. Habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, and the sea). It feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion. It generally forages over large expanses of open water; this is	BioNet - 5, PMST	Low. Specific habitat is not present in the study area

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
			particularly true of birds that occur in coastal environments close to the seashore. However, it will also forage over open terrestrial habitats (such as grasslands). Nests may be built in a variety of sites including tall trees (especially Eucalyptus species), bushes, mangroves, cliffs, rocky outcrops, caves, crevices, on the ground or even on artificial structures.		
White-fronted Chat (*Epthianura albifrons*)	-	V	The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas. Gregarious species usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. Have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. Nests in the Sydney region have also been seen in low isolated mangroves. Nests are usually built about 23 cm above the ground (but have been found up to 2.5 m above the ground).	BioNet - 1	Low. Specific habitat is not present in the study area.
White-throated Needletail (*Hirundapus caudacutus*)	M	-	Widespread in eastern and south-eastern Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. They also commonly occur over heathland but less often over treeless areas, such as grassland or swamps.	BioNet - 4, PMST	Moderate. It may be an occasional visitor.
Wood Sandpiper (*Tringa glareola*)	M	-	The Wood Sandpiper has its largest numbers recorded in north-west Australia, with all areas of national importance located in Western-Australia. Uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes.	BioNet - 2	Low. Specific habitat is not present in the study area.
Amphibians					
Giant Burrowing Frog (*Heleioporus australiacus*)	V	V	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in nonbreeding habitat in areas up to 300 m from breeding sites. Whilst in nonbreeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of	PMST	Low. No records in the locality.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
			burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size.		
Green and Golden Bell Frog (*Litoria aurea*)	V	E	Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range; however, they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Ephemeral and permanent freshwater wetlands, ponds, dams with an open aspect and fringed by Typha and other aquatics, free from predatory fish.	BioNet - 1, PMST	Low. Specific habitat is not present in the study area.
Invertebrates					
Cumberland Plain Land Snail (*Meridolum corneovirens*)	-	E	Primarily inhabits Cumberland Plain Woodland (an endangered ecological community). This community is grassy, open woodland with occasional dense patches of shrubs. Lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.	BioNet - 73	Recorded
Dural Land Snail (Pommerhelix duralensis)	E	E	The Dural land snail is endemic to New South Wales. The species is a shale-influenced habitat specialist, which occurs in low densities along the northwest fringe of the Cumberland Plain on shale-sandstone transitional landscapes. The species has been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	BioNet - 1	Low. Only a single record from the locality and species was not recorded during surveys.
Mammals					
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	-	V	Range extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	PMST	Low. No records in the locality.
Eastern Coastal Free-tailed Bat (*Micronomus norfolkensisI*)	-	V	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in human-made structures.	BioNet - 18, PMST	Moderate. The study area is suitable for foraging, although no roosting habitat present.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	-	V	Prefers moist habitats, with trees taller than 20 m. Generally, roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	BioNet - 7, PMST	Moderate. The study area is suitable for foraging, although no roosting habitat present.
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	-	V	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	BioNet - 13, PMST	Moderate. The study area is suitable for foraging, although no roosting habitat present.
Greater Glider (*Petauroides volans*)	V	-	The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria from sea level to 1200 m altitude. It feeds exclusively on eucalypt leaves, buds, flowers and mistletoe and favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. It roosts in tree hollows, with a particular selection for large hollows in large, old trees. Individuals use multiple hollows and a relatively high abundance of tree hollows (at least 4-8 suitable hollows per hectare) seems to be needed for the species to persist. Individuals occupy relatively small home ranges with an average size of 1 to 3 ha, but the species has relatively low persistence in small forest fragments and disperses poorly across vegetation that is not native forest. Forest patches of at least 160 km2 may be required to maintain viable populations.	PMST	Low. No records in the locality.
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	V	Generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	BioNet - 75, PMST	Moderate. This species is likely to forage in the study area on occasion.
Koala (*Phascolarctos cinereus*)	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	BioNet - 20, PMST	Low. Associated habitat types present on site. However, the sightings are >5.4km from the western end of the construction zone and on the other (north western) side of the Hawkesbury River which is

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
					impassible. The sightings are constrained to the vegetated riparian zones of Redbank Creek and upper tributaries of the Grose River. There is also a >4.2km and >1.2km buffer of open agricultural land or dense residential land either side of the Hawkesbury River which is unlikely to be used for dispersal.
Large Bent-winged Bat (*Miniopterus orianae oceanensis*)	-	V	Occurs on east and north west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other manmade structures.	BioNet - 15, PMST	Moderate. The study area is suitable for foraging, and culverts are available for roosting.
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	Forages over a broad range of open forest and woodland habitats, this species is a cave roosting bat which favours sandstone escarpment habitats for roosting, in the form of shallow overhangs, crevices and caves.	BioNet - 1, PMST	Moderate. The study area is suitable for foraging, although no roosting habitat present.
Little Bent-winged Bat (*Miniopterus australis*)	-	V	East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. Little Bent-winged Bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	BioNet - 1, PMST	Moderate. The study area is suitable for foraging, and culverts are available for roosting.
New Holland Mouse (*Pseudomys novaehollandiae*)	V	-	Distribution is fragmented across all eastern states of Australia, where it inhabits open heath lands, open woodlands with heath understorey and vegetated sand dunes.	PMST	Low. No records in the locality.
Southern Myotis (*Myotis macropus*)	-	V	Generally, roost in groups close to water in caves, mine shafts, hollowbearing trees, and storm water channels, buildings, under bridges and in dense foliage. Forages over streams and pools catching insects and small fish.	BioNet - 13, PMST	Moderate. The study area is suitable for foraging, although no roosting habitat present.
Spotted-tailed Quoll (*Dasyurus maculatus*)	E	V	Wet and dry sclerophyll forests and rainforests, and adjacent open agricultural areas. Generally associated with large expansive areas of habitat to sustain territory size. Requires hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	BioNet - 1, PMST	Low. Specific habitat is not present in the study area.

Scientific name	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act			
Squirrel Glider (*Petaurus norfolcensis*)	-	V	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey.	BioNet - 2, PMST	Low. Specific habitat is not present in the study area.
Yellow-bellied Glider (*Petaurus australis*)	-	V	Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar.	BioNet - 2, PMST	Moderate. The study area is suitable for foraging, although no roosting habitat present.
Fish					
Australian Grayling (*Prototroctes maraena*)	V	-	Inhabits coastal reefs at depths of 3-25m, sheltering beneath ledges and in caves during day.	PMST	Low. No records in the locality.
Macquarie Perch (*Macquaria australasica*)	E	E	The Macquarie Perch is a riverine species that prefers clear water and deep, rocky holes with abundant cover such as aquatic vegetation, large boulders, debris and overhanging banks. In Victorian parts of the Murray Darling, only small natural populations remain in the upper reaches of the Mitta Mitta, Ovens, Broken, Campaspe and Goulburn Rivers; translocated populations occur in the Yarra River and Lake Eildon. In NSW, natural inland populations are isolated to the upper reaches of the Lachlan and Murrumbidgee Rivers. Populations of the eastern form are confined to the Hawkesbury-Nepean and Shoalhaven river systems. Translocated populations in NSW are found in the Mongarlowe River, Queanbeyan River upstream of the Googong Reservoir and in Cataract Dam. In the ACT, it is restricted to the Murrumbidgee, Paddys and Cotter Rivers.	PMST	Low. No records in the locality.

Appendix C: Tests of Significance (BC Act)

Tests of Significance in accordance with Section 7.2 of the BC Act have been updated to reference the additional impact associated to the Addendum REF increased boundary. The test below will present a discussion of the additional impact as well as a holistic assessment taking into consideration the previously assessed impact areas associated to the Project REF**.** For the purpose of consistency, the same reference areas, reports, and research articles from the Project BAR have been utilised for these revised assessments.

Threatened Ecological Communities

Cumberland Plain Woodland in the Sydney Basin Bioregion

As provided in the Project BAR:

"*Cumberland Plain Woodland in the Sydney Basin Bioregion (Cumberland Plain Woodland) is listed as a critically endangered ecological community (CEEC) under the BC Act,and is facing an extremely high risk of extinction in NSW (TSSC, 2019b). This community is associated with clay soils derived from Wianamatta Group geology, or more rarely alluvial substrates, on the Cumberland Plain, a rain shadow area to the west of Sydney's Central Business District. Cumberland Plain Woodland typically occurs on flat to undulating or hilly terrain up to about 350 metre elevation but may also occur on locally steep sites and at slightly higher elevations. It is characterised by a species-rich understorey of native tussock grasses, herbs and shrub layer comprised of Bursaria spinosa, Acacia implexa, Indigofera australis and Dodonaea viscosa* subsp. *cuneata. The canopy is dominated by Eucalyptus moluccana, Eucalyptus tereticornis, Corymbia maculata and Eucalyptus eugenioides on the plains. Eucalyptus crebra generally dominates on shale hills.*

It is estimated that less than 13% of native vegetation of the Cumberland Plain remains as intact bushland (DECCW, 2011). An update of Tozer's (2003) map, based on interpretation of imagery flown in January-March 2007 shows that the extent of Cumberland Plain Woodland east of the Hawkesbury – Nepean River had declined by 442±46 hectare, a reduction of 5.2±0.6% in 9 years (NSW Scientific Committee & Simpson 2008).

The remaining area of the community is severely fragmented, with more than half of the remaining tree cover mapped by Tozer (2003) occurring in patches of less than 80 ha and half of all mapped patches being smaller than 3 hectares.

The integrity and survival of small, isolated stands is impaired by the small population size of many species, enhanced risks from environmental stochasticity, disruption to pollination and dispersal of fruits or seeds, and likely reductions in the genetic diversity of isolated populations (Young et al. 1996; Young & Clarke 2000).

Changes in structure contribute to a very large reduction in the ecological function of Cumberland Plain Woodland. Almost all of the remaining area of the community is regrowth forest and woodland from past clearing activities (Benson & Howell 1990).

Clearing and continuing degradation of Cumberland Plain Woodland patches reduces the likelihood that all flora and fauna species will persist, particularly because a large proportion of species are known from very few locations which are not clustered in predictable ways (Benson & Howell 2002; Tozer 2003)."

In the Project REF, most of the Cumberland Plain Woodland CEEC occurs within a powerline easement and access track that is regularly maintained and disturbed by trimming and slashing. This community is associated with PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion. At a regional scale, 93% of this PCT is estimated to have been cleared with about 6,800 hectares remaining in the Cumberland Plain landscape (DPIE, 2021). Patches of this PCT were assessed against the key characteristics outlined in the final determination for listing of Cumberland Plain Woodland in the Sydney Basin Bioregion (TSSC, 2019b).

The total impact of the proposal on this CEEC is 3.5 hectares. This comprises 0.45 hectares within the Project REF, and 0.08 hectares within the Addendum REF of woodland in moderate condition (Vegetation Zone 4), and 2.96 hectares within the Project REF, and 0.11 hectares within the Addendum REF of woodland in low condition (Vegetation Zone 5). The moderate condition patch occurs next to The Driftway and Londonderry Road intersection and has greater native species diversity than low condition patches. All patches of Cumberland Plain Woodland have been exposed to historical and ongoing disturbances associated with weed invasion and edge effects of being roadside vegetation. The degree of disturbance is substantial in the ground layer where exotic pasture grasses *Eragrostis curvula* and *Chloris gayana* dominate the ground cover in nearly all patches.

The following factors in Table C- are considered for the purposes of determining whether the proposed development or activity is likely to significantly affect the Cumberland Plain Woodland CEEC.

Table C-1 Cumberland Plain Woodland CEEC test of significance

Cumberland Plain Woodland in the Sydney Basin Bioregion	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	Not applicable.
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**
Response	In addressing this question, the local occurrence of these threatened ecological communities is taken to be the community that occurs within the locality and all contiguous vegetation and the movement of individuals and exchange of genetic material across the boundaries in the locality (as defined in the Threatened Species Test of Significance Guidelines, OEH, 2018). Risk of extinction is used here as the likelihood that the local occurrence of the ecological community would become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the threatened ecological community from the Proposed Modifications. Composition refers to the assemblage of species and the physical structure of the community. This community is restricted to shale/clay and rarely alluvial soils of the Cumberland Plain. The best estimate of the extent of occurrence (EOO) for this community in the Cumberland Plain with a range of conditions is 24,530 hectares (DECCW, 2011). Of this, between 6,800-10,612 hectares is expected to contain a relatively intact native tree canopy (ECCW, 2011; DPIE, 2021). The extent of local occurrence for this community was determined using the Remnant Vegetation of the western Cumberland subregion, VIS_ID 4207 OEH, 2013). The extent of local occurrence for this community was determined within approximately 10,000 hectares which encompasses the movement of individuals and exchange of genetic material. There is a total of 3,226 hectares of vegetation that is likely to align with this CEEC in the locality. The community is part of a larger contiguous native vegetation patch comprising 114 hectares extending north, of which 22 hectares conform to Cumberland Plain Woodland CEEC (Niche, 2021). Other fragmented patches also occur in the locality. The Proposed Modifications will impact 3.54 hectares of this CEEC. This comprises 0.53 hectares of woodland in moderate condition (Vegetation Zone 4) and 3.01 hectares woodland in low condition (Vegetation Zone 5). At a local scale this would reduce the extent of this community by 0.11% and is considered negligible given that most of the impact (85%) would be low condition patches. Impacted patches of this community are disturbed in the ground layer with low native species diversity and dominated by exotic pasture grasses *Eragrostis curvula* and *Chloris gayana*. Without intervention, the current quality of this EEC is unlikely to improve in condition next to the roadside. The Moderate condition woodland at the intersection of Londonderry Road and The Driftway is small, disconnected to east west passage, has road edge effects on two sides, integrates into a large patch of Castlereagh Scribbly Gum Woodland and other native vegetation further east, and already is of borderline low condition so is likely to naturally move into a low condition, without management. The low condition woodland to the east is a narrow remnant with The Driftway road separating the length of it and with Blacktown Road separating the larger affected patch from patches to the northeast. Therefore, the Proposed Modifications are unlikely to substantially modify the composition of these patches. Much of the landscape with Cumberland Plain Woodland has been exposed to historical and ongoing disturbances from clearing and other agricultural and urban pressures. Moderate to good condition patches in adjacent land to the north would remain intact and potentially be protected under a proposed biodiversity stewardship site agreement.

Cumberland Plain Woodland in the Sydney Basin Bioregion	
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**
Response	The Proposed Modifications would impact 3.54 hectares of this CEEC. This comprises 0.53 hectares of woodland in moderate condition (Vegetation Zone 4) and 3.01 hectares of woodland in low condition (Vegetation Zone 5). At a local scale this would reduce the extent of this community by 0.11% and is considered negligible given that most of the impact (85%) would be low condition patches. The proposed removal of 0.53 hectares in the moderate condition patch is considered negligible, given that the patch of the of the CEEC is small, disconnected to east west passage, has road edge effects on two sides, integrates into a large patch of Castlereagh Scribbly Gum Woodland and other native vegetation further east, and already is of borderline low condition so is likely to naturally move into a low condition, without management. The patches of the CEEC that make up the local occurrence are already somewhat fragmented and isolated in the locality. The Proposed Modifications are unlikely to break the local occurrence into more fragments. However, it is likely to increase the distance between the remaining fragments, as the distance between patches on either side of roadways would be increased, resulting in increased isolation for fast and air dispersing species. This increased isolation may result in a reduction in the function of ecological processes such as pollination and seed dispersal (seed dispersal by ants would already be impacted) between fragments. The patches of the community affected are of small size and vary in structure from regrowth to semi-mature woodland (all patches have historically been cleared). The CEEC exists in two condition states: moderate and low (small patches including most areas with substantial weed cover). Due to their size, and generally being in low condition, the CEEC patches in the project boundary are not considered to retain levels of ecological integrity and function. Most patches are affected by edge effects along the roadside and would act as a buffer to adjacent larger patches of native vegetation in the north. There is a minor risk that removal of this CEEC may present further edge effects to remaining patches of this community. Due to the conservation significance of this CEEC, all remaining remnants are likely to be important for its long-term survival. However, disjunct patches in low condition that would be impacted have less importance where the ground layer is disturbed with high weed cover and the seedbank is degraded.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.

Cumberland Plain Woodland in the Sydney Basin Bioregion	
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. The Proposed Modifications would result in an increase in the following KTPs: • Invasion of native plant communities by exotic perennial grasses • Clearing of native vegetation • Removal of dead wood and dead trees. The main effect on KTPs would be the clearing of native vegetation and removal of dead wood and dead trees. There is a possible increase in invasion of exotic perennial grasses into less weedy habitats. Due to the small scale of native vegetation loss in low condition, the impact on this KTP in the local context is considered negligible. While there is potential for other KTPs of relevance to this species to be affected by the Proposed Modifications, these KTPs are likely to be able to be adequately managed by standard environmental management measures.

Conclusion

The CEEC within the project boundary is unlikely to be important to the long-term survival of this community in the locality. Although part of this community forms part of a larger patch extending to the north, the majority of the community occurs as small, fragmented patches along either side of the roadside and The Driftway and Blacktown Road intersection. The groundcover of nearly all CEEC patches are very disturbed and dominated by exotic perennial grasses such as *Eragrostis curvula* and *Chloris gayana*, indicating degradation of the seedbank and having less importance to the long-term survival of the community.

The moderate condition patch next to The Driftway and Londonderry Road intersection is likely to have importance and has slightly greater native species diversity than low condition patches. However, the proposed removal of 0.53 hectares in the moderate condition patch is considered negligible, given that the patch of the of the CEEC itself is small, significantly edge affected, and integrates into a large patch of Castlereagh Scribbly Gum Woodland and other native vegetation further east which would remain intact.

The proportion of the local occurrence to be impacted is low (3.54 ha of 3,226 ha; 0.11%) when considered in the context of the known extent of higher condition patches of the CEEC within the locality. The Proposed Modifications are also considered unlikely to substantially and adversely modify the composition of adjacent areas of the CEEC that would not be cleared but may increase risk of edge effects to remaining patches.

There is also a risk of patches becoming more isolated within the local occurrence due to the increase in the width of cleared land associated width of the widened road. The Proposed Modifications are unlikely to place the CEEC at risk of extinction, as only a relatively small proportion of the CEEC would be impacted in an area of habitat that is in low condition and has less importance to the survival of the CEEC where the ground layer is very disturbed with high weed cover.

The Proposed Modifications would contribute to some KTPs that cannot be mitigated against including clearing of native vegetation and removal of dead wood and dead trees.

In summary, the Proposed Modifications are considered unlikely to have a significant adverse effect on the extent and condition of the Cumberland Plain Woodland CEEC, Although the Proposed Modifications would contribute to KTPs, the impact on the local occurrence of the CEEC is unlikely to significantly elevate the risk of extinction.

Shale Gravel Transition Forest in the Sydney Basin Bioregion

As provided in the Project BAR:

"*Shale Gravel Transition Forest in the Sydney Basin Bioregion (Shale Gravel Transition Forest) is listed as an endangered ecological community (EEC) under the BC Act, and is likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary development cease to operate (TSSC, 2019d). This community occurs primarily in areas where shallow deposits of Tertiary alluvium overlie shale soils but may also occur in association with localised concentrations of iron-indurated gravel. Shale Gravel Transition Forest grades into Cumberland Plain Woodland as alluvial and ironstone influences decline. It is characterised by a species-rich understorey of native grasses, herbs and shrub layer comprised of Bursaria spinosa, Daviesia ulicifolia and Lissanthe strigosa. The canopy is open-forest structure, usually with trees of Eucalyptus fibrosa sometimes with Eucalyptus moluccana and Eucalyptus tereticornis. Melaleuca decora is frequently present in a small tree stratum.*

About 36% of the original distribution of about 7,000 hectares remains (NSW NPWS 2000) and much of this is in a degraded state."

In the project boundary, the Shale Transition Forest EEC occurs within a powerline easement and access track that is regularly maintained and disturbed by trimming and slashing. This community is associated with PCT 724 Broad-leaved Ironbark - Grey Box - *Melaleuca decora* grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion. At a regional scale, 75% of this PCT is estimated to have been cleared with about 1,700 hectares remaining in the Cumberland Plain landscape (DPIE, 2021). Patches of this PCT were assessed against the key characteristics outlined in the final determination for listing of Shale Gravel Transition Forest EEC (TSSC, 2019d).

The total impact of the Proposed Modifications on this EEC is 0.51 hectares. This comprises 0.51 hectares within the Project REF, and 0.001 hectares within the Addendum REF, of woodland in low condition in Vegetation Zone 1. All patches of Cumberland Plain Woodland have been exposed to historical and ongoing disturbances associated with weed invasion and edge effects of being roadside vegetation. The degree of disturbance is substantial in the ground layer where *Eragrostis curvula* dominates the ground cover in nearly all patches.

The following factors in Table C- are considered for the purposes of determining whether the proposed development or activity is likely to significantly affect the Shale Gravel Transition Forest EEC.

Table C-2 Shale Gravel Transition Forest EEC test of significance

Shale Gravel Transition Forest in the Sydney Basin Bioregion	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	Not applicable.
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**
Response	In addressing this question, the local occurrence of these threatened ecological communities is taken to be the community that occurs within the locality and all contiguous vegetation and the movement of individuals and exchange of genetic material across the boundaries in the locality (as defined in the Threatened Species Test of Significance Guidelines, OEH, 2018). Risk of extinction is used here as the likelihood that the local occurrence of the ecological community would become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the threatened ecological community from the Proposed Modifications. Composition refers to the assemblage of species and the physical structure of the community. The extent of local occurrence for this community was determined using the Remnant Vegetation of the western Cumberland subregion, VIS_ID 4207 OEH, 2013). The extent of local occurrence for this community was determined within approximately 10,000 hectares. There is a total of 1,982 hectares of vegetation that is likely to align with this EEC occurring locally. The community is part of a larger contiguous native vegetation patch comprising 114 hectares extending north, of which 34 hectares conform to this EEC in good condition (Niche, 2021). Other fragmented patches also occur in the locality. There is a larger patch of Shale Gravel Transition Forest likely to occur further west along The Driftway (pers comm. L. Anderson). The Proposed Modifications would impact 0.51 hectares of this EEC. At a local scale this would reduce the extent of this community by 0.026% and is considered negligible given that only low condition patches would be impacted. Impacted patches of this community are disturbed in the ground layer with low native species diversity and dominated by exotic perennial grasses such as *Eragrostis curvula* and *Chloris gayana*. Without intervention, the current quality of this EEC is unlikely to improve in condition as it is the southern extent of this patch and is split by the road with isolated trees on the southern side. Therefore, the Proposed Modifications are unlikely to substantially modify the composition of this patch. Much of the landscape with Shale Gravel Transition Forest has been exposed to historical and ongoing disturbances from clearing and other agricultural and urban pressures. Good condition patches in adjacent land to the north would remain intact and potentially be protected under a biodiversity stewardship site agreement

Shale Gravel Transition Forest in the Sydney Basin Bioregion	
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**
Response	The Proposed Modifications would impact 0.51 hectares of this EEC. At a local scale this would reduce the extent of this community by 0.026% and is considered negligible given that all low condition patches would be impacted. The patches of the EEC that make up the local occurrence are already somewhat fragmented and isolated in the locality. The Proposed Modifications are unlikely to break the local occurrence into more fragments. However, it is likely to increase the distance between the remaining isolated trees, as the distance between patches on either side of road would be increased, resulting in increased isolation. This increased isolation may result in a reduction in the function of ecological processes such as pollination and seed dispersal (seed dispersal by ants would already be impacted) between fragments. The patches of the community affected are of small size and vary in structure from regrowth to semi-mature woodland (all patches have historically been cleared). The EEC exists in low condition (small patches including most areas with substantial weed cover) and due to their size, the EEC patches in the project boundary are not considered to retain levels of ecological integrity and function. Most patches are affected by edge effects along the roadside and would act as a buffer to adjacent larger patches of native vegetation in the north. There is a minor risk that removal of this EEC may present further edge effects to remaining patches of this community. Due to the conservation significance of this EEC, all remaining remnants are likely to be important for its long-term survival. However, patches in low condition that would be impacted have less importance where the ground layer is disturbed with high weed cover and the seedbank is degraded.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. The Proposed Modifications would result in an increase in the following KTPs: • Invasion of native plant communities by exotic perennial grasses • Clearing of native vegetation • Removal of dead wood and dead trees. The main effect on KTPs would be the clearing of native vegetation and removal of dead wood and dead trees. There is a possible increase in invasion of exotic perennial grasses into less weedy habitats. Due to the small scale of native vegetation loss in low condition, the impact on this KTP in the local context is considered negligible. While there is potential for other KTPs of relevance to this species to be affected by the Proposed Modifications, these KTPs are likely to be able to be adequately managed by standard environmental management measures.

Conclusion

The EEC within the project boundary is unlikely to be important to the long-term survival of this community in the locality. Although this community forms part of a larger patch extending to the north, this is the southern edge of the affected patch and the patches on the southern side of The Driftway are isolated trees. The proposed removal of 0.51 hectares of this community in low condition is considered negligible, given the larger patch to the north would remain intact.

The proportion of the local occurrence affected impact is low (0.51 ha of 1,982 ha; 0.026%) when considered in the context of the known extent of the EEC within the broader locality. The Proposed Modifications are also considered unlikely to substantially and adversely modify the composition of adjacent areas of the EEC that would not be cleared but may increase risk of edge effects to remaining patches.

There is also a risk of patches becoming more isolated within the local occurrence due to the increase in the width of cleared land associated with the road.

The Proposed Modifications would contribute to some KTPs that cannot be mitigated against including clearing of native vegetation and removal of dead wood and dead trees.

In summary, the Proposed Modifications are considered unlikely to have a significant adverse effect on the extent and condition of the Shale Gravel Transition Forest EEC, Although the Proposed Modifications would contribute to KTPs, the impact on the local occurrence of the EEC is unlikely to significantly elevate the risk of extinction.

Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion

As provided in the Project BAR:

"*Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion (Cooks River/Castlereagh Ironbark) is listed as an endangered ecological community (EEC) under the BC Act, and is likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary development cease to operate (TSSC, 2016). This community is associated occurs on clay soils on Tertiary alluvium, or on shale soils on Wianamatta Shale including the Birrong Soil Landscape and associated shale lowlands. The community occurs as an open forest to low woodland structure usually with trees of Eucalyptus fibrosa and Melaleuca decora, sometimes with Eucalyptus longifolia. A relatively dense shrub stratum is typical, commonly with Melaleuca nodosa and Lissanthe strigosa, and to a lesser extent Melaleuca decora. A variety of shrub species may occur, including Acacia pubescens, Dillwynia tenuifolia, Daviesia ulicifolia, Pultenaea villosa and Grevillea juniperina. Commonly occurring species in the ground stratum include Entolasia stricta, Lepidosperma laterale, Opercularia diphylla, Dianella revoluta, Themeda australis, Microlaena stipoides and Lobelia purpurascens. The community may grade into Castlereagh Swamp Woodland in poorly drained depressions or into Castlereagh Scribbly Gum Woodland where the soil is sandier. Where the Tertiary alluvium is shallow, the community may grade into Shale Gravel Transition Forest.*

It is estimated about 7% of the original distribution of this community remains (NSW NPWS 2000). There has been very extensive clearing and major fragmentation and isolation of remnants throughout its range."

In the project boundary, the Cooks River/Castlereagh Ironbark Forest EEC occurs within a powerline easement and access track that is regularly maintained and disturbed by trimming and slashing. This community is associated with PCT 725 Broad-leaved Ironbark - *Melaleuca decora* shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion. At a regional scale, 95% of this PCT is estimated to have been cleared with about 1,100 hectares remaining in the Cumberland Plain landscape (DPIE, 2021). Patches of this PCT were assessed against the key characteristics outlined in the final determination for listing of Cooks River/Castlereagh Ironbark Forest (TSSC, 2016).

The total impact of the Proposed Modifications on this EEC is 0.2 hectares. This comprises woodland in low condition within the Project REF (Vegetation Zone 2). All patches of Cooks River/Castlereagh Ironbark Forest have been exposed to historical and ongoing disturbances associated with weed invasion and edge effects of being roadside vegetation. The degree of disturbance is substantial in the ground layer which had mostly bare ground with high exotic grass, *Eragrostis curvula*, and no native ground cover.

The following factors in Table C-3 are considered for the purposes of determining whether the proposed development or activity is likely to significantly affect the Cooks River/Castlereagh Ironbark Forest EEC.

Table C-3 Cooks River/Castlereagh Ironbark Forest test of significance

Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	Not applicable.
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**
Response	In addressing this question, the local occurrence of these threatened ecological communities is taken to be the community that occurs within the locality and all contiguous vegetation and the movement of individuals and exchange of genetic material across the boundaries in the locality (as defined in the Threatened Species Test of Significance Guidelines, OEH, 2018). Risk of extinction is used here as the likelihood that the local occurrence of the ecological community would become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the threatened ecological community from the Proposed Modifications. Composition refers to the assemblage of species and the physical structure of the community. The extent of local occurrence for this community was determined using the Remnant Vegetation of the western Cumberland subregion, VIS_ID 4207 OEH, 2013). The extent of local occurrence for this community was determined within approximately 10,000 hectares. There is a total of 996 hectares of vegetation that is likely to align with this EEC occurring locally. The community is part of a larger contiguous native vegetation patch comprising 114 hectares extending north, of which 12 hectares conform to this EEC in varying condition (Niche, 2021). Other fragmented patches also occur in the locality. The Proposed Modifications would impact 0.20 hectares of this EEC. At a local scale this would reduce the extent of this community by 0.02% and is considered negligible given that only low condition patches would be impacted. Impacted patches of this community are disturbed in the ground layer with no native species diversity and dominated by exotic perennial grass, such as *Eragrostis curvula*. Without intervention, the current quality of this EEC is unlikely to improve in condition next to the roadside. Therefore, the Proposed Modifications are unlikely to substantially modify the composition of this patch. Much of the landscape with Cooks River/Castlereagh Ironbark Forest has been exposed to historical and ongoing disturbances from clearing and other agricultural and urban pressures. Good condition patches in adjacent land to the north would remain intact and potentially be protected under a biodiversity stewardship site agreement.

Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**
Response	The Proposed Modifications would impact 0.20 hectares of this EEC. At a local scale this would reduce the extent of this community by 0.02% and is considered negligible given that only low condition patches would be impacted. The patches of the EEC that make up the local occurrence are already somewhat fragmented and isolated in the locality. The Proposed Modifications are unlikely to break the local occurrence into more fragments. However, it is likely to increase the distance between the remaining isolated trees, as the distance between patches on either side of road would be increased, resulting in increased isolation. This increased isolation may result in a reduction in the function of ecological processes such as pollination and seed dispersal (seed dispersal by ants would already be impacted) between fragments. The patches of the community affected are of small size and vary in structure from regrowth to semi-mature woodland (all patches have historically been cleared). The EEC exists in low condition (small patches including most areas with substantial weed cover) and due to their size, the EEC patches in the project boundary are not considered to retain levels of ecological integrity and function. Most patches are affected by edge effects along the roadside and would act as a buffer to adjacent larger patches of native vegetation in the north. There is a minor risk that removal of this EEC may present further edge effects to remaining patches of this community. Due to the conservation significance of this EEC, all remaining remnants are likely to be important for its long-term survival. However, patches in low condition that would be impacted have less importance where the ground layer is disturbed with high weed cover and the seedbank is degraded.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. The Proposed Modifications would result in an increase in the following KTPs: • Invasion of native plant communities by exotic perennial grasses • Clearing of native vegetation • Removal of dead wood and dead trees. The main effect on KTPs would be the clearing of native vegetation and removal of dead wood and dead trees. There is a possible increase in invasion of exotic perennial grasses into less weedy habitats. Due to the small scale of native vegetation loss in low condition, the impact on this KTP in the local context is considered negligible. While there is potential for other KTPs of relevance to this species to be affected by the Proposed Modifications, these KTPs are likely to be able to be adequately managed by standard environmental management measures.

Conclusion

The EEC within the project boundary is unlikely to be important to the long-term survival of this community in the locality. Although this community forms part of a larger patch extending to the north, the proposed removal of 0.20 hectares of this community in low condition is considered negligible, given the larger patch to the north would remain intact.

The proportion of the local occurrence affected impact is low (0.2 ha of 996 ha; 0.02%) when considered in the context of the known extent of the EEC within the broader locality. The Proposed Modifications are also considered unlikely to substantially and adversely modify the composition of adjacent areas of the EEC that would not be cleared but may increase risk of edge effects to remaining patches.

There is also a risk of patches becoming more isolated within the local occurrence due to the increase in the width of cleared land associated with the road.

The Proposed Modifications would contribute to some KTPs that cannot be mitigated against including clearing of native vegetation and removal of dead wood and dead trees.

In summary, the Proposed Modifications are considered unlikely to have a significant adverse effect on the extent and condition of the Cooks River/Castlereagh Ironbark Forest EEC, Although the Proposed Modifications would contribute to KTPs, the impact on the local occurrence of the EEC is unlikely to significantly elevate the risk of extinction.

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

As provided in the Project BAR:

"*River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (River-Flat Eucalypt Forest) is listed as a endangered ecological community (EEC) under the BC Act, and is likely to become extinct in nature in NSW unless the circumstances and factors threatening its survival or evolutionary development cease to operate (TSSC, 2019c).*

This community is associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. This community generally occurs below 50 metre elevation but may occur on localised river flats up to 250 metres above sea level in the Sydney Basin. The structure of the community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees. Typically, these forests and woodlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water.

It is estimated that there is less than 30% of the original distribution of this community remaining (NSW NPWS 2000). Less than 25% remained on the Cumberland Plain in 1998 (Tozer, 2003)."

In the project boundary, the River-Flat Eucalypt Forest EEC occurs within a powerline easement and access track that is regularly maintained and disturbed by trimming and slashing. This community is associated with PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion. At a regional scale, 93% of this PCT is estimated to have been cleared with about 4,729 hectares remaining in the Cumberland Plain landscape (DPIE, 2021). Patches of this PCT were assessed against the key characteristics outlined in the final determination for listing of River-Flat Eucalypt Forest (TSSC, 2019c). The Assessment of River-Flat Eucalyptus Forest on Coastal floodplains TEC on NSW Crown Forest Estate (EPA, 2016), and the River-flat Eucalypt Forest on Coastal Floodplains Identification Guidelines (DECC, 2007) were also consulted to assist in the EEC diagnostics.

The total impact of the Proposed Modifications on this EEC is 0.436 hectares. This comprises 0.37 hectares within the Project REF, and 0.006 hectares within the Addendum REF, of woodland in low condition (Vegetation Zone 3). All patches of Cooks River/Castlereagh Ironbark Forest have been exposed to historical and ongoing disturbances associated with weed invasion and edge effects of being roadside vegetation. The degree of disturbance is substantial in the ground layer where *Eragrostis curvula* dominates the ground cover in nearly all patches.

The following factors in Table C-4 are considered for the purposes of determining whether the proposed development or activity is likely to significantly affect the River-Flat Eucalypt Forest EEC.

Table C-4 River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	Not applicable.
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**
Response	In addressing this question, the local occurrence of these threatened ecological communities is taken to be the community that occurs within the locality and all contiguous vegetation and the movement of individuals and exchange of genetic material across the boundaries in the locality (as defined in the Threatened Species Test of Significance Guidelines, OEH, 2018). Risk of extinction is used here as the likelihood that the local occurrence of the ecological community would become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the threatened ecological community from the Proposed Modifications. Composition refers to the assemblage of species and the physical structure of the community. The extent of local occurrence for this community was determined using the Remnant Vegetation of the western Cumberland subregion, VIS_ID 4207 OEH, 2013). The extent of local occurrence for this community was determined within approximately 10,000 hectares. There is a total of 1,493 hectares of vegetation that is likely to align with this EEC occurring locally. The community is part of a larger contiguous native vegetation patch comprising 114 hectares extending north, of which 23 hectares conform to this EEC in varying condition (Niche, 2021). Other fragmented patches also occur in the locality. The Proposed Modifications would impact 0.436 hectares of this EEC. At a local scale this would reduce the extent of this community by 0.029% and is considered negligible given that only low condition patches would be impacted. Impacted patches of this community are disturbed in the ground layer with little native species diversity and dominated by exotic perennial grass, such as *Eragrostis curvula* and *Cenchrus clandestinus*. Without intervention, the current quality of this EEC is unlikely to improve in condition next to the roadside. Therefore, the Proposed Modifications are unlikely to substantially modify the composition of this patch. Much of the landscape with River-Flat Eucalypt Forest EEC has been exposed to historical and ongoing disturbances from clearing and other agricultural and urban pressures. Good condition patches in adjacent land to the north would remain intact and potentially be protected under a biodiversity stewardship site agreement.

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**
Response	The Proposed Modifications would impact 0.436 hectares of this EEC. At a local scale this would reduce the extent of this community by 0.029% and is considered negligible given that only low condition patches would be impacted. The patches of the EEC that make up the local occurrence are already somewhat fragmented and isolated in the locality. The Proposed Modifications are unlikely to break the local occurrence into more fragments. However, it is likely to increase the distance between the remaining fragments, as the distance between patches on either side of roadways would be increased, resulting in increased isolation for fast and air dispersing species. This increased isolation may result in a reduction in the function of ecological processes such as pollination and seed dispersal (seed dispersal by ants would already be impacted) between fragments. The patches of the community affected are of small size and vary in structure from regrowth to semi-mature woodland (all patches have historically been cleared). The EEC exists in low condition (small patches including most areas with substantial weed cover) and due to their size, the EEC patches in the project boundary are not considered to retain levels of ecological integrity and function. Most patches are affected by edge effects along the roadside and would act as a buffer to adjacent larger patches of native vegetation in the north. There is a minor risk that removal of this EEC may present further edge effects to remaining patches of this community. Due to the conservation significance of this EEC, all remaining remnants are likely to be important for its long-term survival. However, patches in low condition that would be impacted have less importance where the ground layer is disturbed with high weed cover and the seedbank is degraded.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. The Proposed Modifications would result in an increase in the following KTPs: • Invasion of native plant communities by exotic perennial grasses • Clearing of native vegetation • Removal of dead wood and dead trees. The main effect on KTPs would be the clearing of native vegetation and removal of dead wood and dead trees. There is a possible increase in invasion of exotic perennial grasses into less weedy habitats. Due to the small scale of native vegetation loss in low condition, the impact on this KTP in the local context is considered negligible. While there is potential for other KTPs of relevance to this species to be affected by the Proposed Modifications, these KTPs are likely to be able to be adequately managed by standard environmental management measures

Conclusion

The EEC within the project boundary is unlikely to be important to the long-term survival of this community in the locality. Although this community forms part of a larger patch extending to the north, the proposed removal of 0.436 hectares of this community in low condition is considered negligible, given the larger patch to the north would remain intact.

The proportion of the local occurrence affected impact is low (0.436 ha of 1,493 ha; 0.029%) when considered in the context of the known extent of the EEC within the broader locality. The Proposed Modifications are also considered unlikely to substantially and adversely modify the composition of adjacent areas of the EEC that would not be cleared but may increase risk of edge effects to remaining patches.

There is also a risk of patches becoming more isolated within the local occurrence due to the increase in the width of cleared land associated with the road.

The Proposed Modifications would contribute to some KTPs that cannot be mitigated against including clearing of native vegetation and removal of dead wood and dead trees.

In summary, the Proposed Modifications are considered unlikely to have a significant adverse effect on the extent and condition of the River-Flat Eucalypt Forest EEC, Although the Proposed Modifications would contribute to KTPs, the impact on the local occurrence of the EEC is unlikely to significantly elevate the risk of extinction.

Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion

As provided in the Project BAR:

"*Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion (Castlereagh Scribbly Gum Woodland) is listed as a vulnerable ecological community (VEC) under the BC Act, and is facing a high risk of extinction in NSW in the medium-term future (TSSC, 2019a).*

The structure of the community is generally woodland or may occur as remnant trees. Characteristic tree species in this community Eucalyptus parramattensis subsp. *parramattensis, Angophora bakeri and E. sclerophylla. A small tree stratum of Melaleuca decora is sometimes present, generally in areas with poorer drainage. It has a well-developed shrub stratum consisting of sclerophyllous species. The ground stratum consists of a diverse range of forbs and grasses. The community occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium (Tozer 2003). It is most often found on sandy soils and tends to occur on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest.*

It is estimated that there was less than 53% of the original distribution of this community remaining on the Cumberland Plain in 1997 (Tozer, 2003)."

In the project boundary, the Castlereagh Scribbly Gum Woodland VEC occurs within a powerline easement and access track that is regularly maintained and disturbed by trimming and slashing. This community is associated with PCT 883 Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion. At a regional scale, 50% of this PCT is estimated to have been cleared with about 3,100 hectares remaining in the Cumberland Plain landscape (DPIE, 2021). Patches of this PCT were assessed against the key characteristics outlined in the final determination for listing of Castlereagh Scribbly Gum Woodland (TSSC, 2019a).

The total impact of the Proposed Modifications on this VEC is 1.192 hectares. This comprises 0.08 hectares within the Project REF of woodland in moderate condition (Vegetation Zone 6) and 1.09 hectares, within the Project REF, and 0.022 hectares, within the Addendum REF of woodland in low condition (Vegetation Zone 7). All patches of Castlereagh Scribbly Gum Woodland have been exposed to historical and ongoing disturbances associated with weed invasion and edge effects of being roadside vegetation. The degree of disturbance is substantial in the ground layer where *Eragrostis curvula* dominates the ground cover in nearly all patches.

The following factors in Table C-5are considered for the purposes of determining whether the proposed development or activity is likely to significantly affect the Castlereagh Scribbly Gum Woodland VEC.

Table C-5 Castlereagh Scribbly Gum Woodland VEC test of significance

Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	Not applicable.
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**
Response	Not applicable. Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion is a vulnerable ecological community.
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**
Response	The extent of local occurrence for this community was determined using the Remnant Vegetation of the western Cumberland subregion, VIS_ID 4207 OEH, 2013). The extent of local occurrence for this community was determined within approximately 10,000 hectares. There is a total of 3,537 hectares of vegetation that is likely to align with this VEC occurring locally. The community is part of a larger contiguous native vegetation patch comprising 114 hectares extending north, of which 19.6 hectares aligns closely with Castlereagh Scribbly Gum Woodland VEC in varying condition (Niche, 2021). Other fragmented patches conforming to the community VEC also occur in the locality. The Proposed Modifications would impact 1.19 hectares of this VEC. At a local scale this would reduce the extent of this community by 0.03% and is considered negligible given that most patches are in low condition and only a small area of 0.08 hectares in moderate condition would be impacted. The patches of the VEC that make up the local occurrence are already somewhat fragmented and isolated in the locality. The Proposed Modifications are unlikely to break the local occurrence into more fragments. However, it is likely to increase the distance between the remaining fragments, as the distance between patches on either side of roadways would be increased, resulting in increased isolation for fast and air dispersing species. This increased isolation may result in a reduction in the function of ecological processes such as pollination and seed dispersal (seed dispersal by ants would already be impacted) between fragments. The patches of the community affected are of small size and vary in structure from regrowth to semi-mature woodland (all patches have historically been cleared). The VEC exists in low condition (small patches including most areas with substantial weed cover) and due to their size, the VEC patches in the project boundary are not considered to retain levels of ecological integrity and function. Most patches are affected by edge effects along the roadside and would act as a buffer to adjacent larger patches of native vegetation in the north. There is a minor risk that removal of this VEC may present further edge effects to remaining patches of this community. Due to the conservation significance of this VEC, all remaining remnants are likely to be important for its long-term survival. However, patches in low condition that would be impacted have less importance where the ground layer is disturbed with high weed cover and the seedbank is degraded.

Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion	
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. The Proposed Modifications would result in an increase in the following KTPs: • Invasion of native plant communities by exotic perennial grasses • Clearing of native vegetation • Removal of dead wood and dead trees. The main effect on KTPs would be the clearing of native vegetation and removal of dead wood and dead trees. There is a possible increase in invasion of exotic perennial grasses into less weedy habitats. Due to the small scale of native vegetation loss in low condition, the impact on this KTP in the local context is considered negligible. While there is potential for other KTPs of relevance to this species to be affected by the Proposed Modifications, these KTPs are likely to be able to be adequately managed by standard environmental management measures

Conclusion

The VEC within the project boundary is unlikely to be important to the long-term survival of this community in the locality. Although this community forms part of a larger patch extending to the north, the proposed removal of 1.17 hectares of this community in mostly low condition is considered negligible, given the larger patch to the north would remain intact.

The proportion of the local occurrence affected impact is low (1.17 ha of 3,537 ha; 0.03%) when considered in the context of the known extent of the VEC within the broader locality. The Proposed Modifications are also considered unlikely to substantially and adversely modify the composition of adjacent areas of the VEC that would not be cleared but may increase risk of edge effects to remaining patches.

There is also a risk of patches becoming more isolated within the local occurrence due to the increase in the width of cleared land associated with the road. The Proposed Modifications would contribute to some KTPs that cannot be mitigated against including clearing of native vegetation and removal of dead wood and dead trees.

In summary, the Proposed Modifications are considered unlikely to have a significant adverse effect on the extent and condition of the Castlereagh Scribbly Gum Woodland VEC. Although the Proposed Modifications would contribute to KTPs, the impact on the local occurrence of the VEC is unlikely to significantly elevate the risk of extinction.

Threatened Flora

Dillwynia tenuifolia

Dillwynia tenuifolia is a native flora species listed as a vulnerable under the BC Act, and is facing a high risk of extinction in NSW. The species has a restricted distribution, endemic to the Sydney region and occurs in the Cumberland Plain from Windsor and Penrith east to Dean Park near Colebee, with a number of disjunct populations outside of the Cumberland Plain (OEH, 2019b). In western Sydney, the species can be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays.

The species produces fruit from both self- and cross-pollination events. Seeds are hard coasted and are persist in the soil seedbank and is known to have a high level of genetic variation and can appear in different forms (being polymorphic) (Rymer, Morris and Richardson, 2002).

The abundance of individuals is influenced by past disturbance history such as fire. The high population densities at some recorded sites (200,000+ individuals) reflects prolific seed germination in response to fire (OEH, 2019b).

There are two endangered populations listed under the BC Act at Kemps Creek and in the Baulkham Hills local government area. The population along The Driftway is not part of these endangered populations.

In the project boundary, *Dillwynia tenuifolia* grows as a pioneer species which has established in response to disturbance, particularly along the edge of tracks and beneath the powerline easement amongst a high cover of exotic perennial grass *Eragrostis curvula*. Although individuals in the project boundary occur in a disturbed roadside area, they are considered part of a large viable local population in a significant area of habitat that extends into better condition native vegetation in land to the north which currently has a proposed biodiversity stewardship site agreement. The genetic neighbourhood of a large population is considered to be 120m in diameter (Rymer, 1999). This means that any populations separated by more than 120m are unlikely to exchange genes and can lead to inbreeding, especially for small, isolated populations. As a result, plants occurring in the project boundary are not isolated or fragmented and would share the same genetic structure to the broader population.

The entire population (not including any plants occurring on the south side of The Driftway) has an estimated area of occupancy of 67 hectares with about 1.516 hectares occurring in the Project and Proposed Modifications boundary. Dense patches were observed in parts of the roadside in low condition patches of PCT 724 and PCT 849 and 0.216 hectares within the Addendum REF Boundary. The species is generally sparser in other parts of the project boundary in PCT 724 and PCT 883. Only one isolated dense cluster of plants was observed in PCT 835. The project boundary is estimated to contain about 5,000 individuals mostly in dense patches in localised disturbed areas based on 1 square metre density quadrats and general observations. There is likely to be >100,000 individuals in the entire population in the based-on data from BioNet (DPIE, 2021), Niche (2021) and site observations.

The following factors in Table C-6 are taken into account for the purposes of determining whether the proposed development or activity is likely to significantly affect the *Dillwynia tenuifolia* population.

Table C-6 *Dillwynia tenuifolia* test of significance

Dillwynia tenuifolia	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	There is one large linear area occupied by the species in the project boundary with dense patches occurring near the east in PCT 725 and PCT 849. Other parts of the project boundary are sparser with individuals. Representative samples of the population were undertaken in both dense and sparse patches to estimate the area of occupancy and population numbers. The entire population has an estimated area of occupancy of 67 hectares with about 1.3 hectares occurring in the project boundary. Although individuals in the project boundary occur in a disturbed roadside area, they are considered part of a large viable local population in a significant area of habitat that extends into better condition native vegetation in land to the north. There is likely to be high interaction between plants in adjacent areas to the north. Accurately estimating the number of individuals of this species is problematic, given the large numbers in dense patches and sparser patches over a large area. The project boundary is estimated to contain about 5,000 individuals mostly in dense patches in localised disturbed areas. There is likely to be >100,000 individuals in the entire population. Due to the species' habit and the representative rather than comprehensive nature of surveys on-foot, population numbers are only an estimate. In determining the proportion of population loss, the area of habitat or area of occupancy was used. The Proposed Modifications would impact about 1.516 hectares of habitat for this species. This would impact on 2.2 % of the large viable local population. Given the disturbance history of habitat in the project boundary it is likely that individuals have re-established from dispersal of plants in the adjacent population to the north. As a result, it is unlikely that the Proposed Modifications would have an adverse effect on the lifecycle of the species. The remaining large viable population of the species to the north would be protected and not placed at risk of extinction by the Proposed Modifications.
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**
Response	Not applicable.

Dillwynia tenuifolia	
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**
Response	The Proposed Modifications are predicted to remove around 1.516 hectares of habitat for *Dillwynia tenuifolia*, comprising low condition habitat in PCT 724 (0.35ha), PCT, 725 (0.04 ha), PCT 849 (0.06 ha) and PCT 883 (0.85 ha) and 0.216 hectares within the Addendum REF Boundary. There may be additional indirect impacts to remaining areas of habitat (drying/modification of the soil surface) the due to edge effects. However, the edge of adjacent areas is already highly disturbed with weeds, particularly exotic perennial grasses. The species is known to colonise disturbed habitats in high abundance and is likely to benefit from edge effected areas. The clearing of habitat would be small and only remove disturbed vegetation. Good condition habitat to the north would be retained and the Proposed Modifications are unlikely to fragment habitat. The habitat for the population is all on the north side of the road and the Proposed Modifications are unlikely to affect isolation or fragmentation of this population. The population occurs in high densities in localised patches in disturbed habitat, but generally has a low importance for the long-term survival of the species as it is part of a large contiguous area of better habitat that supports a very large number of individuals. The roadside reserve is likely to be under a higher intense disturbance regime due to the access track and maintenance of the powerline easement. The adjacent habitat to the north is being established as a biodiversity stewardship site on private lands and is likely to contain a disproportionately high percentage of the population of the species and to be of high importance to the long-term survival of the species in the locality.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.

Dillwynia tenuifolia	
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. The Proposed Modifications would result in an increase in the following KTPs: • Invasion of native plant communities by exotic perennial grasses • Clearing of native vegetation • Removal of dead wood and dead trees. The main effect on KTPs would be the clearing of native vegetation and removal of dead wood and dead trees. There is a possible increase in invasion of exotic perennial grasses into less weedy habitats. Due to the small scale of native vegetation loss in low condition, the impact on this KTP in the local context is considered negligible. While there is potential for other KTPs of relevance to this species to be affected by the Proposed Modifications, these KTPs are likely to be able to be adequately managed by standard environmental management measures

Conclusion

The Proposed Modifications are predicted to remove around 1.3 hectares of habitat for *Dillwynia tenuifolia*, comprising low condition habitat in PCT 724 (0.35ha), PCT, 725 (0.04 ha), PCT 849 (0.06 ha) and PCT 883 (0.85 ha). There may be additional indirect impacts to remaining areas of habitat (drying/modification of the soil surface) the due to edge effects. However, the edge of adjacent areas is already highly disturbed with weeds, particularly exotic perennial grasses. The species is known to colonise disturbed habitats in high abundance and is likely to benefit from edge effected areas.

The Proposed Modifications are unlikely to place the *Dillwynia tenuifolia* population at risk of extinction, as only a relatively small proportion of the population would be impacted in an area of habitat that is in low condition and has less importance to the survival of the species where the ground layer is disturbed with high weed cover.

The Proposed Modifications are therefore considered unlikely to have a significant impact on *Dillwynia tenuifolia* population.

Other Threatened flora

- *Pultenaea parviflora*
- *Acacia pubescens*
- *Grevillea juniperina* subsp. *juniperina*

Pultenaea parviflora is listed as Endangered under the BC Act and Vulnerable under the EPBC Act and is endemic to the Cumberland Plain, where the core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce. *Pultenaea parviflora* may be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. *Eucalyptus fibrosa* is usually the dominant canopy species. *Eucalyptus globoidea, Eucalyptus longifolia, Eucalyptus parramattensis, Eucalyptus sclerophylla* and *Eucalyptus sideroxylon* may also be present or co-dominant, with *Melaleuca decora* frequently forming a secondary canopy layer. This species is also often found in association with other threatened species such as *Dillwynia tenuifolia, Grevillea juniperina, Micromyrtus minutiflora* and *Persoonia nutans*. Dominance at a site largely depends on competition from other shrubby plants.

Acacia pubescens (Downy Wattle) also listed as Vulnerable under both the BC and EPBC Acts. This species is concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. *Acacia pubescens* occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone and occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.

Grevillea juniperina subsp. *juniperina* (Juniper-leaf Grevillea) is listed as Vulnerable under the BC Act. It is endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town. *Grevillea juniperina* subsp. *juniperina* grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels. It has been recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest.

There is potential habitat for these five flora species within the project boundary. For *Pultenaea parviflora*, this includes PCT 724, PCT 725, and PCT 883 with the associated Threatened Ecological Communities (TEC), Shale Gravel Transition Forest in the Sydney Basin Bioregion, Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion and Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion. The PCTs associated with *Grevillea juniperina* subsp. *juniperina* and *Acacia pubescens*, which are located within the project boundary, include PCT 724, 148 PCT 725, PCT 849 and PCT 883 with the associated TECs, Shale Gravel Transition Forest in the Sydney Basin Bioregion, Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, Cumberland Plain Woodland in the Sydney Basin Bioregion and Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion.

Of the threatened flora recognised to have potential habitat within the project boundary, during field surveys performed by Jacobs, only the *Grevillea juniperina* subsp. *juniperina* species was identified. Based on database searches, *Pultenaea parviflora* was identified to have one recent record within the adjacent patch, to the north of the project boundary. Database searches also shows records of *Acacia pubescens* within the locality of the Proposed Modifications, however, none were identified within the adjacent habitat.

The following is to be considered for the purposes of determining whether the proposed development is likely to significantly affect the threatened *Pultenaea parviflora* species, or their habitat.

Table C-7 Test of significance for threatened flora with potential habitat in study area

Acacia pubescens, Grevillea juniperina subsp. juniperina* and *Pultenaea parviflora	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	There is one large linear area occupied by the species in the project boundary with dense patches occurring near the east in PCT 725 and PCT 849. Other parts of the project boundary are sparser with individuals. Representative samples of the population were undertaken in both dense and sparse patches to estimate the area of occupancy and population numbers. The entire population has an estimated area of occupancy of 67 hectares with about 1.3 hectares occurring in the project boundary. Although individuals in the project boundary occur in a disturbed roadside area, they are considered part of a large viable local population in a significant area of habitat that extends into better condition native vegetation in land to the north. There is likely to be high interaction between plants in adjacent areas to the north. Accurately estimating the number of individuals of this species is problematic, given the large numbers in dense patches and sparser patches over a large area. The project boundary is estimated to contain about 5,000 individuals mostly in dense patches in localised disturbed areas. There is likely to be >100,000 individuals in the entire population. Due to the species' habit and the representative rather than comprehensive nature of surveys on-foot, population numbers are only an estimate. In determining the proportion of population loss, the area of habitat or area of occupancy was used. The Proposed Modifications would impact about 1.516 hectares of habitat for this species. This would impact on 2.2 % of the large viable local population. Given the disturbance history of habitat in the project boundary it is likely that individuals have re-established from dispersal of plants in the adjacent population to the north. As a result, it is unlikely that the Proposed Modifications would have an adverse effect on the lifecycle of the species. The remaining large viable population of the species to the north would be protected and not placed at risk of extinction by the Proposed Modifications.
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**
Response	Not applicable.

Acacia pubescens, Grevillea juniperina subsp. juniperina* and *Pultenaea parviflora	
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**
Response	The Proposed Modifications are predicted to remove around 1.516 hectares of habitat for *Dillwynia tenuifolia*, comprising low condition habitat in PCT 724 (0.35ha), PCT, 725 (0.04 ha), PCT 849 (0.06 ha) and PCT 883 (0.85 ha). There may be additional indirect impacts to remaining areas of habitat (drying/modification of the soil surface) the due to edge effects. However, the edge of adjacent areas is already highly disturbed with weeds, particularly exotic perennial grasses. The species is known to colonise disturbed habitats in high abundance and is likely to benefit from edge effected areas. The clearing of habitat would be small and only remove disturbed vegetation. Good condition habitat to the north would be retained and the Proposed Modifications are unlikely to fragment habitat. The habitat for the population is all on the north side of the road and the Proposed Modifications are unlikely to affect isolation or fragmentation of this population. The population occurs in high densities in localised patches in disturbed habitat, but generally has a low importance for the long-term survival of the species as it is part of a large contiguous area of better habitat that supports a very large number of individuals. The roadside reserve is likely to be under a higher intense disturbance regime due to the access track and maintenance of the powerline easement. The adjacent habitat to the north is being established as a biodiversity stewardship site on private lands and is likely to contain a disproportionately high percentage of the population of the species and to be of high importance to the long-term survival of the species in the locality.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.

Acacia pubescens, Grevillea juniperina subsp. juniperina* and *Pultenaea parviflora	
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. The Proposed Modifications would result in an increase in the following KTPs: • Invasion of native plant communities by exotic perennial grasses • Clearing of native vegetation • Removal of dead wood and dead trees. The main effect on KTPs would be the clearing of native vegetation and removal of dead wood and dead trees. There is a possible increase in invasion of exotic perennial grasses into less weedy habitats. Due to the small scale of native vegetation loss in low condition, the impact on this KTP in the local context is considered negligible. While there is potential for other KTPs of relevance to this species to be affected by the Proposed Modifications, these KTPs are likely to be able to be adequately managed by standard environmental management measures

Conclusion

The breeding cycle of the overall core populations would continue (if present) within the adjacent suitable habitat to the north of the project boundary. Given the highly disturbed habitat within the project boundary, it is unlikely that the study area provides good quality breeding habitat for *Pultenaea parviflora*, *Grevillea juniperina* subsp. j*uniperina* or *Acacia pubescens*. Furthermore, the reduction in available habitat being limited to 1.88 hectares (*Pultenaea parviflora*) and 5.29 hectares (*Grevillea juniperina* subsp. j*uniperina* or *Acacia pubescens*) of vegetation within a larger patch of 67 hectares is unlikely to reduce the habitat of these species such that it will put it at risk of extinction.

Pultenaea parviflora, or *Acacia pubescens* were not identified within the proposed project boundary during surveys. The Proposed Modifications are however, predicted to remove approximately 1.88 hectares of potential habitat for *Pultenaea parviflora*, comprising low – moderate condition habitat in PCT 724 (0.51ha), PCT, 725 (0.2 ha) and PCT 883 (1.17 ha) and 5.29 hectares of habitat for *Grevillea juniperina* subsp. *juniperina* and *Acacia pubescens* comprising of low – moderate condition habitat in PCT 724 (0.51ha), PCT, 725 (0.2 ha), PCT 849 (3.41 ha) and PCT 883 (1.17 ha). *Grevillea juniperina* subsp. *juniperina*, which was identified in the study area during surveys, may suffer a small reduction in extent of suitable habitat from the Proposed Modifications. However, no further habitat fragmentation or isolation on a landscape scale would occur.

There may be additional indirect impacts to remaining areas of habitat (drying/modification of the soil surface) the due to edge effects. However, the edge of adjacent areas is already highly disturbed with weeds, particularly exotic perennial grasses. Furthermore, the location of the species records within the locality are not situated in proximity to the edge of the habitat to be disturbed by the Proposed Modifications. Therefore, impacts to these species because of edge effects are unlikely.

There may be additional indirect impacts to remaining areas of habitat (drying/modification of the soil surface) the due to edge effects. However, the edge of adjacent areas is already highly disturbed with weeds, particularly exotic perennial grasses. Furthermore, the location of the species records within the locality are not situated in proximity to the edge of the habitat to be disturbed by the Proposed Modifications. Therefore, impacts to these species because of edge effects are unlikely.

Given the considerations, the proposed works are not likely to significantly impact on the *Pultenaea parviflora*, *Grevillea juniperina* subsp. *juniperina* or *Acacia pubescens* habitats within the locality.

Fauna

Threatened bird species

- Dusky Woodswallow (Artamus cyanopterus cyanopterus)
- Little Lorikeet (*Glossopsitta pusilla*)
- Swift Parrot (*Lathamus discolor*)
- Little Eagle (*Hieraaetus morphnoides*)
- Varied Sittella (*Daphoenositta chrysoptera*)

The Dusky Woodswallow is widespread in eastern, southern and southwestern Australia, occurring throughout most of New South Wales. The Dusky Woodswallow primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and groundcover of grasses or sedges and fallen woody debris.

The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat. They forage primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species and riparian habitats are also preferrable. The Little Lorikeet nests in close proximity to feeding areas, if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.

The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and southwest slopes. In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought.

Vegetation communities and key tree species that provide important nesting and foraging habitat for Swift Parrots in NSW include *Eucalyptus sideroxylon* (Mugga Ironbark), *Eucalyptus microcarpa* (Grey Box), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus albens* (White Box), Eucalyptus robusta (Swamp Mahogany), *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus pilularis* (Blackbutt) and *Corymbia maculata* (Spotted Gum). The use of these habitats is dependent on prevailing climatic conditions and corresponding food availability. The production of lerp and nectar food resources in these habitats and the availability of nesting hollows are considered the main limiting factors to the species' survival and capacity to breed. Due to the variable production of nectar and lerps across this species' range, it is considered important to protect and manage a broad range of habitats to provide a range of foraging resources.

The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. They occupy open eucalypt forest, woodland or open woodland and Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. The Little Eagle nests in tall living trees within a remnant patch.

The Varied Sittella inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.

During field surveys, no threatened bird species were identified, however, database searches identified local occurrences of the Dusky Woodswallow, Little Lorikeet, Little Eagle, Swift Parrot and the Varied Sitella within the locality of the Proposed Modifications. Two species, the Little Lorikeet and the Varied Sitella have been recorded within the adjacent habitat patch to the north of the Proposed Modifications. Two sightings were recorded in 2006 and 2019 for the Little Lorikeet and one record for the Varied Sitella in 2007.

The Dusky Woodswallow, Little Eagle and Varied Sitella are likely to fly over the study area on occasion and may temporarily perch on trees. However, the study area is considered unlikely to form suitable breeding habitat for these species and habitat use would be intermittent and minimal. Furthermore, there were no hollow bearing trees identified within the project boundary, which would provide breeding and roosting habitat for the Little Lorikeet and the Swift Parrot.

The Swift Parrot has been recorded in the locality and sporadically occurs in the urbanised areas of western Sydney during winter. The Little Lorikeet has also been recorded in the locality and within the adjacent patch connected to the project boundary. These species may pass through the study area during movements between larger foraging habitats (from

vegetation patches to the north of The Driftway to Castlereagh Nature Reserve and other vegetation patches within the locality) where it may rest and forage in street trees or small vegetation remnants. Although no significant areas of foraging habitat are present, the Swift Parrot and Little Lorikeet are considered moderately likely to occur in the study area on occasion.

There is potential foraging habitat for the Dusky Woodswallow, Little Lorikeet, Swift Parrot, Little Eagle and Varied Sittella, comprising of PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883. These PCTs are associated with the following respective TECs; Shale Gravel Transition Forest in the Sydney Basin Bioregion, Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, Cumberland Plain Woodland in the Sydney Basin Bioregion and Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion.

The following is to be considered for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.

Table C-8 Test of significance for threatened bird species with potential habitat in the study area

Dusky Woodswallow, Little Lorikeet, Swift Parrot, Little Eagle and Varied Sittella	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	The Dusky Woodswallow is widespread in eastern, southern and south western Australia. It inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and groundcover of grasses or sedges and fallen woody debris. Little Lorikeets are distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri (Royal Australian Ornithologists Union, 2003). Little Lorikeets are generally considered to be nomadic (Higgins, 1999) and forage mainly on flowers, nectar and fruit. The breeding biology of Little Lorikeets is little known however studies indicate that nest hollows are located at heights of between 2 metre and 15 metre, mostly in living, smooth-barked eucalypts, and hollow openings are approximately 3 centimetre in diameter (Courtney and Debus, 2006). The Little Eagle is distributed throughout the Australian mainland occupying habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. Prey includes birds, reptiles and mammals, with the occasional large insect and carrion. Most of its former native mammalian prey species in inland NSW are extinct and rabbits now form a major part of the diet. Importantly, no large stick nests for the Little Eagle were observed during the field surveys within the study area and therefore no nesting habitat for this species would be impacted by the Proposed Modifications. The Varied Sittella inhabits most of mainland Australia except the treeless deserts and open grasslands. They feed on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. The Varied Sittella may use marginal habitat in the project boundary intermittently to forage, however no breeding habitat is present. The removal of habitat for these threatened bird species would equate to 5.66 hectares including PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.37 ha), PCT 849 (3.41 ha) and PCT 883 (1.17 ha). This amount of habitat is small relative to amount of better-quality habitat in the locality. The removal of habitat would affect the lifecycle of these species if they are present. However, the habitat to be removed as a result of the Proposed Modifications is of low quality and is along the edge of a much larger high-quality vegetation patch. Furthermore, due to the abundance of aggressive birds, such as Noisy Miners, and adjacent urbanisation, the quality of the habitat to be removed is not considered high. Any birds that may use the habitat in the study area would also likely use adjacent habitats and habitats within the locality that are of higher quality. After the Proposed Modifications has been completed, there would be sufficient habitat left in the vicinity of study area for these species to complete their lifecycles. The Proposed Modifications are not considered likely to have an adverse effect on the life cycle of these species such that a viable local population of these species is likely to be placed at risk of extinction.

Dusky Woodswallow, Little Lorikeet, Swift Parrot, Little Eagle and Varied Sittella	
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Response	Not applicable.
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**
Response	The extent of foraging habitat removal for these species (PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883) is estimated at 5.66 hectares of foraging habitat (mix of mature, native tree species and invasive species). This is a small impact compared to the extent of habitat availability in the locality. Fragmentation is unlikely to occur from the Proposed Modifications as the work would largely involve removing vegetation from patch edges rather than breaking apart of large blocks of vegetation into many smaller patches. Importantly, the Proposed Modifications would not result in the breaking apart of large blocks of high-quality habitats. No further habitat fragmentation on a landscape scale would occur as a result of the Proposed Modifications. Isolation of habitats is likely to increase by a small extent as the distance between patches on either side of road would be increased. The project boundary does not contain high quality habitats for these species, though the adjoining habitat is of high quality. However, the high-quality habitat would result in minimal impacts conduced to edge effects. These species may utilise the habitat on occasion but would not use it preferentially. The larger adjacent habitats are considered more important for these species than the roadside vegetation in the study area. No breeding habitat is present in the study area so the importance of the habitat for these species is limited. The loss of native vegetation from the Proposed Modifications would reduce the amount of foraging habitat available for these species by a small amount. However, when compared to the larger and higher quality vegetation remnants in the locality, the vegetation within the project boundary is not considered crucial for the long-term survival of these species in the locality.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.

Dusky Woodswallow, Little Lorikeet, Swift Parrot, Little Eagle and Varied Sittella	
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. Of the 39 listed KTPs under the BC Act, nine are applicable to this assessment. However, hygiene and weed control measures would reduce or avoid the impact of most KTPs except for clearing of native vegetation and removal of dead wood and dead trees. Though the extent of native vegetation clearing, and habitat removal associated with the Proposed Modifications are considered unlikely to be significant considering the availability of good quality habitat for these species in the locality.

Conclusion

These bird species would suffer a small reduction in extent of foraging habitat from the Proposed Modifications. No breeding habitat would be affected. Fragmentation is unlikely to occur from the Proposed Modifications as the work would largely involve removing vegetation from patch edges rather than breaking apart of large blocks of vegetation into many smaller patches. The Proposed Modifications are unlikely to reduce the population size of these species or decrease the reproductive success of these species. After consideration of the factors above, an overall conclusion has been made that the Proposed Modifications are unlikely to result in a significant effect to threatened birds.

Threatened insectivorous bats

- Large Bent-winged Bat (Miniopterus orianae oceanensis)
- Little Bent-wing Bat (*Miniopterus australis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Southern Myotis (*Myotis macropus*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Greater Broad-nosed Bat *(Scoteanax rueppellii*)

The study area provides some habitat for species of threatened insectivorous bat including the Large Bent-winged Bat, Little Bent-winged Bat, Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat, Eastern Coastal Freetail-bat, Southern Myotis, Large-eared Pied Bat and the Greater Broad-nosed Bat (all listed as vulnerable under the BC Act).

Large Bent-winged Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. The Large Bent-winged Bat hunts in forested areas, catching moths and other flying insects above the treetops.

The Little Bent-winged Bat is distributed along the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. They inhabit Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub and are generally found in well-timbered areas. The Little Bent-winged Bat roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.

The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. They prefer moist habitats, with trees taller than 20 metres. Generally, roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.

The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. The Yellow-bellied Sheathtail-bat roosts singly or in groups of up to six, in tree hollows and buildings. They forage in most habitats across their wide range and when foraging for insects in woodland, they fly high and fast over the forest canopy.

The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. They occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great 158 Dividing Range. The Eastern Freetail-bat roosts mainly in tree hollows but will also roost under bark or in man-made structures.

The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. They generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.

The Large-eared Pied Bat is 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. They roost in caves (near their entrances), crevices in cliffs and in old mine workings, frequenting low to mid-elevation dry open forest and woodland close to these features.

The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however, does not occur at altitudes above 500 metre. they utilise a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. This species usually roosts in tree hollows and has also been found in buildings.

These species have been recorded widely from the locality or have been modelled to occur within the locality and are likely to forage in the habitats in the study area. Database records have placed the Large Bent-winged Bat, Eastern Coastal Freetail-bat and the Southern Myotis within the study area, with records from 2019, 2006 and 2019 respectively. Tree hollows are

limited but the habitat is likely to be suitable as foraging habitat. Culverts are located within the study area which are suitable for the Large Bent-winged Bat, Little Bent-winged Bat and the Large-ear Pied Bat.

There is potential foraging habitat for the Large Bent-winged Bat, Little Bent-winged Bat, Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat, Eastern Coastal Freetail-bat, Southern Myotis, Large-eared Pied Bat and the Greater Broad-nosed Bat, comprising of PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883. These PCTs are associated with the following respective TECs; Shale Gravel Transition Forest in the Sydney Basin Bioregion, Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, Cumberland Plain Woodland in the Sydney Basin Bioregion and Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion.

The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats**.**

Table C-9 Test of significance for threatened insectivorous bat species with potential habitat in the study area

Large Bentwing-bat, Little Bentwing-bat, Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat, Eastern Coastal Freetail-bat, Southern Myotis, Large-eared Pied Bat and Greater Broad-nosed Bat	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	The Little Bent-winged Bat roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings. They often share roosting sites with the Large Bent-winged Bat, and, in winter, the two species may form mixed clusters. Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer. The Large Bent-winged Bat primarily roosts in caves, but will also use derelict mines, storm-water tunnels, buildings and other man-made structures. The Large Bent-winged Bat forms populations centered on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300-kilometre range of maternity caves. The Eastern False Pipistrelle and Greater Broad-nosed Bat generally roost in eucalypt hollows but have also been found under loose bark on trees or in buildings. The Eastern Coastal Freetail-bat roosts mainly in tree hollows but will also roost under bark or in man-made structures. The Large-eared Pied Bat are found in well-timbered areas containing gullies. They roost in caves, crevices in cliffs and old mine workings. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. The Southern Myotis generally roosts close to water in caves, mine shafts, hollow-bearing trees, storm-water channels, buildings, under bridges and in dense foliage. The Southern Myotis forages over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW, females have one young each year usually in November or December. The Yellow-bellied Sheathtail-bat roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. The Yellow-bellied Sheathtail-bat forages in most habitats including forested areas and open paddocks. Breeding has been recorded from December to mid-March, when single young is born. The Eastern Coastal Free-tailed Bat occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in human-made structures. All vegetation within the study area is likely to provide foraging habitat for these bat species. No hollow-bearing trees or culverts would be affected by the Proposed Modifications, so no breeding habitat is predicted to be affected. These species have been recorded widely from the locality and are likely to use the study area as foraging habitat on occasion. The impact to potential foraging habitat within the project boundary would consist of 5.66 hectares including, PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.37 ha), PCT 849 (3.41 ha) and PCT 883 (1.17 ha). However, much of the project boundary area is not considered high quality habitat. The current potential for these species to occur based on the presence of potential foraging habitat is expected to remain after completion of the Proposed Modifications. Impacts are likely to be restricted to loss of foraging habitat of 5.66 hectares. Therefore, this amount of habitat removal is not considered likely to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction. Considerable foraging habitat would remain in the locality.

Large Bentwing-bat, Little Bentwing-bat, Eastern False Pipistrelle, Yellow-bellied Sheathtail-bat, Eastern Coastal Freetail-bat, Southern Myotis, Large-eared Pied Bat and Greater Broad-nosed Bat	
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Response	The Proposed Modifications would remove around 5.66 hectares of potential foraging habitat for the threatened insectivorous bat species. This amount of habitat removal is small when the amount of available foraging habitat in the locality is considered. The habitat within the study area is not limiting for these species. No roosting or breeding habitat would be affected. Importantly, the Proposed Modifications would not result in fragmentation of habitat for these species. These species are highly mobile and will freely fly long distances over open areas to move between habitats. The Proposed Modifications would not affect the movement of these bats between habitat patches. The vegetation in the study area would form a small component of a larger foraging range for these species. Vegetation at the edge of patches is likely to be a focal point of foraging activity. The loss of native vegetation from the Proposed Modifications would reduce the amount of foraging habitat available for these species by a small amount. However, when compared to the larger and higher quality vegetation remnants in the locality, the vegetation within the study area is not considered as important for the long-term survival of these species.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. Of the 39 listed KTPs under the BC Act, nine are applicable to this assessment. • The Proposed Modifications may indirectly contribute to several other KTPs, some including the following: • Pest animals that can compete with or prey upon native animals. They can also damage native plants and degrade natural habitats. • Weeds that compete with native plants for resources such as light and nutrients. They can aggressively invade areas, displacing native plants and animals. • Diseases, those exotic fungal infections, viruses and other pathogens can weaken and kill native species. The extent of native vegetation clearing, and habitat removal associated with the Proposed Modifications are considered unlikely to be significant in terms of available habitat for these species next to the project boundary. Hygiene and weed control measures would reduce or avoid the impact of most other KTPs.

Conclusion

These bat species would suffer a small reduction in extent of foraging habitat from the Proposed Modifications. No roosting habitat, including tree hollows and culverts would be affected. The Proposed Modifications are unlikely to reduce the population size of these species or decrease the reproductive success of these species. After consideration of the factors above, an overall conclusion has been made that the Proposed Modifications are unlikely to result in a significant effect to threatened insectivorous bats.

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

Grey-headed Flying-foxes are generally found within 200 kilometers of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. They occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. The Grey-headed Flying-fox can travel up to 50 kilometers from the camp to forage. They feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, which are present in the study area, and fruits of rainforest trees and vines.

The Grey-headed Flying-fox is considered moderately likely to forage in the trees within the study area. No roost camps are present in the study area but the bats from the Ropes Crossing, Emu Plains, Yarramundi and Penrith camps are likely to forage in the study area.

There is potential foraging habitat for the Grey-headed Flying-fox, comprising of PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883. These PCTs are associated with the following respective TECs; Shale Gravel Transition Forest in the Sydney Basin Bioregion, Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, Cumberland Plain Woodland in the Sydney Basin Bioregion and Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion.

The following is to be considered for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.

Table C-10 Test of significance for the threatened Grey-headed Flying-fox

Grey-headed Flying-fox	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	The Grey-headed Flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 kilometre of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Annual mating commences in January and conception occurs in April or May; single young is born in October or November. There is one record of the Grey-headed Flying-fox from 2019 within the study area. There are no roost camps located in the study area and the Proposed Modifications would not directly impact on any known breeding / maternity sites. As such, the impacts of the Proposed Modifications to the Grey-headed Flying-fox would be limited to loss of feeding habitat caused by direct clearing or damage to native vegetation during the construction phase. The Proposed Modifications would remove around 5.66 hectares of foraging habitat, including PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.37 ha), PCT 849 (3.41 ha) and PCT 883 (1.17 ha). The vegetation to be removed within the project boundary exists along the existing road verge connected to a higher-quality patch. However, removal of vegetation would be avoided where possible. The affected area of foraging habitat would represent a small percentage of the total extent of important foraging vegetation types present within the locality. Given the relative widespread nature of similar planted vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of the camps located near the study area, the Proposed Modifications are not expected to significantly affect the life cycle of the species. Furthermore, the Proposed Modifications are unlikely to reduce the population size of the Grey-headed Flying-fox or decrease the reproductive success of this species.
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Response	Not applicable.

Grey-headed Flying-fox	
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality**
Response	The potential habitat of the Grey-headed Flying-fox within the study area is limited to foraging habitat and includes fruiting and flowering trees present. The extent of potential foraging habitat for the Grey-headed Flying-fox would be reduced by around 5.66 hectares of foraging habitat (mix of mature, native tree species). This amount of habitat removal is small when the amount of available foraging habitat in the locality is considered, and the impacts would be along the edge of a larger high-quality patch. Importantly, the Proposed Modifications would not result in fragmentation of habitat for the Grey-headed Flying-fox. This species is highly mobile and will freely fly long distances (up to 50 kilometres) over open areas including urbanised city centres to move between roost camps and foraging sites. The Proposed Modifications would not affect the movement of the Grey-headed Flying-fox between habitat patches. The Proposed Modifications would not affect the most important habitats for Grey-headed Flying-fox within the locality. The most important habitats for the local Grey-headed Flying-fox sub-populations are the roosting camps at Ropes Crossing, Emu Plains, Yarramundi and Penrith, which would not be impacted upon by the Proposed Modifications. Foraging habitat within the study area is likely to form part of an overall foraging range of these subpopulations and would only form a small proportion of available habitat for this species. As such, the foraging habitat within the study area is unlikely to be of critical importance for the survival of the Grey-headed Flying-fox within the locality.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process**
Reponse	With respect to Grey-headed Flying-fox, the Proposed Modifications would directly contribute to one key threatening process (KTPs) listed under the BC Act, Clearing of native vegetation. The Proposed Modifications may also indirectly contribute to several other KTPs including: • Pest animals that can compete with or prey upon native animals. They can also damage native plants and degrade natural habitats. • Weeds that compete with native plants for resources such as light and nutrients. They can aggressively invade areas, displacing native plants and animals. • Diseases, those exotic fungal infections, viruses and other pathogens can weaken and kill native species. The extent of native vegetation clearing, and habitat removal associated with the Proposed Modifications are considered unlikely to be significant in terms of available habitat for the Grey-headed Flying-fox within the vicinity of the study area. Hygiene and weed control measures would reduce or avoid the impact of most other KTPs.

Conclusion

The Grey-headed Flying-fox would suffer a small reduction in extent of suitable foraging habitat from the Proposed Modifications of around 5.66 hectares of foraging habitat including PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.37 ha), PCT 849 (3.41 ha) and PCT 883 (1.17 ha). No roosting camps or other important habitat would be impacted. As such, the Proposed Modifications are considered unlikely to reduce the population size of the Grey-headed Flying-fox or decrease the reproductive success of this species. After consideration of the factors above, an overall conclusion has been made that the Proposed Modifications are unlikely to result in a significant effect to the Grey-headed Flying-fox.

Cumberland Plain Land Snail (*Meriodolum corneovirens*)

The Cumberland Plain Land Snail (*Meriodolum corneovirens*) (CPLS) is listed as Endangered under the BC Act. It is endemic to Western Sydney, living in small areas on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. The CPLS is known from over 100 different locations, but not all are currently occupied, and they are usually isolated from each other as a result of land use patterns.

The CPLS is primarily found within Cumberland Plain Woodland, which is a grassy, open woodland with occasional dense patches of shrub, and inhabits leaf litter debris under Eucalyptus species such as Forest Red Gum. They are also known to persist in habitats during significant disturbance. The CPLS is a fungus specialist, where it is generally active at night. Little is known of its biology, however there is a suggestion that the species breeds throughout the year when conditions are suitable.

The CPLS is known to occur across the study area based on targeted snail surveys completed by Australian Museum Consulting (2014). During the Australian Museum Consulting (2014) survey, three live specimens and 18 shells of the Cumberland Plain Land Snail were recorded.

During field surveys three CPLS shells were identified within the project boundary. There is potential habitat for the CPLS within the project boundary, including Cumberland Plain Woodland in the Sydney Basin Bioregion, Shale Gravel Transition Forest in the Sydney Basin Bioregion, Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion, River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast Sydney Basin and South East Corner Bioregions and the Castlereagh Swamp Woodland Threatened Ecological Community.

The following, outlined in Table C-11, is to be considered for the purposes of determining whether the proposed development is likely to significantly affect the threatened CPLS species, or their habitat.

Table C-11 Cumberland Plain Land Snail test of significance

Cumberland Plain Land Snail	
Factor	**Adverse effects on the life cycle of a species:** **(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction**
Response	The proposed works involve the permanent removal of 5.66 hectares of potential habitat for the CPLS, including Cumberland Plain Woodland, Shale Gravel Transition Forest, Cooks River/Castlereagh Ironbark Forest, River-Flat Eucalyptus Forest and Castlereagh Swamp Woodland. Within the project boundary, majority of the ground cover is dominated by *Eragrostis curvula* which may impact on the occurrence of the CPLS within the area. Information about the breeding cycle of the Cumberland Plain Land Snail is limited, with knowledge extending to preferred breeding habitat to occur beneath moist logs for the deposit of eggs. Given the lack of appropriate woody debris and logs within the project boundary it is unlikely that the area provides good quality breeding habitat for the species. Furthermore, the reduction in available habitat being limited to 5.66 hectares of vegetation within a larger patch of 67 hectares is unlikely to reduce the habitat of the species such that it would put it at risk of extinction. The proposed works, however, could potentially impact individual species. Mitigation measures would include the implementation of a predisturbance survey to identify any individuals that could occur within the impact area. If individuals are found, work would cease, the individuals would be flagged, and further mitigation measures would be implemented. The proposed works are not likely to adversely affect the life cycle of Cumberland Plain Land Snail such that the viable local population is to be placed at risk of extinction.
Factor	**Adverse effects on ecological communities:** **(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:** **i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Response	Not applicable.

Cumberland Plain Land Snail	
Factor	**Adverse effects on habitats:** **(c) in relation to the habitat of a threatened species or ecological community:** **i the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **iii the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**
Response	The Proposed Modifications are predicted to remove approximately 5.66 hectares of habitat for the CPLS, comprising low – moderate condition habitat in PCT 724 (0.51 ha), PCT, 725 (0.2 ha), PCT 835 (0.37 ha), PCT 849 (3.41 ha) and PCT 883 (1.17 ha). There may be additional indirect impacts to remaining areas of habitat (drying/modification of the soil surface) the due to edge effects. However, the edge of adjacent areas is already highly disturbed with weeds, particularly exotic perennial grasses. Clearing of habitat would increase the distance between areas of habitat by a small amount in some locations but it is unlikely to fragment habitat. The habitat for the population is all on the north side of the road and the Proposed Modifications are unlikely to affect isolation or fragmentation of this population. The vegetation to be impacted is located along the southern extent of the local occurrence, which already is impacted by the location of road corridors and residential properties. The community would retain similar connectivity, and the removal of 5.66 hectares of the southern extent would not impact the connectivity of the larger patch. The proposed works would not impact on habitat specifically important for the survival of the species. The habitat has been previously fragmented by the installation of The Driftway and Londonderry Road, such that it provides a break in the landscape that would not allow free movement of the CPLS. The removal of vegetation on the extent and next to the road corridor is unlikely to increase fragmentation further, such that it would have an impact on the CPLS. Therefore, the vegetation to be removed is not important for the long-term survival of the species. The impacts on habitat would not be of magnitude likely to affect the long-term survival of the community in the locality.
Factor	**Adverse effects on areas of outstanding biodiversity value:** **(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).**
Response	The Proposed Modifications would not impact on any declared area of outstanding biodiversity value.

Cumberland Plain Land Snail	
Factor	**Key threatening processes:** **(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.**
Response	A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 39 listed KTPs. The Proposed Modifications would result in an increase in the following KTPs: • Invasion of native plant communities by exotic perennial grasses • Clearing of native vegetation. The main effect on KTPs would be the clearing of native vegetation and possible further invasion of exotic perennial grasses into less weedy habitats. The removal of the native vegetation constitutes a small amount of the overall available native vegetation for the CPLS. Furthermore, due to the small scale of native vegetation loss in low condition, the impact on this KTP in the local context is considered negligible. Weed management strategies would be implemented to reduce the risk of invasion of native plant communities by exotic perennial grasses, such as *Eragrostis curvula*. This would include targeting the removal of these species such that they do not pose a threat to the local occurrence of the community. While there is potential for other KTPs of relevance to this species to be affected by the Proposed Modifications, these KTPs are likely to be able to be adequately managed by standard environmental management measures.

Conclusion

The Proposed Modifications are predicted to remove around 5.66 hectare of habitat for the CPLS, comprising low – moderate condition habitat in PCT 724 (0.51 ha), PCT, 725 (0.2 ha), PCT 835 (0.37 ha), PCT 849 (3.41 ha) and PCT 883 (1.17 ha). There may be additional indirect impacts to remaining areas of habitat (drying/modification of the soil surface) the due to edge effects. However, the edge of adjacent areas is already highly disturbed with weeds, particularly exotic perennial grasses.

Clearing of habitat would increase the distance between areas of habitat by a small amount in some locations but it is unlikely to fragment habitat for the CPLS. The vegetation to be removed is not important for the long-term survival of the species. The impacts on habitat would not be of magnitude likely to affect the long-term survival of the community in the locality.

Given the aforementioned considerations, the proposed works are not likely to significantly impact on the CPLS habitat in the locality.

Appendix D: Assessments of significance (EPBC Act)

Assessment of significance have been conducted for threatened species, populations and communities that were recorded in the Proposed Modifications area during field surveys or were identified as having a moderate or higher potential to occur in the Proposed Modifications are based on the presence of habitat. For threatened biodiversity listed under the EPBC Act, significance assessments have been completed in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Department of Environment, 2013). Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude and geographic extent of the impacts (Department of Environment, 2013). Importantly, for a 'significant impact' to be 'likely', it is not necessary for a significant impact to have a greater than 50 per cent chance of happening; it is sufficient if a significant impact on the environment is a real or not a remote chance or possibility (Department of Environment, 2013). This advice has been considered while undertaking the assessments.

The EPBC Act listed threatened ecological communities (TECs) and species subject to this assessment include:

- Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion (Endangered, EPBC)
- *Pultenaea parviflora* (Vulnerable, EPBC)
- Downy Wattle (*Acacia pubescens*) (Vulnerable, EPBC)
- Swift Parrot (*Lathamus discolor*) (Critically Endangered, EPBC)
- Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable, EPBC)
- Large-eared Pied-bat (*Chalinolobus dwyeri*) (Vulnerable, EPBC).

Threatened Ecological Communities

Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion (Endangered)

Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion (hereafter referred to as Castlereagh Scribbly Gum and Agnes Banks Woodlands, the ecological community or EEC) is listed as vulnerable under the EPBC Act and has been identified within the Proposed Modifications area. Approximately 0.08 hectares of moderate condition Castlereagh Scribbly Gum and Agnes Banks Woodlands community would be impacted by the Proposed Modifications.

The Castlereagh Scribbly Gum and Agnes Banks Woodlands ecological community is located in the Sydney Basin Bioregion as defined by version 7 of the Interim Biogeographic Regionalisation of Australia (IBRA v 7, 2012). It occurs primarily in the Castlereagh area in the north-west of the Cumberland Plain with other known occurrences near Holsworthy, Kemps Creek and Longneck Lagoon (Tozer et al., 2010; NSW Scientific Committee, 2013).

The ecological community occurs primarily on Tertiary sands and gravels of the Hawkesbury-Nepean river system. At Agnes Banks the ecological community primarily occurs on aeolian (wind-blown) sands overlying Tertiary alluvium (DoE, 2015).

The Castlereagh Scribbly Gum and Agnes Banks Woodlands ecological community is typically a low woodland, with canopy species reaching an average 15 metres in height, but with some trees growing to around 20 metre (Tozer et al., 2010; DoE, 2015). Characteristic tree species in this community *Eucalyptus parramattensis* subsp. *parramattensis, Angophora bakeri and Eucalyptus sclerophylla*. A small tree stratum of Melaleuca decora is sometimes present, generally in areas with poorer drainage. A mid layer is present and is sometimes dominated by either Banksia or Melaleuca species. The ground layer consists of a diverse range of graminoids and forbs including *Themeda triandra* syn. *T. australis* (kangaroo grass), *Entolasia stricta* (wiry panic), *Cyathochaeta diandra*, *Dianella revoluta* subsp. *revoluta* (blue flax-lily*), Lepidosperma urophorum, Stylidium graminifolium* (grass triggerplant), *Lepyrodia scariosa, Mitrasacme polymorpha, Trachymene incisa* subsp. *incisa, Laxmannia gracilis* (slender wire lily) *Lomandra spp.* and *Aristida warburgii* (Keith, 2004; Tozer et al., 2010; NSW Scientific Committee, 2000, 2010).

Vegetation clearance was, and continues to be, a major contributor to the decline of native vegetation across the Cumberland sub-region. The reduction in geographic distribution of the Castlereagh Scribbly Gum and Agnes Banks Woodlands was initially due to clearing for sand and gravel extraction, some timber cutting, and later, hobby farms and rural-residential development (Benson and Howell, 1990). Clearance continues due to the increasing urbanisation of western Sydney and the ecological community is highly fragmented as a result. Other threats include fire regimes, weed invasion, hydrological changes, predation and displacement of native fauna, climate change, changes in faunal components and disease.

The ecological community is estimated to have been reduced to approximately 49% of its original preEuropean extent. Data presented in Tozer et al. (2010) indicate the present extent of the ecological community is approximately 3190 hectares ('restricted', where the total area of occupancy is less than 10 000 ha) (DoE, 2015)

The moderate condition patch within the study area meets the moderate condition threshold which is represented by a medium to large-size patch as part of a larger native vegetation remnant and/or with mature trees. The patch within the study area has a perennial groundcover greater than 30%, approximately 35%, consisting of native species. Therefore, 0.08 hectares has been classified as an ecological community under the EPBC Act.

An action is likely to have a significant impact on a Critically Endangered or Endangered ecological community if there is a real chance or possibility that it will:

Table D-1 Assessment of significance for threatened EEC Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion Ecological Community

Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion Ecological Community	
Factor	**Reduce the extent of an ecological community**
Response	This ecological community occurs primarily in the Castlereagh area in the north-west of the Cumberland Plain, with other known occurrences near Holsworthy, Kemps Creek and Longneck Lagoon (Tozer et al., 2010; NSW Scientific Committee, 2013). Based on the current Proposed Modifications area, a total of 5.93 hectares of vegetation would be impacted on as a result of the Proposed Modifications. Of this, a total of 0.08 hectares (within Vegetation Zone 6) of Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion ecological community would be impacted. The patch within the study area has a perennial groundcover, approximately 35%, comprising of a high abundance of the native *Microlaena stipoides*. The extent of local occurrence for this community was determined within approximately 10,000 hectares based on the regional mapping units. There is a total of 3,190 hectares of vegetation that is likely to align with this EEC occurring locally (DoE, 2015), resulting in approximately 0.0025% loss as a result of the Proposed Modifications. Within the project boundary, this community was classified as moderate, but found in disturbed and modified areas subject to a range of existing impacts. While there would be a decrease in the extent of the Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion ecological community, the impact would be minimal in the context of the EEC occurrence within the locality.
Factor	**Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines**
Response	The Proposed Modifications would involve the removal of approximately 0.08 hectares of this ecological community and would experience increased edge effects as a result. However, Impacts would be limited to the edge of a large contiguous patch. No significant fragmentation or isolation of habitat would occur as a result of the Proposed Modifications as the works would involve the removal of vegetation along a large native vegetation patch, and the vegetation to be removed is of moderate quality with a disturbed ground layer. The Proposed Modifications would not break apart large areas of habitat into many smaller fragments and the distance between patches would not increase appreciably. Habitat connectivity is expected to remain in a similar state after completion of the Proposed Modifications and there is unlikely to be an alteration to community composition, altered species interactions, or altered ecosystem functioning in the locality due to the action. Habitat fragmentation is not considered an important impact of the action with regard to its context and intensity as the impacts would be along an existing road verge.

Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion Ecological Community	
Factor	**Adversely affect habitat critical to the survival of an ecological community**
Response	The following indicators of the ecological context of areas surrounding patches of Castlereagh Scribbly Gum and Agnes Banks Woodlands should be considered, both when assessing the impacts of actions or proposed actions under the EPBC Act (DoE, 2015): • Large size and/or a large area to boundary ratio • Evidence of recruitment of key native plant species or the presence of a range of age classes • Good faunal habitat – as indicated by diversity of landscape. For example, patches containing mature trees (particularly those with hollows) and logs • High native species richness, which may include many understorey plant species or native fauna species • Presence of EPBC Act or NSW TSC Act listed threatened species • Patches that contain a unique combination of species and/or rare or important species in the context of the particular ecological community or local region • Areas with minimal weeds and feral animals, or where these threats can be efficiently managed • Presence of cryptogams, soil crust and leaf litter on the soil surface, indicating low recent disturbance and potential for good functional attributes such as nutrient cycling • Derived native grasslands and shrublands that were formally the woodlands, particularly those adjacent or near to forest/woodland remnants. These can be important to the survival of the ecological community in a fragmented, modified landscape. • Connectivity to other native vegetation remnants or restoration works (native plantings) in particular, a patch in an important position between (or linking) other patches in the landscape. This can contribute to movement of fauna and transfer of pollen and seeds. Due to the conservation significance of this EEC, all remaining patches and associated habitat within NSW are likely to be important for its survival. An impact of 0.08 hectares has been calculated and impacts would be located along the existing road verge. Therefore, it is unlikely that the Proposed Modifications would adversely affect habitat critical to the survival of Castlereagh Scribbly Gum and Agnes Banks Woodlands ecological community. Further to this, weed management would be undertaken in areas affected by construction prior to any clearing works. While the moderate patch of this community recorded for the Proposed Modifications are considered to be important, the 0.08 hectares of this community being impacted by the Proposed Modifications is not considered to be critical to the survival of the EEC.
Factor	**Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns**
Response	The Proposed Modifications would impact 0.08 hectares of this community within the Proposed Modifications area. Most indirect impacts are likely to be negligible once managed through the mitigation measures. While the Proposed Modifications would impact on abiotic factors of the EEC associated with the Proposed Modifications, they are limited to potential of altered surface hydrology during construction, which may increase overland surface water flows or sediment movement which could run off into the retained EEC patch and remove topsoil. Implementation of site-specific rehabilitation and revegetating temporary disturbed areas during the construction phase would minimise these effects. These actions would follow a detailed Biodiversity Management Plan prepared prior to construction. In conclusion, these impacts are not considered to modify or destroy abiotic factors necessary for the survival of the EEC.

Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion Ecological Community	
Factor	**Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting**
Response	The composition of the EEC along the newly created edge is likely to be modified as a result of the action through weed invasion and removal of vegetation. The patch of this EEC is in moderate condition and a reduction in ecological function can be expected from the action although may be limited to a narrow impact area along the edge. Species composition in the patch is considered unlikely to occur as it is already highly altered by weed invasion from past disturbance. The Proposed Modifications are not considered likely to cause any further substantial change in species composition.
Factor	**Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:** • **assisting invasive species, that are harmful to the listed ecological community, to become established, or** • **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or**
Response	Weed introduction and spread, and the infection of native plants by the fungus Phytophthora (*Phytophthora cinnamomi*) have been identified as being spread typically from agricultural areas by construction machinery and on the soles of shoes. Once Phtyophthora spreads into or above drainage lines, it readily travels downstream. The Proposed Modifications area currently contains exotic perennial grasses throughout areas historically cleared for industrial and residential areas. The Proposed Modifications has the potential to result in the spread of existing exotic species and potential introduction of new species into the area by ground disturbance and movement of plant propagules. Phytophthora infects the roots of several native plant species and has the potential to cause dieback. Machinery and walking associated with vegetation clearance and subsequent works for the Proposed Modifications area has the potential to introduce and transmit weed propagules and Phytophthora. This is a potential indirect impact through the spread and transmission of weeds and pathogens into retained habitat. These impacts can be mitigated through the development and implementation of suitable control measures for vehicle, shoe and plant hygiene but an impact, particularly from weeds, is likely. The Proposed Modifications mitigation strategy and environmental management procedures should include guidance for preventing the introduction and/or spread of weeds and disease-causing agents such as fungi or water moulds. Considering the current disturbance of vegetation within the Proposed Modifications area and the limited tree removal, it is unlikely to cause a substantial reduction in the quality or integrity of the occurrence of this EEC.
Factor	**Interfere with the recovery of an ecological community.**
Response	There is no adopted or made Recovery Plan for this ecological community. The main threats to this EEC and the priority actions required to address them are largely understood. The Conservation Advice sufficiently outlines the priority actions needed for this EEC and many of the threats affecting the EEC are best managed at a landscape scale, coordinated with management of other EECs.

Conclusion

In summary, the Proposed Modifications are considered unlikely to have an adverse effect on the extent of the Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion EEC such that the local occurrence of it is likely to be placed at further risk of extinction. The impacts would be to moderate-quality vegetation. This 0.08-hectare area to be impacted by the Proposed Modifications has approximately 35% ground cover, comprising of a high abundance of the native *Microlaena stipoides*. However, the impact is small when considered in the context the extent of this EEC within the broader locality. No significant fragmentation or appreciable increase in isolation of habitat would occur as a result of the Proposed Modifications. The Proposed Modifications are unlikely to adversely modify or reduce the composition and quality of retained vegetation through edge effects. Considering the context of this EEC and limited significant impacts expected to occur to the local extent of the community, an overall conclusion has been made that the Proposed Modifications are unlikely to result in a significant impact to the Castlereagh Scribbly Gum and Agnes Banks Woodlands ecological community.

Threatened flora

***Pultenaea parviflora* and Downy Wattle (*Acacia pubescens*)**

Pultenaea parviflora and *Acacia pubescens* (Downy Wattle) are both listed as vulnerable under the EPBC Act. These species were not recorded within the study area, however there is potential habitat for these species to exist, including PCT 724, PCT 725 and PCT 883 for *Pultenaea parviflora* and PCT 724, PCT 725, PCT 849 and PCT 883 for *Acacia pubescens*.

The definition of an important population as provided in the Matters of National Environmental Significance Significant Impact Guidelines 1.1 (Department of the Environment 2013) is a "… a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range".

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:

Table D-2 Assessment of significance for threatened flora - *Pultenaea parviflora* and Downy Wattle (*Acacia pubescens*)

Pultenaea parviflora and Downy Wattle (Acacia pubescens)	
Factor	**Lead to a long-term decrease in the size of an important population of a species**
Response	The risk of extinction of the local populations would increase if anything reduces its population size or reproductive success. However, there would be no impacts to the populations of *Pultenaea parviflora* and *Acacia pubescens* as a result of the Proposed Modifications and no individual plants would be removed. Genetic exchange with the larger core populations would remain intact. The Proposed Modifications would not lead to a long-term decrease in the size of the important population.
Factor	**Reduce the area of occupancy of an important population**
	The Proposed Modifications would remove or modify potential habitat for the species *Pultenaea parviflora* and *Acacia pubescens* associated with around 1.9 hectares and 5.5 hectares respectively. However, the area of occupancy of *Pultenaea parviflora* and *Acacia pubescens* would not be impacted by the Proposed Modifications as no individual plants were identified within the study area. The habitat to be impacted by the Proposed Modifications is of low-quality and would provide minimal support compared to the adjacent vegetation patch which is of high-quality. This high-quality habitat may experience increased minimal impacts due to the edge effect. However, the area occupied by these species would remain the same after the action. No decrease in the area of occupancy for these species expected as a result of the Proposed Modifications.
Factor	**Fragment an existing important population into two or more populations**
Response	The species both have an existing fragmented distribution in the western Sydney region due to urbanization. The Proposed Modifications would, however, not permanently remove or otherwise isolate any occupied habitat for the species. Importantly, the action would not result in the breaking apart of large blocks of high-quality habitat for *Pultenaea parviflora* or *Acacia pubescens* and would not fragment a continuous population of *Pultenaea parviflora* or *Acacia pubescens*. These species were not identified within the Proposed Modifications area which is to be impacted upon. The large intact, high-quality habitat adjacent to the Proposed Modifications, which provides potential habitat for these species, would not be fragmented as a result of the Proposed Modifications. Genetic exchange within the populations and dispersal would not be disrupted by the Proposed Modifications.

Pultenaea parviflora and Downy Wattle (Acacia pubescens)	
Factor	**Adversely affect habitat critical to the survival of a species**
Response	Habitat critical to the survival of a species refers to areas that are necessary for activities such as: • Foraging, breeding, roosting, or dispersal • For the long-term maintenance of the species including the maintenance of other species essential to the survival of the species, such as pollinators • To maintain genetic diversity and long-term evolutionary development • For the reintroduction of populations or recovery of the species. *Pultenaea parviflora* is known chiefly from Penrith, Windsor and Blacktown and there are outlier populations in Liverpool (James et al., 1999). Within these areas it may be locally abundant, and it may also be common in transitional areas where the Castlereagh Ironbark Forest adjoins Castlereagh Scribbly Gum Woodland (NPWS, 2000). This species re-establishes from soil-stored seed and there is no evidence of vegetative spread (NPWS, 2000). *Pultenaea parviflora* does not have an adopted or made recovery plan. Critical habitats for the *Pultenaea parviflora* include Scheyville National Park, Windsor Downs Nature Reserve, Castlereagh Nature Reserve, and the ADI Regional Park. These are all public land reserved for conservation. Populations on private property are also likely to be important for the survival of this species but no specific areas of critical habitat have been identified. *Acacia pubescens* is restricted to the Sydney region of NSW. Its distribution is concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon (NSW NPWS 2003). Although the distribution includes a large area, the extant sites are mostly small and fragmented, surrounded by development. Given the limited range and specific habitat requirements of the species all occupied habitat is probably necessary 'for the long-term maintenance of the species' and 'to maintain genetic diversity and long-term evolutionary development' and should be considered habitat critical to the survival of the species. The recovery plan for *Acacia pubescens* (NSW National Parks and Wildlife Service, 2003) states that habitat critical to the survival of this species cannot be identified given the clonal nature of the species and a lack of genetic information about this clonality. The area of habitat to be impacted by the action would not impact on the identified critical habitats or potential critical habitats for these species.
Factor	**Disrupt the breeding cycle of an important population**
Response	The Proposed Modifications may affect the breeding cycle of these species by reducing the extent of potential habitat and of native vegetation that may provide shelter and food for pollinator species. *Pultenaea parviflora* is killed by fire and re-establishes from soil-stored seed. There is no evidence of vegetative spread. Ants are implicated in the dispersal of the species as the seed has an aril. Germination can be prolific after a moderate to high intensity fire. *Acacia pubescens* is a clonal species with clumps of tens or even hundreds of stems comprising potentially one genetic individual (NPWS, 2003). *Acacia pubescens* produces few seeds, often with low viability and/or survival and appears to have only local dispersal of seed (NPWS, 2003). It is likely the species is able to resprout from rootstock after fire. The species is likely to maintain a long-term soil-stored seedbank and germination is likely to be triggered by fire or other local disturbance (NPWS, 2003). Given the importance of clonal stems and the soil seed bank to the reproduction of the species, impacts on pollination would have a minor effect on the local population. The Proposed Modifications may reduce the potential for expansion of *Pultenaea parviflora* and *Acacia pubescens* into areas of potential habitat however, no individuals are expected to be impacted on as no species were identified within the study area. The Proposed Modifications would not disrupt the breeding cycle of the local population in occupied habitat.

Pultenaea parviflora and Downy Wattle (Acacia pubescens)	
Factor	**Modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**
Response	The Proposed Modifications are predicted to remove approximately 1.9 hectares of potential habitat for *Pultenaea parviflora*, comprising low – moderate condition habitat in PCT 724 (0.51ha), PCT, 725 (0.2 ha) and PCT 883 (1.192 ha), as well as approximately 5.5 hectares of potential habitat for *Acacia pubescens* comprising low – moderate condition habitat in PCT 724 (0.51ha), PCT, 725 (0.2 ha), PCT 849 (3.6 ha) and PCT 883 (1.192 ha). However, the Proposed Modifications would not remove any occupied habitat of *Pultenaea parviflora* or *Acacia pubescens*. Neither of these species were observed in the study area. This impact is not expected to lead to a decline in the species in the region given the availability of high-quality habitat available in the locality surrounding the study area.
Factor	**Result in invasive species that are harmful to a vulnerable species becoming established in the Vulnerable species' habitat**
Response	The potential for weed invasion was considered possible with a Proposed Modifications of this nature and appropriate controls are required during construction and operation of the road to reduce this threat. The management of invasive species would be managed under the construction environmental management plan and during operation of the highway using best practice methods.
Factor	**Introduce disease that may cause the species to decline, or**
Response	The Proposed Modifications has the potential to introduce or spread pathogens such as Phytophthora (*Phytophthora cinnamomi*) through vegetation and soil disturbance and vehicle and foot traffic. There is little available information about the distribution of plant diseases within the locality, and no evidence of disease was observed during surveys. The Proposed Modifications mitigation strategy and environmental management procedures would include guidance for preventing the introduction and/or spread of disease-causing agents such as and fungi or water moulds.
Factor	**Interfere substantially with the recovery of the species**
Response	There is no recovery plan for *Pultenaea parviflora*. However, the OEH have identified six priority actions to help recover this species as follows: • Fire intervals of 10–15 years (where there is no need for asset protection zones). • Protect areas of known and potential habitat from clearing and further fragmentation. • A community awareness program. • Research into pollinating species for *Pultenaea parviflora*. • Identify and survey potential habitat for the species. • Monitor known populations. The action would not remove areas of known habitat. the recovery of *Pultenaea parviflora* as a species is not dependent on the low-moderate habitat to be removed as a result of the Proposed Modifications. The *Acacia pubescens* Recovery Plan (NPWS, 2003) comprises the National and NSW State Recovery Plan for the species and as such considers the conservation requirements of the species across its known range. It identifies the future actions to be taken to ensure the short and long-term viability of *Acacia pubescens* and the parties who would carry out these actions. Known threats to the species include habitat loss, habitat degradation through weed invasion, mechanical damage, rubbish dumping, illegal track creation, and inappropriate fire regimes), disease and hybridization (NPWS, 2003). The recovery plan lists priority recovery and threat abatement actions that can be taken to support the recovery of this species. The following are relevant to the Proposed Modifications: 'Informed environmental assessment and planning decisions are made' (NSW NPWS, 2003), which has been addressed through the preparation of this report in accordance with relevant policy and guidelines and especially the identification of the local population of *Acacia pubescens* and purposeful modification of the Proposed Modifications to avoid direct impacts. The Proposed Modifications are unlikely to directly harm any *Acacia pubescens*, affect the life cycle of the species, have any notable adverse effects on habitat for the species or otherwise interfere with the recovery of the species.

Conclusion

The Proposed Modifications are predicted to remove approximately 1.9 hectares of potential habitat for *Pultenaea parviflora*, comprising low – moderate condition habitat in PCT 724 (0.51ha), PCT, 725 (0.2 ha) and PCT 883 (1.192 ha), as well as approximately 5.5 hectares of potential habitat for *Acacia pubescens* comprising low – moderate condition habitat in PCT 724 (0.51ha), PCT, 725 (0.2 ha), PCT 849 (3.6 ha) and PCT 883 (1.192 ha). The local populations have persisted in a highly modified and edge-affected environment and is likely to be resilient to potential indirect impacts. The local occurrence of this species would persist after the action. Given the conservation status of these species (vulnerable) and the low magnitude of the impact, an overall conclusion has been made that the action is unlikely to result in a significant impact to *Pultenaea parviflora* or *Acacia pubescens*.

Threatened Fauna:

Swift Parrot (*Lathamus discolor*)

The Swift Parrot breeds in Tasmania during the Australian summer and the entire population migrates north to mainland Australia for the winter. During the winter migration period, the parrots disperse across a broad landscape, foraging on nectar and lerps in eucalypts mainly in Victoria and NSW. In New South Wales, Swift Parrots forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought.

Vegetation communities and key tree species that provide important nesting and foraging habitat for Swift Parrots in NSW include *Eucalyptus sideroxylon* (Mugga Ironbark), *Eucalyptus microcarpa* (Grey Box), *Eucalyptus melliodora* (Yellow Box), *Eucalyptus albens* (White Box), *Eucalyptus robusta* (Swamp Mahogany), *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus pilularis* (Blackbutt) and *Corymbia maculata* (Spotted Gum). The use of these habitats is dependent on prevailing climatic conditions and corresponding food availability. The production of lerp and nectar food resources in these habitats and the availability of nesting hollows are considered the main limiting factors to the species' survival and capacity to breed. Due to the variable production of nectar and lerps across this species' range, it is considered important to protect and manage a broad range of habitats to provide a range of foraging resources.

Increases in fire frequency pose a significant threat to avian communities. Where fire intervals are too regular, flowering events and maturation of nectar rich plant species may be reduced, resulting in a reduction of foraging resources for nectivorous birds. This is of particular concern in coastal New South Wales and in central Victoria where there is increasing residential and industrial development in close proximity to Swift Parrot habitat.

The Swift Parrot (*Lathamus discolor*) is considered likely to occur based on the presence of suitable winter foraging habitat. There is potential foraging habitat for the Swift Parrot, comprising of PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883.

An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it would:

Table D-3 Assessment of Significance for the Swift Parrot (*Lathamus discolor*)

Swift Parrot (Lathamus discolor)	
Factor	**Lead to a long-term decrease in the size of a population**
Response	The study area contains some potential low-quality foraging habitat for the Swift Parrot. While the habitat in the study area is not optimal, the loss of potential feed trees would directly affect the species opportunity to feed in the area. However, the study area is not considered a critical area for the Swift Parrot. The Swift Parrot may utilise trees in the study area for foraging intermittently when no other suitable inland (box ironbark woodlands) or coastal resources (Spotted Gum or Swamp Mahogany forests) are available. The potential foraging habitat for this species would be reduced by about 5.93 hectares of foraging habitat (mix of mature, native tree species), including, PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.436 ha), PCT 849 (3.6 ha) and PCT 883 (1.192 ha). Within the Cumberland subregion, this potential habitat removal represents a small proportion of currently available habitat for this species. The Swift Parrot does not breed in the study area and the extent of habitat remaining in the locality area would provide sufficient resources to sustain future visitation, such that the action itself is unlikely to lead to a long-term decrease in the size of the Australian population.
Factor	**Reduce the area of occupancy of the species**
Response	Swift Parrots are vulnerable to the loss of quantity and quality of key forage tree species. As a large-scale migrant, it can cover vast areas of its winter range, seeking suitable flowering eucalypt habitat. The species is an occasional visitor to the region and may utilise trees in the study area for foraging intermittently when no other suitable resources are available. The Proposed Modifications would contribute to the loss of potential foraging habitat which would reduce the area of habitat available. However, the action, removing approximately 5.93 hectares, would not reduce the area of occupancy of this species which is estimated at 4,000 square kilometres.
Factor	**Fragment an existing population into two or more populations**
Response	Importantly, the action would not result in fragmentation of habitat for the Swift Parrot. This species is highly mobile and, as a regular behavior, flies long distances over open areas to move between suitable foraging habitats. The action would not affect the movement of the Swift Parrot between habitat patches or fragment the population. The action is considered unlikely to fragment existing populations as movement corridors within the locality would remain intact. The proposed impacts are on the edge of the adjacent intact high-quality habitat and would not be significant to the breeding and dispersal or the genetic diversity of this species.
Factor	**Adversely affect habitat critical to the survival of a species**
Response	Key habitats for this species on the coast and coastal plains of New South Wales include large stands of Spotted Gum (*Corymbia maculata*), Swamp Mahogany (*Eucalyptus robusta*), Red Bloodwood (*Corymbia gummifera*) and Forest Red Gum (*Eucalyptus tereticornis*) forests. The study area supports some Forest Red Gum, and therefore suitable habitat for this species is considered to be present. The habitat within the study area is considered to be secondary habitat for the Swift Parrot as this species is not regularly recorded from the area and it is not known as critical habitat.
Factor	**Disrupt the breeding cycle of a population**
Response	The Swift Parrot is endemic to south-eastern Australia and breeds only in Tasmania and migrates to mainland Australia in autumn. As such, the Proposed Modifications would not impact on breeding habitat for this species. Important winter foraging grounds would not be impacted.

Swift Parrot (Lathamus discolor)	
	Foraging habitat for this species would be reduced by about 5.93 hectares of foraging habitat (mix of mature, native tree species) including, PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.436 ha), PCT 849 (3.6 ha) and PCT 883 (1.192 ha). As a large-scale migrant, it has the ability to cover vast areas of its winter range, seeking suitable flowering eucalypt habitat. The species is an occasional visitor to the region and may utilise trees in the study area for foraging intermittently when no other suitable resources are available. As there is a limited habitat value for this species within the Proposed Modifications area, there is no significant impact expected. The Proposed Modifications are unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Factor	**Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat**
Response	The main invasive species harmful to the habitat for the swift parrot is weeds. Noisy Miners and Bell Miners are abundant in the habitat which may make the habitat less suitable for the Swift Parrot due to competitive exclusion. The action may result in weed invasion and the removal of habitat may concentrate local miner populations increasing competition. The management of invasive species would be managed under the construction environmental management plan and during operation.
Factor	**Introduce disease that may cause the species to decline, or**
Response	There are no known disease issues affecting this species in relation to the action. The action would be unlikely to increase the potential for significant disease vectors to affect local populations. Infection of native plants by Phtyophthora (*Phytophthora cinnamomi*) has been identified as being spread typically from agricultural areas by construction machinery and on the soles of shoes. Once Phtyophthora spreads into or above drainage lines, it readily travels downstream. This water mould infects the roots of plants and has the potential to cause dieback. Machinery and walking associated with vegetation clearance and subsequent construction has the potential to transmit the fungus to remaining native vegetation remnants of the species. This is a potential indirect impact to the species through the transmission of pathogens into retained habitat near the road. This can be mitigated through the development and implementation of suitable control measures for vehicle and plant hygiene and is unlikely to have a significant impact. It is the intention to use current best practice hygiene protocols as part of the CEMP to prevent the introduction or spread of pathogens. The Proposed Modifications mitigation strategy and environmental management procedures would include guidance for preventing the introduction and/or spread of disease-causing agents such as fungi or water moulds.

Swift Parrot (Lathamus discolor)	
Factor	**Interfere substantially with the recovery of the species.**
Response	The Draft National Recovery Plan for the Swift Parrot (*Lathamus discolor*) (Department of the Environment and Energy, 2019) aims to prevent further population decline of the Swift Parrot and to achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity. The Draft National Recovery Plan outlines the following objectives: 1. Identify the extent and quality of habitat 2. Manage and protect Swift Parrot habitat at the landscape scale 3. Monitor and manage the impact of collisions, competition, and disease 4. Monitor population and habitat. These objectives, and the associated recovery actions outlined in the Draft National Recovery Plan for the Swift Parrot (*Lathamus discolor*) (Department of the Environment and Energy, 2019) are not applicable to the study area or Proposed Modifications. The identified recovery actions mostly relate to identifying the extent and quality of habitat, monitoring, raising community awareness, and coordinating and reviewing the recovery process. There is an action relating to manage and protect Swift Parrot habitat at the landscape scale. However, this action applies to fencing off habitat on private land to encourage regeneration of habitat, revising forestry practices, developing a strategic management plan for Swift Parrot breeding habitat in Tasmania, and providing Swift Parrot conservation information for consideration during the New South Wales Local Government Local Environmental Planning review process. The recovery actions identified in the Draft National Recovery Plan for the Swift Parrot (*Lathamus discolor*) (Department of the Environment and Energy, 2019) would not be interfered with by the Proposed Modifications.

Conclusion

The local population may suffer a small reduction in extent of suitable (low quality and not preferred) foraging habitat from the action, but no critical important habitat of the Swift Parrot would be impacted by the Proposed Modifications. The action is unlikely to reduce the population size of the Swift Parrot or decrease the reproductive success of this species. The action would not interfere with the recovery of the Swift Parrot. An overall conclusion has been made that the action is unlikely to result in a significant impact to the Swift Parrot.

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

The Grey-headed Flying-fox is considered moderately likely to utilise the intact area of vegetation as foraging habitat, which would result in edge effect impacts due to the Proposed Modifications. The desktop research and survey confirmed there are no roost camps present within the Proposed Modifications area.

The Proposed Modifications would have impacts on the Grey-headed Flying-fox via direct impact on 5.93 hectares of low-quality habitat adjacent to a larger higher quality patch, consisting of PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883. The low-quality habitats being impacted, provide much lower value as potential foraging habitat. This loss of potential foraging habitat is very minor in the context of similar and better-quality foraging available throughout the Richmond-Londonderry locality.

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range.

The Grey-headed Flying-fox exists as one interconnected population along the eastern Australian coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. As a result, for this assessment, the impact has been considered in terms of 'important habitat' as opposed to the presence of an 'important population'.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:

Table D-4 Assessment of Significance for the Grey-headed Flying-fox (*Pteropus poliocephalus*)

Grey-headed Flying-fox (*Pteropus poliocephalus*)	
Factor	**Lead to a long-term decrease in the size of a population**
Response	The desktop research and survey confirmed there are no roost camps present within the Proposed Modifications area. The action would not affect any known permanent roosting, breeding / maternity sites. Therefore, it is likely that the impacts of construction and operation of the action would be confined to minor loss of foraging habitat caused by direct clearing or damage to native vegetation during the construction phase. There is also a low risk of vehicle strike during operation. The Proposed Modifications would have impacts on potential foraging habitat for the Grey-headed Flying-fox via direct loss of around 5.93 ha of intact woodland within the Proposed Modifications area, consisting of PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.436 ha), PCT 849 (3.6 ha) and PCT 883 (1.192 ha). Given the adjacent high-quality habitat next to the Proposed Modifications, the relative widespread nature of similar native vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of local individuals, the Proposed Modifications are not expected to significantly affect important habitat or lead to a long-term decrease in the size of an important population.
Factor	**Reduce the area of occupancy of an important population**
Response	The area of occupancy of the Grey-headed Flying-fox is not known but the species exists as one interconnected population along the eastern Australian coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. The habitat to be impacted by the Proposed Modifications are of low-quality and would provide minimal food resources compared to the adjacent vegetation patch which is of high-quality. The area occupied by this species would remain the same after the action. No decrease in the area of occupancy for this species expected as a result of the Proposed Modifications.
Factor	**Fragment an existing important population into two or more populations**
Response	Highly mobile species such as bats are expected to be less impacted by fragmentation. The Grey-headed Flying-fox is particularly well adapted to accessing widely spaced habitat resources given its mobility and preference for seasonal fruits and blossom in differing parts of the landscape. The Proposed Modifications would not fragment an important population of the Grey-headed Flying-fox. Individuals would still be able to disperse between roosts along the east Australian coast. Genetic exchange within the population and dispersal would not be disrupted by the Proposed Modifications.

Grey-headed Flying-fox (*Pteropus poliocephalus*)	
Factor	**Adversely affect habitat critical to the survival of a species**
Response	This species typically exhibits very large home range and Grey-headed Flying-fox is known to travel distances of at least 50 kilometres from roost sites to access seasonal foraging resources. There are no known roost camps within the study area and the site does not provide critical roosting habitat. However, there are a number of known roost camps within a 50-kilometre radius of the Proposed Modifications, the closest being the Yarramundi, Ropes Crossing, Emu Plains and Penrith camps. The draft recovery plan for the Grey-headed Flying-fox identifies critical foraging habitat for this species as: Productive during winter and spring when food bottlenecks have been identified • Known to support populations of >30,000 individuals, within an area of 50 km radius of a camp site • Productive during the final weeks of gestation, and during the weeks of birth, lactation, and conception (Sept-May) • Productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes • Known to be continuously occupied as a camp site. Native vegetation within the study area may constitute critical foraging habitat but the affected area of foraging habitat would represent a small percentage of the total extent of important foraging vegetation types present within a 50-kilometre radius of the closest camps. Given the highquality foraging habitats within the locality, outside of the study are, the Proposed Modifications are not expected to adversely affect foraging habitat critical to the survival of this species in this region.
Factor	**Disrupt the breeding cycle of an important population**
Response	As stated above there would be a minor impact on foraging habitat during the breeding cycle of the species. The Proposed Modifications would not directly impact on a known roost camp / breeding or maternity site. Alternative foraging resources are available in the locality that would provide suitable resources during the maternity season. The habitats in the study area are not limiting for this species.
Factor	**Modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**
Response	The impacts to foraging habitat are minimal and no evidence of a roost camp has been identified from the study area. This impact is not expected to lead to a decline in the species in the region given the availability of high-quality foraging habitat available to local animals in surrounding the study area.
Factor	**Result in invasive species that are harmful to a vulnerable species becoming established in the Vulnerable species' habitat**
Response	The action is unlikely to result in an invasive species harmful to the Grey-headed Flying-fox becoming established in the habitat. The potential for weed invasion was considered possible with Proposed Modifications of this nature and appropriate controls are required during construction and operation of the road to reduce this threat. The management of invasive species would be managed under the construction environmental management plan and during operation of the road using best practice methods.

Grey-headed Flying-fox (*Pteropus poliocephalus*)	
Factor	**Introduce disease that may cause the species to decline, or**
Response	There are no known disease issues affecting this species in relation to the action. The action would be unlikely to increase the potential for significant disease vectors to affect local populations. Infection of native plants by *Phytophthora cinnamomi* has been identified as being spread typically from agricultural areas by construction machinery and on the soles of shoes. Once Phtyophthora spreads into or above drainage lines, it readily travels downstream. This water mould infects the roots of plants and has the potential to cause dieback. Machinery and walking associated with vegetation clearance and subsequent construction has the potential to transmit the fungus to remaining native vegetation remnants of the species. This is a potential indirect impact to the species through the transmission of pathogens into retained habitat near the road. This can be mitigated through the development and implementation of suitable control measures for vehicle and plant hygiene and is unlikely to have a significant impact. It is the intention to use current best practice hygiene protocols as part of the CEMP to prevent the introduction or spread of pathogens. The Proposed Modifications mitigation strategy and environmental management procedures would include guidance for preventing the introduction and/or spread of disease-causing agents such as fungi or water moulds.
Factor	**Interfere substantially with the recovery of the species.**
Response	The Draft National Recovery Plan for the Grey-headed Flying-fox (*Pteropus poliocephalus*) (Department of Environment Climate Change and Water, 2009) outlines the following actions: • Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes across their range • Enhance winter and spring foraging habitat for Grey-headed Flying-foxes • Identify, protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes • Significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture • Provide information and advice to managers, community groups and members of the public that are involved with controversial flying-fox camps • Produce and circulate educational resources to improve public attitudes toward Grey-headed Flying-foxes, promote the recovery program to the wider community and encourage participation in recovery actions • Monitor population trends for the Grey-headed Flying-fox • Assess the impacts on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts • Oversee a program of research to improve knowledge of the demographics and population structure of the Grey-headed Flying-fox • Maintain a National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan. The recovery actions listed above are largely not applicable to the action and the action is not expected to interfere substantially with the recovery of the species.

Conclusion

The Grey-headed Flying-fox would suffer a small reduction in extent of suitable foraging habitat from the action of approximately 5.93 hectares of low-quality vegetation along the road verge. No breeding camps or other important habitat would be impacted. The action is unlikely to reduce the population size of the Grey-headed Flying-fox or decrease the reproductive success of this species. The action would not interfere with the recovery of the Grey-headed Flying-fox and would not contribute to the key threats to this species. After consideration of the factors above, an overall conclusion has been made that the action is unlikely to result in a significant impact to the Grey-headed Flying-fox.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

In the case of a vulnerable species, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- Key source populations either for breeding or dispersal; or
- Populations that are necessary for maintaining genetic diversity; and/or
- Populations that are near the limit of the species range.

The identification of potential foraging habitat for this vulnerable species does not constitute the presence of an 'important population' as defined by the criteria listed above, as any potentially occurring individuals within the study area do not represent a key source population either for breeding or dispersal; the study area is not important for the maintenance of genetic diversity of the species; and the species is not at the limits of its range in the study area. Therefore, the study area is not likely to contain an important population of the large-eared pied bat.

Further, the National Recovery Plan for the large-eared pied bat (DERM 2011) states that habitat critical for the survival of the species requires the presence of diurnal roosts and shelter habitat, usually in the form of sandstone cliffs and adjacent fertile woodland valley foraging habitat. The majority of records of the species occur within several kilometers of cliff lines or caves. Due to the absence of suitable cliff lines or cave roosting habitat within the study area, it is not considered to contain important habitat for the species.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it would:

Table D-5 Assessment of Significance for the Large-eared Pied Bat (*Chalinolobus dwyeri*)

Large-eared Pied Bat (*Chalinolobus dwyeri*)	
Factor	**Lead to a long-term decrease in the size of an important population of a species**
Response	Given that there is not considered to be an important population of the Large-eared Pied Bat within the study area, the Proposed Modifications would not lead to a long-term decrease in the size of an important population of this species. The action would not affect any known permanent roosting, breeding / maternity sites. Therefore, it is likely that the impacts of construction and operation of the action would be confined to minor loss of foraging habitat caused by direct clearing or damage to native vegetation during the construction phase. There is also a low risk of vehicle strike during operation. The Proposed Modifications would have impacts on potential foraging habitat for the Large-eared Pied Bat via direct loss of around 5.93 ha of intact woodland within the Proposed Modifications area, consisting of PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.436 ha), PCT 849 (3.6 ha) and PCT 883 (1.192 ha). Given the adjacent high-quality habitat next to the Proposed Modifications, the relative widespread nature of similar native vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of local individuals, the Proposed Modifications are not expected to significantly affect important habitat or lead to a long-term decrease in the size of an important population. Mitigation measures would be undertaken to ensure the impact is contained within the Proposed Modifications area.
Factor	**Reduce the area of occupancy of an important population**
Response	There would be a loss of approximately 5.93 hectares in potential foraging habitat for the local population, consisting of low-quality PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.436 ha), PCT 849 (3.6 ha) and PCT 883 (1.192 ha). This section of low-quality habitat occurs along the existing road verge which is continuous with the surrounding high-quality vegetation. The area occupied by this species would remain the same after the action. No decrease in the area of occupancy for this species expected as a result of the Proposed Modifications.
Factor	**Fragment an existing important population into two or more populations**
Response	Approximately 5.66 ha of potential foraging habitat occurs within the Proposed Modifications. However, highly mobile species such as bats are expected to be less impacted by fragmentation. The proposed action would not result in any barriers to movement and is unlikely to fragment an existing population of this species into two or more populations. Genetic exchange within the population and dispersal would not be disrupted by the Proposed Modifications.
Factor	**Adversely affect habitat critical to the survival of a species**
Response	The Large-eared Pied Bat is distributed across the east coast of Australia. The habitat in the study area is not known to provide core habitat for this species and the Proposed Modifications are not expected to interfere with any dispersal pathways for this species. Mitigation measures would be undertaken to ensure there is no further impacts impact to foraging habitat. Given the above, the Proposed Modifications are not considered to be critical habitat for the Large-eared Pied Bat and consequently, the Proposed Modifications are not expected to adversely affect habitat critical to the survival of this species.
Factor	**Disrupt the breeding cycle of an important population**
Response	As stated above there would be a minor impact on foraging habitat during the breeding cycle of the species. Alternative foraging resources are available in the locality that would provide suitable resources during the maternity season. The habitats in the study area are not limiting for this species. No important populations of the large-eared pied bat occur within the study area, and no breeding populations or breeding habitat for this species has been recorded in the study area. As such, the Proposed Modifications are not expected to disrupt the breeding cycle of an important population of this species.

Large-eared Pied Bat (*Chalinolobus dwyeri*)	
Factor	**Modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**
Response	The impacts to foraging habitat are minimal and no important populations of the Large-eared Pied Bat have been identified within the study area. This impact is not expected to lead to a decline in the species in the region given the availability of high-quality foraging habitat available to local animals in surrounding the study area. Due to the mobile nature of this species, it is unlikely that the proposed action would modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Factor	**Result in invasive species that are harmful to a vulnerable species becoming established in the Vulnerable species' habitat**
Response	The action is unlikely to result in an invasive species harmful to the Large-eared Pied Bat becoming established in the habitat. The potential for weed invasion was considered possible with Proposed Modifications of this nature and appropriate controls are required during construction and operation of the road to reduce this threat. The management of invasive species would be managed under the construction environmental management plan and during operation of the road using best practice methods.
Factor	**Introduce disease that may cause the species to decline, or**
Response	There are no known disease issues affecting this species in relation to the action. The action would be unlikely to increase the potential for significant disease vectors to affect local populations. Infection of native plants by *Phytophthora cinnamomi* has been identified as being spread typically from agricultural areas by construction machinery and on the soles of shoes. Once Phtyophthora spreads into or above drainage lines, it readily travels downstream. This water mould infects the roots of plants and has the potential to cause dieback. Machinery and walking associated with vegetation clearance and subsequent construction has the potential to transmit the fungus to remaining native vegetation remnants of the species. This is a potential indirect impact to the species through the transmission of pathogens into retained habitat near the road. This can be mitigated through the development and implementation of suitable control measures for vehicle and plant hygiene and is unlikely to have a significant impact. It is the intention to use current best practice hygiene protocols as part of the CEMP to prevent the introduction or spread of pathogens. The Proposed Modifications mitigation strategy and environmental management procedures would include guidance for preventing the introduction and/or spread of disease-causing agents such as fungi or water moulds.
Factor	**Interfere substantially with the recovery of the species.**
Response	The National recovery plan for the Large-eared Pied Bat (*Chalinolobus dwyeri*) (Department of Environment and Resource Management. 2011) outlines the following actions: • Identify priority roost and maternity sites for protection • Implement conservation and management strategies for priority sites • Educate the community and industry to understand and participate in the conservation of the Large-eared Pied Bat • Research the Large-eared Pied Bat to augment biological and ecological data to enable conservation management • Determine the meta-population dynamics throughout the distribution of the Large-eared Pied Bat. The recovery actions listed above are largely not applicable to the action and the action is not expected to interfere substantially with the recovery of the species. Considering the limited extent of impact, the proposed activity is unlikely to substantially interfere with the recovery of this species.

Conclusion

The Proposed Modifications would have impacts on potential foraging habitat for the Large-eared Pied Bat via direct loss of around 5.93 ha of intact woodland within the Proposed Modifications area, consisting of PCT 724 (0.51 ha), PCT 725 (0.2 ha), PCT 835 (0.436 ha), PCT 849 (3.6 ha) and PCT 883 (1.192 ha). However, the Proposed Modifications are not expected to adversely affect habitat critical to the survival of this species. The Proposed Modifications are unlikely to result in a significant impact upon an important population of the large-eared pied bat as the study area is not considered to support an important population of this species.