North West Treatment Hub
Flora and fauna assessment

FINAL REPORT

Prepared for Sydney Water

17 June 2022

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Glossary

BC Act	*Biodiversity Conservation Act 2016*
Biosecurity Act	*Biosecurity Act 2015*
BOS	Biodiversity Offsets Scheme
CBD	Central Business District
CEEC	Critically Endangered Ecological Community
DAWE	Department of Agriculture, Water and the Environment
DCP	Development Control Plan
DPIE	NSW Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EES	NSW Environment, Energy and Science Group
EIS	Environmental Impact Statement
ENV	Existing Native Vegetation as described under the SEPP (Sydney Region Growth Centres) 2006
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Existing Certified	Land that is mapped as 'Existing Certified' land on the land application map of the SEPP (Sydney Region Growth Centres) 2006.
Existing Non-certified	Land that is mapped as 'Existing Non-certified' land on the land application map of the SEPP (Sydney Region Growth Centres) 2006.
FM Act	*Fisheries Management Act 1994*
GIS	Geographic Information System
Impact area	The area of direct impact for the proposed works
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Services
Matters of NES	Matters of National Environmental Significance
Non-Bio certified	Areas of the study area that do not fall within the boundaries of the Growth Centres SEPP
NSW	New South Wales
PCT	Plant Community Type

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SEPP	NSW State Environmental Planning Policy
SIC	Significant Impact Criteria
SIS	Species Impact Statement
study area	The area which falls within existing footprints of the Rouse Hill WRP, Riverstone Waste Water Treatment Plant (WWTP) and proposed sludge transfer system pipeline alignments
TEC	Threatened Ecological Community
ToS	Test of Significance
WM Act	*Water Management Act 2000*

Summary

Biosis Pty Ltd was commissioned by Sydney Water to undertake a flora and fauna assessment to support the proposed North West Treatment Hub, New South Wales (NSW).

The study area is defined as the existing footprints of the Rouse Hill Water Recycling Plant (WRP) and the Riverstone Waste Water Treatment Plant (WWTP) as well as two proposed sludge transfer system pipeline alignments, the Riverstone WWTP discharge main to Eastern Creek, and the area required to facilitate the construction of a second sliding gate required for upgrade works at the Castle Hill WRP (the proposal). Although, the proposed sludge pipeline will connect to the Castle Hill Water Recycling Plant (WRP) the upgrades within this plant have been assessed under a separate report. The study area is generally linear in arrangement and is located between the suburbs of Castle Hill, Rouse Hill and Riverstone (Figure 1). The study area follows the alignment of the proposed footprint as supplied by Sydney Water with a buffer of 20 metres applied either side of the alignments to cover a 40 metre wide assessment corridor. This assessment approach has been undertaken to allow for assessment of both the impact area as well as any additional areas in the broader study area which are likely to be affected by the proposal, either directly or indirectly. Identified constraints will be used to guide detailed design, with an emphasis on avoiding ecological impacts where feasible.

The study area and the extent of the proposed works occur primarily within the North West Growth Area (NWGA) as defined under the *State Environmental Planning Policy (Sydney Region Growth Centres) 2006* (Growths Centres SEPP) in both Existing Certified and Existing Non-certified land (Figure 1 and Figure 3). Under the *Order to confer biodiversity certification on the State Environmental Planning Policy (Sydney Region Growth Centres) 2006* and pursuant to Section 126I of the Act and under Part 8 of the *Biodiversity Conservation Act 2016* (BC Act), assessment of threatened biota within areas mapped as Existing Certified under the Growth Centres SEPP is not required against NSW *Biodiversity Conservation Act 2016* (BC Act) or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Consideration of the Relevant Biodiversity Measures (RBMs) for vegetation removal within a growth centre will need to be considered in conjunction with development controls under Part 5 and Part 6 of the Growths Centres SEPP.

Portions of the study area also occur outside the NWGA and as such are not subject to the Growths Centres SEPP or Biodiversity Certification (Figure 1 and Figure 3). Impacts to native vegetation and habitats in these areas remain subject to the requirements of both the BC Act and EPBC Act.

Based on the location of the study area being both within and outside of the NWGA, areas subject to assessment of biodiversity impacts covered in this report include Existing Non-Certified areas (within the NWGA) and areas not subject to Biodiversity Certification (outside the NWGA). These areas have been collectively termed 'Non-BioCertified' areas and unless specifically stated, all impacts referred to herein refer only to biodiversity values impacted within Non-BioCertified areas. Existing native vegetation in Non-Certified areas is addressed in Section 6.2.

Ecological values of the study area

Key ecological values of the overall study area (which encompasses the impact area) include (refer Figure 4):

- Native vegetation in varying condition from scattered trees to intact vegetation.
- Fauna habitat including; several waterways and drainage lines, marginal foraging resources and organic litter.

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- 32 hollow-bearing trees and eight nest boxes providing habitat for threatened and non-threatened fauna.
- Six Threatened Ecological Communities (TECs) are present within the study area consisting of three Critically Endangered Ecological Communities (CEEC) and three Endangered Ecological Communities (EEC). Including:
  - *Cumberland Plain Woodland in the Sydney Basin Bioregion* (Cumberland Plain Woodland), listed as a CEEC under the BC Act and EPBC Act.
    - Comprising Plant Community Type (PCT) 849 - *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion* within the study area.
  - *River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin* (River-flat Eucalypt Forest) listed as an EEC under the BC Act and a CEEC EPBC Act.
    - Comprising PCT 835 – *Forest Red Gum-Rough-barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin* within the study area.
  - *Shale Gravel Transition Forest in the Sydney Basin Bioregion* (Shale Gravel Transition Forest), listed as an EEC under the BC Act and a CEEC EPBC Act.
    - Comprising PCT 724 - *Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion* within the study area.
  - *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* (Shale Sandstone Transition Forest) listed as a CEEC under the BC Act BC Act and EPBC Act.
    - Comprising PCT 1081 - *Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion* (EPBC Act only) and PCT 1395 - *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion* within the study area.
  - *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Swamp Oak Floodplain Forest) listed as an EEC under the BC Act and EPBC Act.
    - Comprising PCT 1800 - *Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley* within the study area.
  - *Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (Freshwater Wetlands) listed as an EEC under the BC Act.
    - Comprising PCT 781 *Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion* and *1071 Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion* within the study area.
- Four non-threatened plant communities including:
  - PCT *1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion.*
  - PCT *1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion.*

- PCT *1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region.*
- PCT 1255 - *Sydney sandstone hinterland dry sclerophyll forests of the Sydney Basin Bioregion*.

- One threatened flora species, Juniper-leaved Grevillea *Grevillea juniperina* subsp. *juniperina* (Vulnerable, BC Act) has been recorded within the study area within a patch of wholly Existing Certified land.
- One threatened flora species *Epacris purpurascens* (Vulnerable, BC Act) has been recorded within the study area outside of the NWGA and therefore not subject to Biodiversity Certification.
- Habitat for 18 threatened fauna species and six threatened flora species.
- Riparian corridors for six higher Strahler order waterways, constituting key fish habitat (KFH):
  - Eastern Creek.
  - Killarney Chain of Pond.
  - Caddie's Creek.
  - Cattai Creek.
  - Seconds Pond Creek.
  - First Ponds Creek.
- Riparian corridors for seven first order and two second order streams.
- Good quality intact native vegetation, in particular located within the southern extent of the study area.

Impacts to the threatened species and communities listed under the EPBC Act that are present or likely to occur, have been considered through undertaking Significant Impact Criteria (SIC) assessments. Impacts to the threatened species and communities listed under the BC Act that are present or likely to occur, have been considered through undertaking a Test of Significance (ToS).

Aquatic condition of sites within the study area is generally described as poor in the context of the surrounding region. Although the higher order streams mentioned above are identified as key fish habitat, only one stream, First Ponds Creek, will be directly impacted during construction by the proposal.

Proposed impacts

The proposal's impact area, defined by the extent of proposed works, is surrounded by the study area which includes adjacent areas likely to be directly or indirectly affected by the proposal. The impact area comprises a 15 metre-wide corridor along the alignment. A summary of the proposal's impacts is provided in Table 1 below, and illustrated on Figure 4.

Table 1 Summary of project impacts

Non-BioCertfied land				
	Direct impact		Indirect impacts (trimming)	
Native vegetation	9.56 ha		3.71 ha	
	Inside NWGA	Outside NWGA	Inside NWGA	Outside NWGA
	7.12 ha	2.44 ha	2.46 ha	1.25 ha
	Direct impact		Indirect impacts (trimming)	
Urban native / exotic vegetation	6.66 ha		0.56 ha	
Existing certified land				
	Direct impact		Indirect impacts (trimming)	
Native vegetation	1.79 ha		0.57 ha	
Urban native / exotic vegetation	9.37 ha		0.00 ha	

It should also be noted that of the 9.56 hectares of native vegetation directly impacted on Non-BioCertifed land, 0.49 hectares is considered Existing Native Vegetation (ENV) within the NWGA, subject to Relevant Biodiversity Measure (RBM) 8, and RBM 11 present mainly along the riparian corridors of Cattai Creek, Caddie's Creek, and Killarney Chain of Ponds. As prescribed by the Growth Centres Biodiversity Certification Order, Sydney Water is committed to securing the offsets required in accordance with RBM 8, which are expected to be secured though revegetation / restoration at an offsetting ratio of 3:1.

A further breakdown of impacts by PCT, TEC and ENV status is provided in Table 2 below.

Table 2 Summary of direct impacts to native vegetation

PCT No.	Total area impacted (ha)	Portion of total impact Inside NWGA (ha)	Portion of total impact Outside NWGA (ha)	Portion of total impact BC Act listed (ha)	Portion of total impact EPBC Act listed (ha)	Portion of total impact ENV (ha)
781	0.02	0.02	0.00	0.02	-	0.01
835	1.57	1.34	0.23	1.57	1.57	0.34
849	0.01	0.01	0.00	0.01	0.01	0.01
1071	0.01	0.01	0.00	0.01	-	0.01
1081	0.96	0.18	0.78	-	0.96	0.04
1083	0.68	0.20	0.48	-	-	-
1181	2.60	1.91	0.69	-	-	0.01
1255	0.02	0.00	0.02	-	-	-
1292	0.21	0.00	0.21	-	-	-
1395	0.28	0.25	0.03	0.28	0.28	-
1800	0.11	0.11		0.11	0.11	0.06
1841	3.09	3.09		-	-	0.01
Totals		**7.12**	**2.44**	**2.00**	**2.93**	**0.49**

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Recommendations

The primary measure for the development to minimise impacts to ecological values on the site is to minimise removal of native vegetation and habitat, avoid disruption to the habitat linkage across the study area and avoid impacts to waterways and riparian vegetation. In particular, impacts to TECs and threatened flora species should be avoided, minimised or mitigated where possible. The proposed pipeline alignments run adjacent to existing development and infrastructure in some sections, however, the proposal will likely require removal of intact native vegetation in other areas, in particular for the sludge pipeline between Rouse Hill WRP and Castle Hill WRP. In general, the alignment has been sited to take advantage of currently present disturbed areas including existing tracks, with the alignment only impacting vegetation that has not been subject to disturbance in the most southern part of the sludge pipeline. A minimal clearing approach is proposed to be implemented during construction, with complete removal of vegetation within the impact area only undertaken where required.

To retain the ecological values present within the study area, they need to be considered in the design process and identified to all staff/contractors involved in the proposal during pre-start meetings. Although offsets are not required for the majority of vegetation removal within the study area, it is understood that Sydney Water intends to perform non-statutory offsetting, in accordance with Sydney Water's *Biodiversity Offset Guidelines* (Sydney Water 2019) for areas outside of the growth centre.

Government legislation and policy

An assessment of the proposal against key biodiversity legislation and policy is provided and summarised below.

Table 3 Legislation relevant to the proposal

Legislation / Policy	Relevant ecological feature	Permit / approval required
Environment Protection and Biodiversity Conservation Act 1999	Four TECs that satisfy listing requirements under the EPBC Act will be impacted by the proposal. A total of up to 9.56 hectares of potential habitat for two threatened flora species and three threatened fauna species listed under the EPBC Act is expected to be impacted on Non-BioCertified land within the study area as a result of the proposal.	Four TECs have been identified within the study area. As such, four SICs have been provided in Appendix 3. Potential habitat for two threatened flora and three threatened fauna species is located within the study area. As such, five SICs have been provided in Appendix 3. The assessment concluded that a significant impact to EPBC Act listed threatened entities is unlikely.
Biodiversity Conservation Act 2016	Five TECs occur within areas of Non-BioCertified land which is subject to further assessment. Four TECs occurs within Existing Certified land and are not subject to further assessment under the BC Act. One flora species *Epacris purpurascens* (Vulnerable, BC Act) was recorded within the	Five TECs have been identified within Non-BioCertified land. As such, five ToSs have been provided in Appendix 3 Biosis recommends that ToS be undertaken under Section 1.7 of the EP&A Act for 18 threatened fauna species and six threatened flora species, including *Epacris Purpurascens*, (see Section 6.2). As such, ToS have been provided in Appendix 4.

Legislation / Policy	Relevant ecological feature	Permit / approval required
	study area. The study area contains potential habitat for 18 threatened fauna and six threatened flora species.	ToSs concluded that a significant impact is not likely to result from the proposed works due to the scale of impacts on individual populations and communities being confined primarily to the edges of patches which are considered unlikely to contribute to substantial community fragmentation or major local scale reduction in the extent and functionality of the TECs.
Fisheries Management Act 1994	No threatened flora or fauna species, populations or communities are considered likely to occur within the study area. The proposal will impact directly First Ponds Creek (KFH) as well as seven first order and one second order.	An aquatic assessment does not form part of this report, however preliminary advice has been provided in Section 6.4.
Environmental Planning & Assessment Act 1979	Threatened species and ecological communities occur within the study area.	Impacts to the threatened species and communities present or likely to occur must be assessed through undertaking a ToS (Appendix 4).
Water Management Act 2000	As a Major Utility listed under Schedule 2 of the Act, Sydney Water is exempt from aspects of the Act that relate to this biodiversity assessment. Therefore the Water Management Act is considered not applicable.	N/A
SEPP Sydney Region Growth Centres 2006	The study area contains areas assessed as Existing Certified under the Growth Centres SEPP. Certified areas do not require further consideration under the NSW BC Act or Commonwealth EPBC Act. The proposal will impact (direct and indirect/trimming) upon a total of 2.23 hectares of native vegetation (either removal or trimming) within Existing Certified land.	No permits or approvals are required under the current scope of works. Where vegetation is to be cleared in Existing Non-Certified areas Sydney Water should give written notice to DPIE.
National Parks and Wildlife Act 1974	The proposal does not require the removal of vegetation within a National Park.	No permits or approvals are required under the current scope of works.
Biosecurity Act 2015	The following priority weeds are present: • Madeira Vine *Anredera cordifolia* • Giant Reed *Arundo donax* • Ground Asparagus *Asparagus aethiopicus* • Bridal Creeper *Asparagus asparagoides* • Alligator Weed *Alternanthera philoxeroides*	Control requirements for these priority listed weeds is outlined in Section 6.5.

Legislation / Policy	Relevant ecological feature	Permit / approval required
	• Green Cestrum *Cestrum parqui* • Blackberry *Rubus fruticosus* spp. aggregate • Lantana *Lantana camara* • African Olive *Olea europaea* subsp. *cuspidata* • Fireweed *Senecio madagascariensis*	

Note: Guidance provided in this report does not constitute legal advice.

1 Introduction

1.1 Proposal background

Biosis Pty Ltd was commissioned by Sydney Water to undertake a flora and fauna assessment of the impact area and broader study area (Figure 1). Sydney Water proposes to upgrade the Rouse Hill Water Recycling Plant (WRP) and Riverstone Wastewater Treatment Plant (WWTP) to accommodate the growth and development in the Metro Northwest Growth Corridor (MNGC) and North West Growth Area (NWGA) .The development of the proposed assets (Figure 2) includes:

- The upgrading of liquid streams at Rouse Hill WRP and Riverstone WWTP, with temporary interconnection between all sites to use available capacity.
- The development of a centralised bio solids facility at Riverstone, to maximise energy recovery and potential for co-treatment of imported food waste.
- Construction of a new sludge transfer system, including a sludge pipeline from Castle Hill WRP to Rouse Hill WRP (approximately 10.2 kilometres), and then to Riverstone WWTP (approximately 6.3 kilometres).
- Construction of a new discharge main from Riverstone WWTP to Eastern Creek.
- Construction of a second sliding gate required for upgrade works at the Castle Hill WRP.
- Under boring of the pipeline in areas of high environmental constraints.
- Use of temporary access paths for constructions of the sludge pipelines.

The pipeline alignment occurs primarily within the NWGA under the Growths Centres SEPP in both Existing Certified and Existing Non-certified land. The NSW Government completed Biodiversity Certification of the Growth Centres in accordance with the NSW *Threatened species Conservation Act 1995* (TSC Act) (now replaced by the BC Act) in 2007 and subsequently prepared the Strategic Assessment of the North West and South West Growth Centres under the EPBC Act in 2010. Under the *Order to confer biodiversity certification on the State Environmental Planning Policy (Sydney Region Growth Centres) 2006* and pursuant to Section 126I of the Act and under Part 8 of the BC Act, assessment of threatened biota within areas mapped as Existing Certified under the Growth Centres SEPP is not required against NSW *Biodiversity Conservation Act 2016* (BC Act) or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). However, consideration of the Relevant Biodiversity Measures (RBMs) prescribed by the *Order to confer biodiversity certification on the State Environmental Planning Policy (Sydney Region Growth Centres) 2006* (Biodiversity Certification Order) for these areas is required as well as any relevant measures within the precinct plans. (Figure 1 and Figure 3)

Portions of the study area also occur outside the NWGA and as such are not subject to the Growths Centres SEPP or Biodiversity Certification. Impacts to native vegetation and habitats in these areas remain subject to the requirements of both the BC Act and EPBC Act.

Based on the location of the study area being both within and outside within the NWGA, areas subject to assessment of biodiversity impacts covered in this report include Existing Non-Certified areas (within the NWGA) and areas not subject to Biodiversity Certification (outside the NWGA). These areas have been collectively termed 'Non-BioCertified' areas and unless specifically stated, all impacts referred to herein refer only to biodiversity values impacted within Non-BioCertified areas.

The study area includes a 20 metre buffer on the alignment provided by Sydney Water (40 metre assessment corridor) for locations subject to terrestrial impacts, within which a 7.5 metre buffer on the alignment (15 metre corridors) has been considered and assessed for direct impacts. This area of direct impact excludes impacts associated with a variable 3-15 metre wide fire trails that occurs throughout the alignment from Rouse Hill WRP and Castle Hill WRP, with impacts coinciding with this fire trail being assessed as trimming impacts (indirect impacts) only. Sections of the alignment that will be under bored and not subject to on-ground impacts, have been excluded from the impact calculations (Figure 2). Additional assessment of ecological values has been taken along riparian corridors that may be subject to a change in hydrological conditions. At present no impact is expected in these areas.

The proposal is proposing to directly remove up to a total of 11.35 hectare of native vegetation, with a total of 9.56 hectares occurring on Non-BioCertified land (Figure 2 and Figure 3), and therefore this 9.56 hectares of direct impact is subject to assessment in accordance with the BC Act and EPBC Act. A further breakdown of impacts (both direct and indirect) can be found in Section 5.

This proposal is to be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). These investigations will be used to inform the Review of Environmental Factors (REF) being prepared by Sydney Water. The objective of this assessment is to determine impacts to threatened biota in the study area, and to quantify the area of native vegetation proposed for removal.

1.2 Scope of assessment

The objectives of this investigation are to:

- Map native vegetation and other habitat features.
- Describe the vascular flora (ferns, conifers, and flowering plants), vertebrate fauna (birds, mammals, reptiles, frogs, and fish) and decapod crustacea (e.g. crayfish).
- Identify potential habitat for threatened flora or fauna species or populations (biota).
- Confirm the extent of Existing Certified, Existing non-certified and Existing Native Vegetation (ENV) areas within the study area.
- Review the implications of relevant biodiversity legislation and policy.
- Identify potential implications of the proposal and provide design recommendations.
- Recommend any further assessments of the site that may be required.
- Assess the impacts with regards to Sydney Water's *Biodiversity Offset Guideline* (Sydney Water 2019).

1.3 Location of the study area

The study area is located broadly within Sydney in the townships of Castle Hill, Rouse Hill and Riverstone (Figure 1). The study area falls within both The Hills Council Local Government Area (LGA) and the Blacktown Council LGA. The study area includes:

- The existing footprints of Castle Hill WRP, Rouse Hill WRP and Riverstone WWTP.
- A proposed sludge pipeline from Castle Hill WRP to Rouse Hill WRP (approximately 10.5 kilometres), and from Rouse Hill WRP to Riverstone WWTP (approximately 6.3 kilometres), as well as the new Riverstone WWTP discharge main (approximately 0.9 kilometres).

The study area is within the:

- Sydney Basin Bioregion: Cumberland and Yengo Subregions.
- Hawkesbury Catchment Management Area.
- Greater Sydney Local Land Services (LLS) Management Area.
- The Blacktown and Hills LGAs.

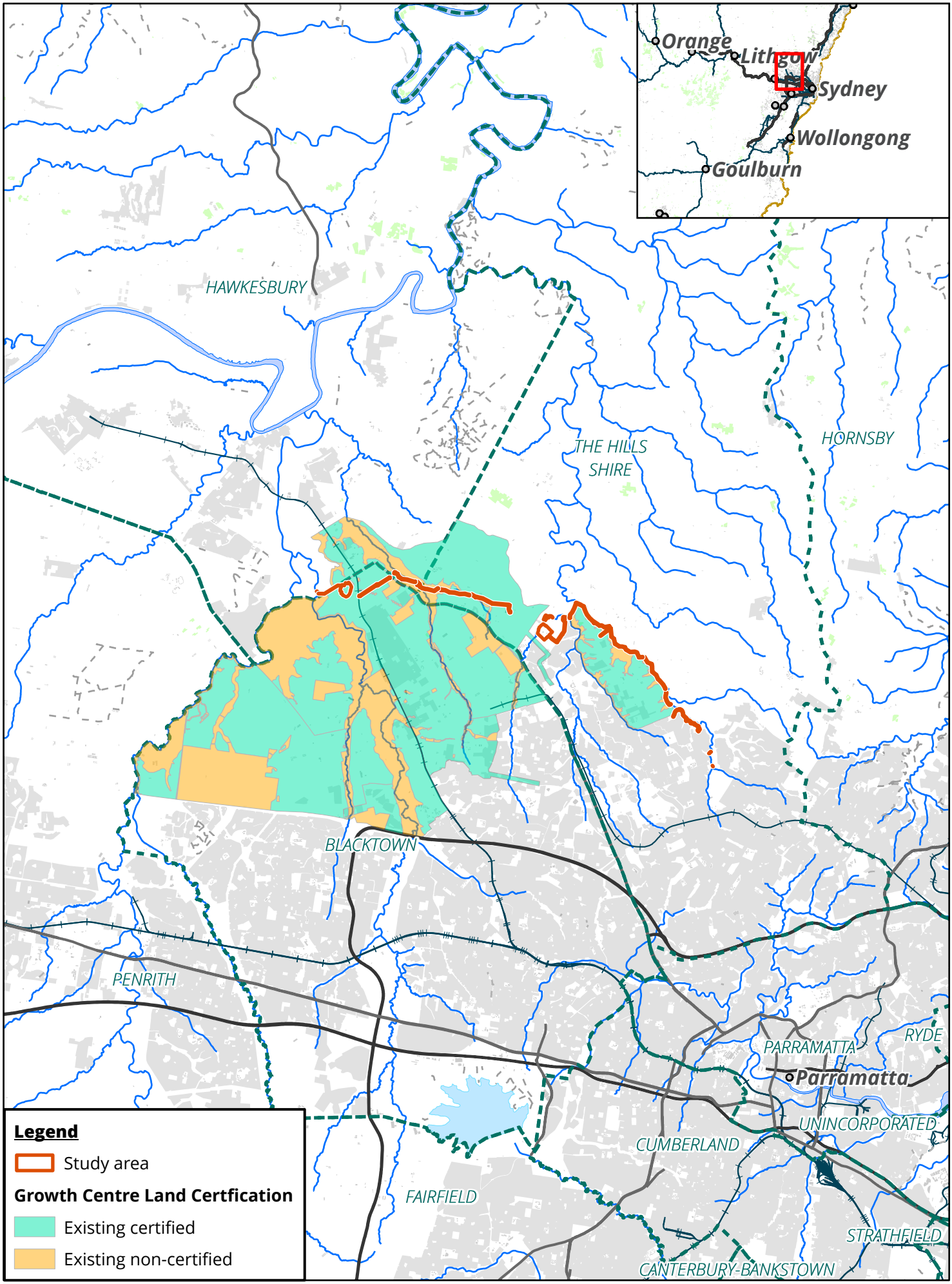

Figure 1 Location of the study area

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Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
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Kilometers

Scale: 1:170,000 @ A4
Coordinate System GDA 1994 MGA Zone 56

N

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Legend

- Study area
- Impact area

Figure 2.1 Location of the subject site within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
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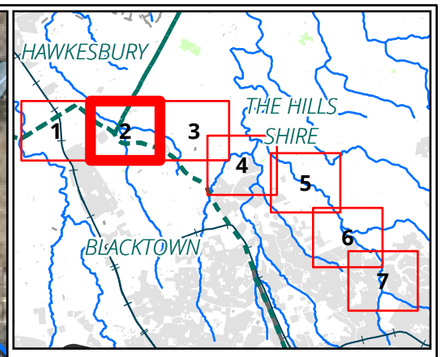

Legend

- Study area
- Impact area

Figure 2.2 Location of the subject site within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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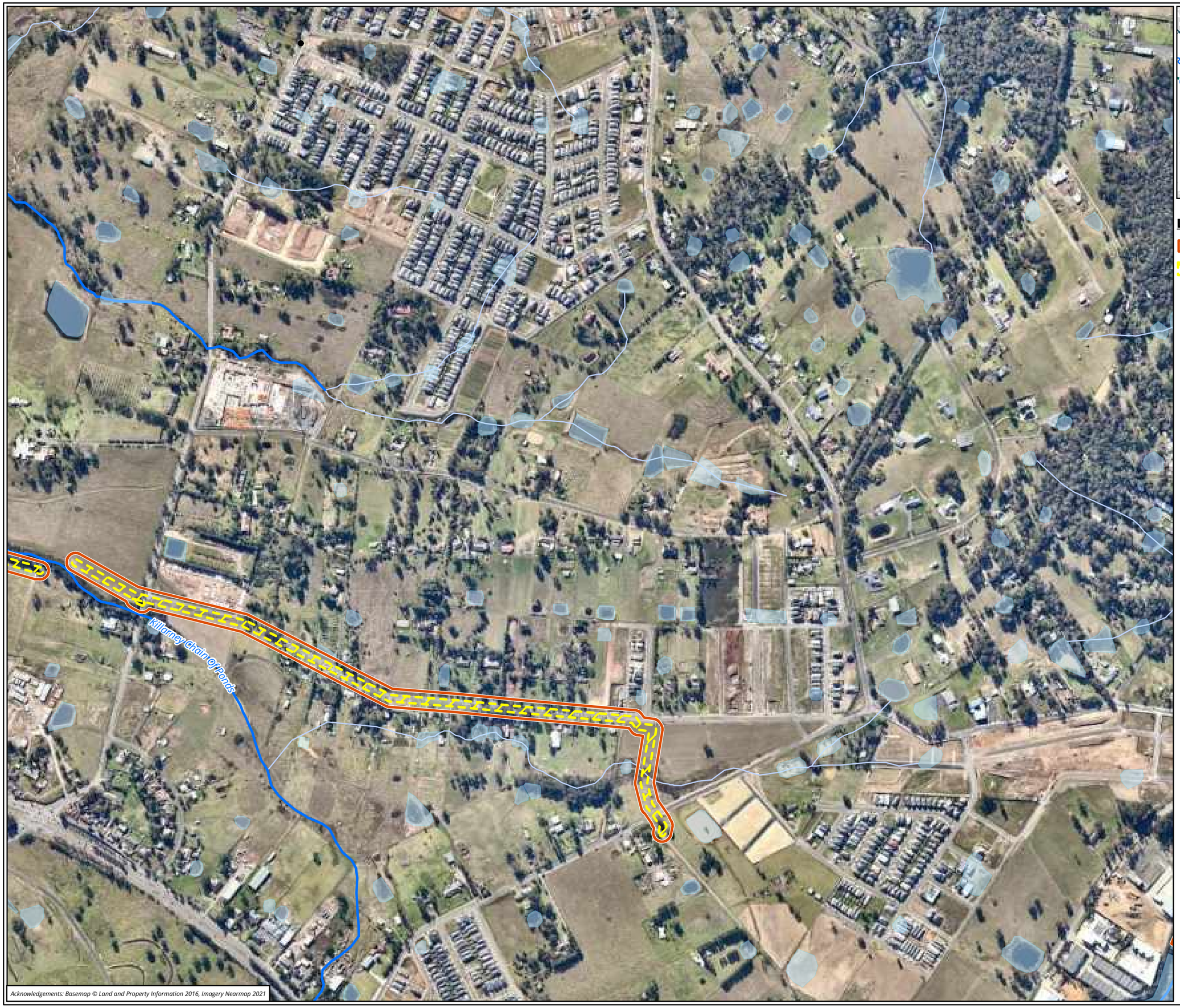

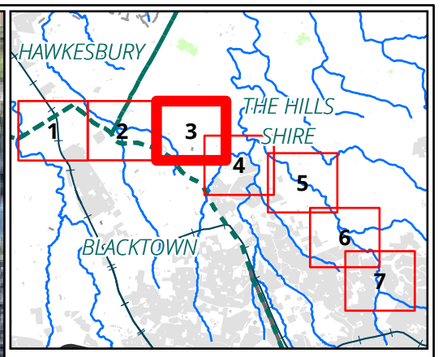

Legend

- Study area
- Impact area

Figure 2.3 Location of the subject site within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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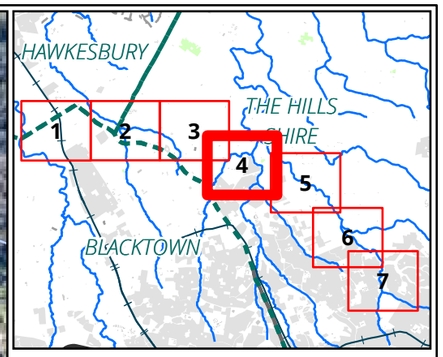

Legend

- Study area
- Impact area

Figure 2.4 Location of the subject site within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F2_SubjectSite
Project: P:\34900s\34968\Mapping\
34968_NW_Hub.aprx

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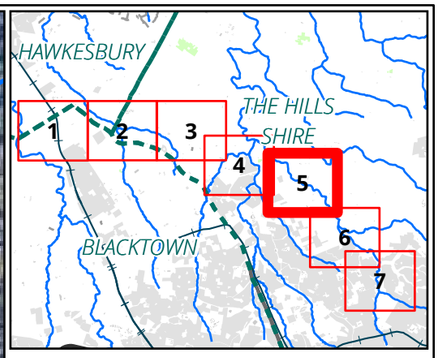

Legend

- Study area
- Impact area

Figure 2.5 Location of the subject site within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
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34968_NW_Hub.aprx

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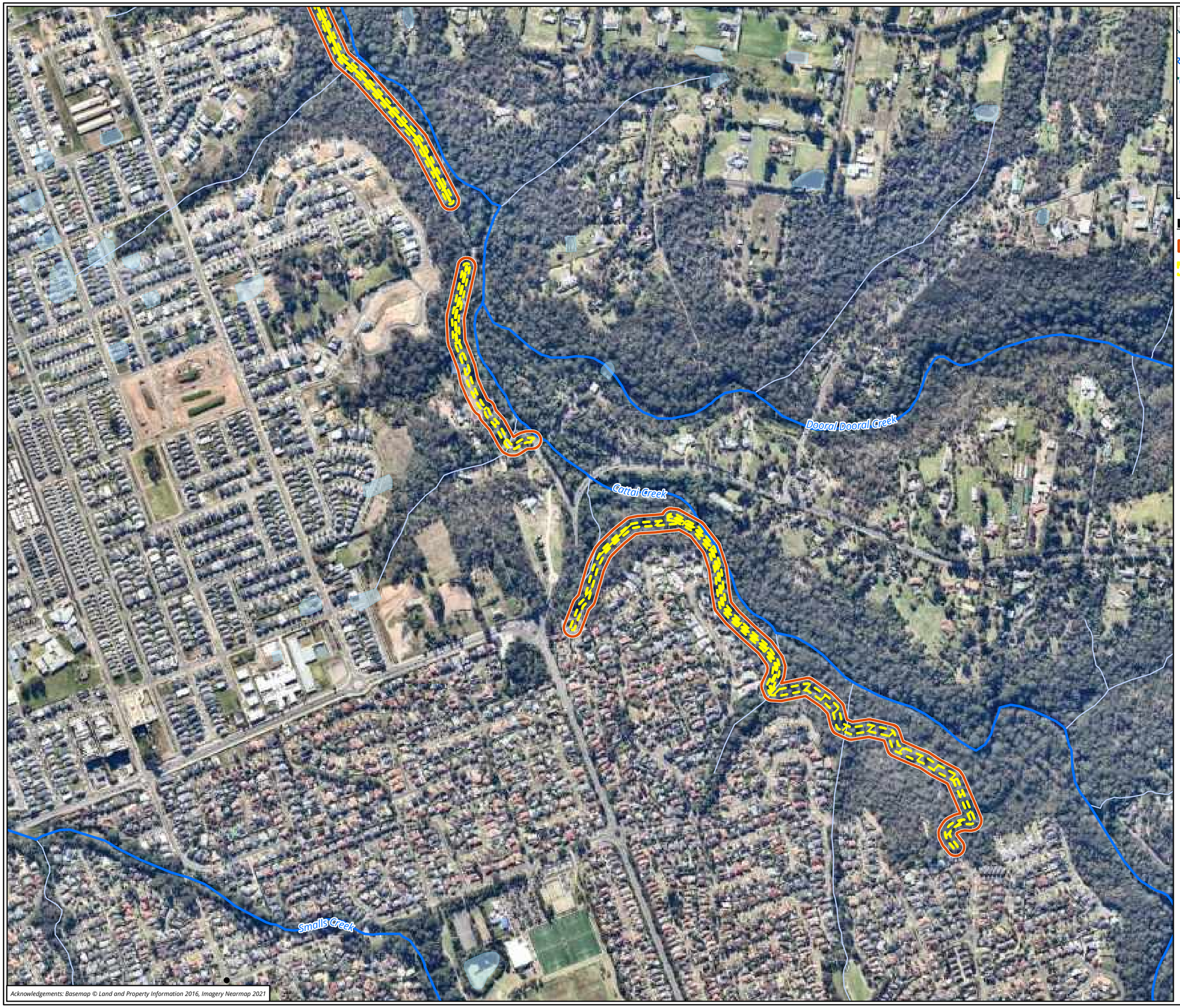

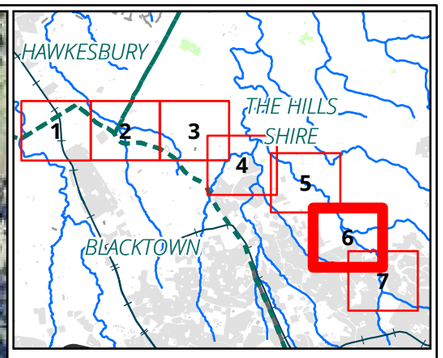

Legend

- Study area
- Impact area

Figure 2.6 Location of the subject site within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F2_SubjectSite
Project: P:\34900s\34968\Mapping\
34968_NW_Hub.aprx

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Legend

- Study area
- Castle Hill Treatment Plant (completed assessment)
- Impact area

Figure 2.7 Location of the subject site within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F2_SubjectSite
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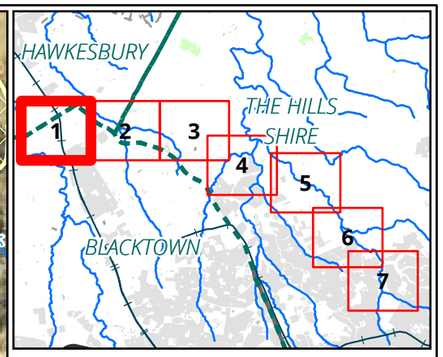

Legend

- Study area
- Impact area

Biodiversity certification

- Land subject to RBM 12

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Exisitng Native Vegetation (ENV)
- Impacted ENV

Figure 3.1 Biocertified land within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F3_Biocertified_land
Project: P:\34900s\34968\Mapping\
34968_NW_Hub.aprx

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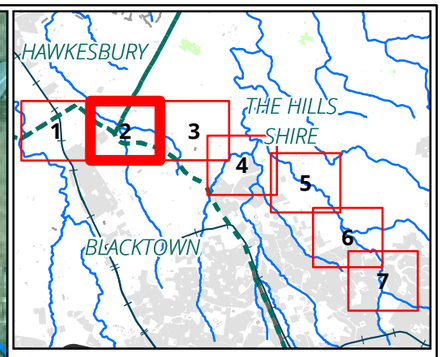

Legend

- Study area
- Impact area

Biodiversity certification

- Land subject to RBM 12

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Exisitng Native Vegetation (ENV)
- Impacted ENV

Killarney Chain Of Ponds

First Ponds Creek

Acknowledgements: Basemap © Land and Property Information 2016, Imagery Nearmap 2021

Figure 3.2 Biocertified land within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
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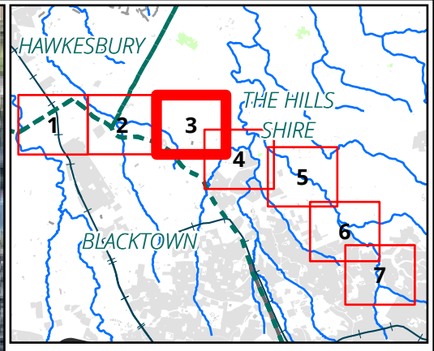

Legend

- Study area
- Impact area

Biodiversity certification

- Land subject to RBM 12

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Exisitng Native Vegetation (ENV)
- Impacted ENV

Figure 3.3 Biocertified land within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F3_Biocertified_land
Project: P:\34900s\34968\Mapping\
34968_NW_Hub.aprx

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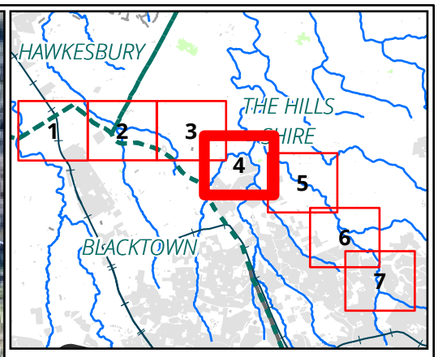

Legend

- Study area
- Impact area

Biodiversity certification

- Land subject to RBM 12

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Exisitng Native Vegetation (ENV)
- Impacted ENV

Figure 3.4 Biocertified land within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F3_Biocertified_land
Project: P:\34900s\34968\Mapping\
34968_NW_Hub.aprx

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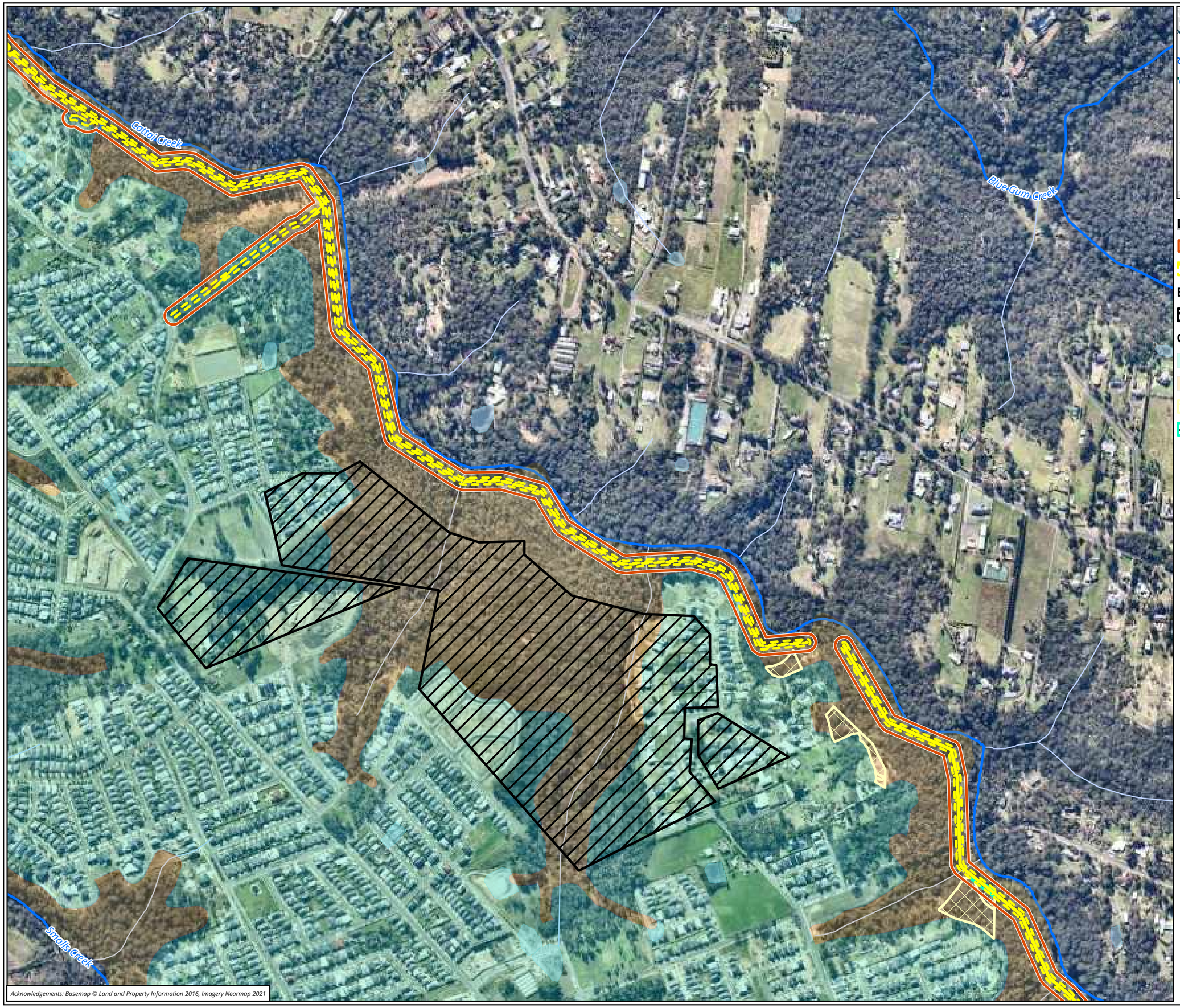

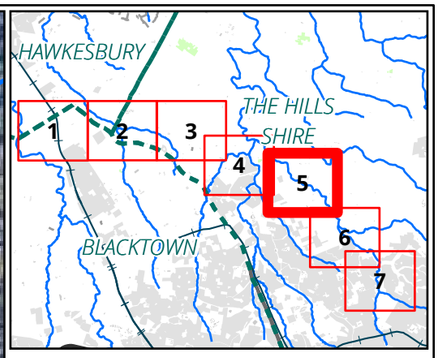

Legend

- Study area
- Impact area

Biodiversity certification

- Land subject to RBM 14, 17, 18

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Exisitng Native Vegetation (ENV)
- Impacted ENV

Figure 3.5 Biocertified land within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
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Project: P:\34900s\34968\Mapping\
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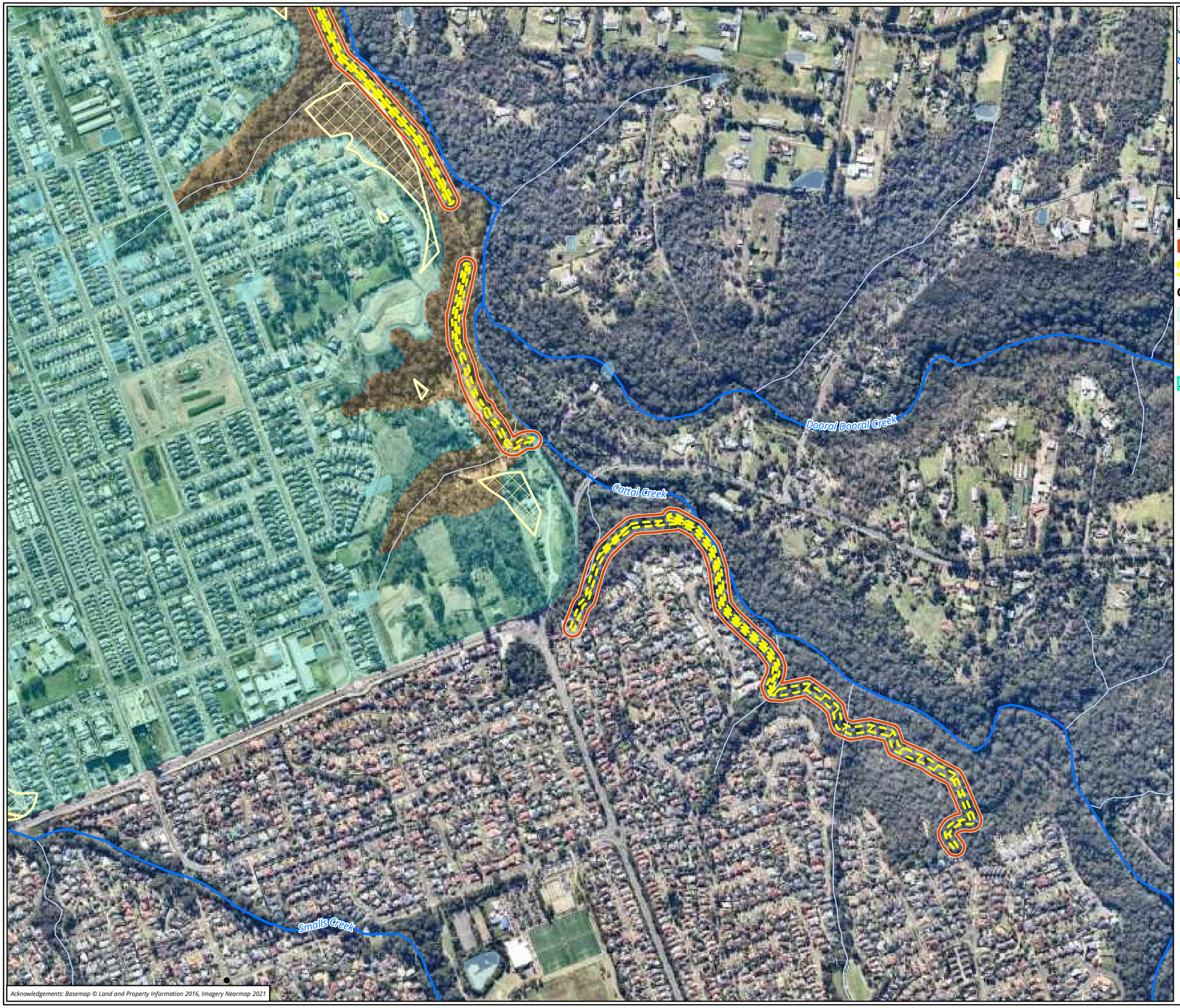

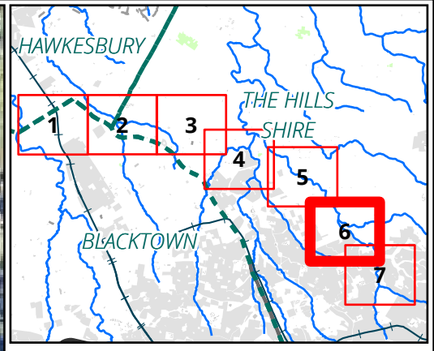

Legend

- Study area
- Impact area

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Exisitng Native Vegetation (ENV)
- Impacted ENV

Figure 3.6 Biocertified land within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: CW, Prepared by: AM, Last edited by: amackegard
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Project: P:\34900s\34968\Mapping\
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Acknowledgements: Basemap © Land and Property Information 2016, Imagery Nearmap 2021

Legend

- Study area
- Castle Hill Treatment Plant (completed assessment)
- Impact area
- Exisitng Native Vegetation (ENV)
- Impacted ENV

Figure 3.7 Biocertified land within the study area

0 50 100 150 200 250

Metres

Scale: 1:8,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
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2 Legislative context

This section provides an overview of key biodiversity legislation and government policy considered in this assessment. Where available, links to further information are provided. This section does not describe the legislation and policy in detail, and guidance provided here does not constitute legal advice.

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

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

Nine Matters of NES are identified under the EPBC Act:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (also known as 'Ramsar' wetlands).
- Nationally threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).
- A water resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, activities that have potential to result in significant impacts on Matters of NES must be referred to the Commonwealth Minister for the Environment and Energy for assessment.

Matters of NES relevant to the current proposal include nationally threatened species and ecological communities and migratory species. Threatened species and ecological communities protected by the EPBC Act are outlined in Sections 4.2 and 4.4. Significant impact criteria (SIC) assessments are provided in Appendix 3.

An assessment of potential impacts to all Matters of NES under the provisions of the EPBC Act is provided in Section 6.1, including whether referral of the proposal to the Commonwealth Minister for the Environment for assessment is recommended.

2.2 State

2.2.1 Environmental Planning and Assessment Act 1979

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

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

Test of Significance

Section 1.7 of the EP&A Act requires proponents and consent authorities to consider if a development will have a significant effect on threatened species, populations or communities listed under the BC Act and FM Act. These assessments do not need to be undertaken for any impacts to land mapped as Existing certified under the Growth Centres SEPP.

Section 1.7 (and Section 7.3 of the BC Act) outlines factors that must be taken into account in a ToS. Where any ToS determines that a development will result in a significant effect to a threatened species, population or community, a Species Impact Statement (SIS) or preparation of a Biodiversity Offsets Scheme (BOS) application is required.

Threatened species, populations and communities listed under the BC Act and FM Act are discussed in Section 4.2 and Section 4.4. ToS are provided in Appendix 4.

An assessment of whether the proposal will result in a significant effect to any threatened species, populations or communities listed under the BC Act or FM Act, and whether an SIS or preparation of a BOS application is required, is provided in Section 6.2.

2.2.2 State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) are environmental planning instruments under the EP&A Act that outline policy objectives relevant to State or regional environmental planning issues. There are over 65 SEPPs; however, only those relevant to the proposed development have been considered and are detailed below.

SEPP (Sydney Region Growth Centres) 2006

The NSW Government completed Biodiversity Certification of the Growth Centres in accordance with the NSW *Threatened species Conservation Act 1995* (TSC Act) (now replaced by the BC Act) in 2007 and subsequently prepared the Strategic Assessment of the North West and South West Growth Centres under the EPBC Act in 2010. The above processes resulted in the identification and security of strategic conservation outcomes and removed the requirement to assess threatened species, populations and threatened ecological communities (threatened biota) against the provisions of the EPBC Act and BC Act.

The study area and impact area extend across Existing Certified and Existing Non-certified land within the NWGA between Riverstone and Kellyville, all of which is regulated by SEPP (Sydney Region Growth Centres) 2006. As all Existing Certified land has already undergone assessment and offsetting against the EPBC Act and former NSW *Threatened Species Conservation Act 1994*, biodiversity impacts that occur within Existing Certified areas are not considered as part of this this assessment. Specific Relevant RBMs prescribed (Biodiversity Certification Order are addressed in Section 6.2.

2.2.3 Local Environmental Plans

Local Environmental Plans (LEPs) are created by Councils in consultation with their community and guide planning decisions for LGAs. They apply either to the whole or part of a LGA and make provision for the protection or utilisation of the environment through zoning of land and development controls.

LEPs relevant to this proposal include:

- *The Hills LEP 2019.*

- *Blacktown LEP 2015.*

Elements of the LEP objectives are not relevant to this assessment as the works relate to *Division 24 Water Supply Systems* under the *State Environmental Planning Policy (Infrastructure) 2007*, and under clauses 125 and 127 are considered as 'development permitted without consent' and 'exempt development', respectively. Elements of the LEP objectives are not discussed further.

2.2.4 Development Control Plans

Development Control Plans (DCPs) are developed by Council and provide detailed planning and design guidelines to support the planning controls in the LEP. DCPs identify additional development controls and standards for addressing development issues at a local level and can be applied more flexibly than a LEP.

The proposal is subject to the following DCPs:

- *Blacktown DCP 2015* (Blacktown DCP).
- *Blacktown Growth Centre Precincts DCP 2018*
- *Box Hill Growth Centre Precincts DCP 2018*
- *North Kellyville Precinct DCP March 2018*
- *The Hills DCP 2012 – as amended 4 May 2018*.
- *Riverstone West DCP (2009)*

Elements of the DCPs relevant to this assessment are discussed further in Section 6.2.

2.2.5 Biodiversity Conservation Act 2016

The BC Act is the key piece of legislation providing for the protection and conservation of biodiversity in NSW through the listing of threatened species, populations and communities, key threatening processes (KTPs) and critical habitat for threatened species, populations and communities. Impacts to threatened species, populations and communities are assessed under Section 1.7 of the EP&A Act and Section 7.3 (or Section 7.8 for Part 5 projects) of the BC Act. If assessment under the EP&A Act and BC Act determines a project is likely to result in a significant effect to threatened species, populations or communities, then a SIS or the BOS should be prepared. No assessment under the BC Act is required or has been undertaken for land mapped as Existing certified under the Growth Centres SEPP.

Threatened species, populations and communities listed under the BC Act and FM Act are discussed in Sections 4.2 and 4.4. ToS are provided in Appendix 4. An assessment of whether the proposal will result in a significant effect to these threatened species, populations and communities is summarised in Section 6.3.

2.2.6 Fisheries Management Act 1994

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened species, populations and communities, and critical habitats listed under the FM Act must be assessed through the ToS process under Section 1.7 of the EP&A Act (see above). If assessment under Section 1.7 of the EP&A Act determines a project is likely to result in a significant effect to threatened species, populations or communities then a SIS should be prepared.

Threatened species, populations and communities listed under the FM Act are discussed in Section 4.3. An assessment of whether the project will result in a significant effect to these threatened species, populations and communities is summarised in Section 6.3.

Two key objectives of the FM Act are to; conserve fish stocks and Key Fish Habitat (KFH), and conserve threatened species, populations and ecological communities of fish and marine vegetation. When reviewing

applications the Department of Primary Industries (DPI) will assess the likelihoods of impacts to waterways in relation to their sensitivity (TYPE) and waterway class (CLASS). A general description of aquatic habitats provided by the waterways is provided in Section 4.3 and an assessment under the FM Act is provided in Section 6.4 relating to the likelihood of impacts to threatened species, however it is understood that an aquatic ecological assessment will be undertaken for the proposal, separately to this biodiversity assessment report.

2.2.7 Biosecurity Act 2015

The Biosecurity Act outlines biosecurity risks and impacts, which in relation to the current assessment includes those risks and impacts associated with weeds. A biosecurity risk is defined as the risk of a biosecurity impact occurring, which for weeds includes the introduction, presence, spread or increase of a pest into or within the State or any part of the State. A pest plant that has the potential to out-compete other organisms for resources, including food, water, nutrients, habitat and sunlight and / or harm or reduce biodiversity.

Under the Biosecurity Act, a priority weed is any weed identified in a local strategic plan, for a region that includes that land or area, as a weed that is or should be prevented, managed, controlled or eradicated in the region. A local strategic plan here refers to a local strategic plan approved by the Minister under Division 2 of Part 4 of the *Local Land Services Act 2013*, which for the study area is the Greater Sydney Regional Strategic Weed Management Plan.

The Biosecurity Act also introduces the General Biosecurity Duty, which states:

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

Priority weeds are discussed further in Section 6.5.

2.2.8 Water Management Act 2000

As a public authority, Sydney Water does not need to obtain a controlled activity approval from the Natural Resources Access Regulator (NRAR) for any controlled activities that it carries out in, on or under waterfront land.

However, the WM Act is supported by a series of interpretation guidelines which provide design considerations and overarching management measures for works on waterfront land. These considerations and management measures should be considered when planning and undertaking the proposed works. To which the following guidelines are relevant:

- *Guidelines for watercourse crossings on waterfront land* (NSW Office of Water 2012a).
- *Guidelines for outlet structures on waterfront land* (NSW Office of Water 2012b).
- *Guidelines for laying pipes and cables in watercourses on waterfront land* (NSW Office of Water 2012c).
- *Guidelines for instream works on waterfront land* (NSW Office of Water 2012d).

Considerations under the Water Management Act are not discussed further.

3 Methods

3.1 Literature and database review

In order to provide a context for the study area, information about flora and fauna from within 5 kilometres (the locality) was obtained from relevant public databases. Aquatic fauna records were also searched with a 5 kilometre buffer around the study area for available and predicted species habitat and fish community spatial data. Records from the following databases were collated and reviewed:

- Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool, for matters protected by the EPBC Act.
- Environment, Energy and Science (EES) NSW BioNet - *the database for the Atlas of NSW Wildlife*, for entities listed under the BC Act.
- The NSW DPI Spatial Data Portal for FM Act listed threatened species, populations and communities.
- PlantNET (RBGDT 2021).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2021.

Other sources of biodiversity information:

- Relevant vegetation mapping, including:
  - *Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands* (SCIVI) (DPIE 2010).
  - *Cumberland Plain Vegetation Mapping* (NPWS 2002, NPWS 2013).
  - *The Native Vegetation of the Sydney Metropolitan Area, 2016, VIS_ID 4489* (OEH 2016a)

The following reports were also reviewed:

- NSW Scientific Committee final determinations for threatened biodiversity.
- *Position Statement: Maintaining and Enhancing Biodiversity Values* (Sydney Water 2018).
- Sydney Water's *Biodiversity Offset Guideline* (Sydney Water 2019).
- *Growth Centres Conservation Plan. Exhibition draft* (Growth Centres Commission 2007).
- *Property Environmental Management Plan Rouse Hill Water Recycling Plant (WRP) ST0031* (Arcadis 2018a)
- *Property Environmental Management Plan Riverstone Water Recycling Plant (WRP) ST0042* (Arcadis 2018b)
- *Biodiversity Assessment Castle Hill Water Recycling Plant (WRP) ST0024* (UBM Ecological Consultants 2018a)
- Biodiversity Assessment Rouse Hill WRP (ST0031) (UBM Ecological Consultants 2018b)
- *Flora and fauna assessment for North West Treatment Hub Project: Rouse Hill and Castle Hill* (Biosis 2021)

3.2 Site investigation

3.2.1 Flora assessment

The flora assessment was undertaken between 12 May 2021 to 9 June 2021 for a total 16 person days using targeted meanders to determine the vegetation types present.

General classification of native vegetation in NSW used in this report is based on the classification system in Keith (2004) which uses three groupings of vegetation: vegetation formation, vegetation class and vegetation type, with vegetation type the finest grouping. The grouping referred to in this report is Plant Community Type (PCT) as defined by the BAM and commonly used across NSW since 2016.

The vegetation types were stratified into PCTs broadly based on previous vegetation mapping, and the vegetation boundaries marked with a hand-held GPS in the field. Appropriate PCTs were selected on the basis of species composition and structure, known geographical distribution, landscape position, underlying geology, soil type, and any other diagnostic features.

A list of flora species was compiled for each vegetation type. Records of flora species will be submitted to EES for incorporation into the BioNet Wildlife Atlas.

The general condition of native vegetation was observed, as well as the effects of current seasonal conditions. Notes were made on specific issues such as priority weed infestations, evidence of management works, current grazing impacts and the regeneration capacity of the vegetation.

Targeted flora surveys for the following threatened species were undertaken in November 2021 to align with peak flowering period for the following species:

- *Hibbertia superans*
- *Darwinia biflora*
- *Epacris purpurascens* subsp. *purpurascens*
- *Leucopogon fletcheri* subsp. *fletcheri.*

The targeted surveys were undertaken using 5 metre separated transects within areas that were assessed as providing high quality habitat for the above species as per *Surveying threatened plants and their habitats* (DPIE 2020).

It should be noted that a site assessment has not been specifically conducted to cover the Riverstone WWTP discharge main as the design was not available at the time of field survey. However where the pipeline occurs within the WWTP site, surveys completed for the current project have been augmented by surveys undertaken for the development for the site's Biodiversity Assessment (UBM 2018), and the discharge location has been assessed as part of the field investigation undertaken for the current project. Where the discharge main occurs along Bandon Road, and within private property before meeting Eastern Creek, the assessment is based on desktop analysis only. Native vegetation occurs on Existing Certified land on the southern side of Bandon Creek, however the PCTs can be suitably determine via desktop analysis, and the remaining area is considered highly unlikely to support native vegetation and habitats. The risk of impact to biodiversity values in this area is therefore considered low.

Surveys of the area required for the construction of the sliding gate at the Castle Hill WRP were incidentally undertaken in May 2021, during the assessment of the site for the Compliance Upgrades package of works (Biosis 2021a). Whilst the area to be impacted is outside the area assessed by Biosis in that report it occurs immediately adjacent to, and contiguous with, the impacted area assessed, and the findings of that report are relevant to, and can be extrapolated to, the current assessment in that location.

3.2.2 Fauna assessment

The study area was investigated from 12 May 2021 to 9 June 2021, for a total 16 person days, to determine its values for fauna. These were determined primarily on the basis of the types and qualities of habitat(s) present. All species of fauna observed during the assessment were noted and active searching for fauna was undertaken. This included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for threatened biota and their habitats. Fauna species were recorded with a view to characterising the values of the site and the investigation was not intended to provide a comprehensive survey of all fauna that has potential to utilise the site over time.

Field investigations incorporated both searches for aquatic fauna and potential habitat for aquatic fauna at sites where the proposed works may result in impacts to the aquatic environment.

Fauna records will be submitted to EES for incorporation into the NSW BioNet Wildlife Atlas. Aquatic fauna records will also be submitted to NSW DPI Fisheries.

Biosis' Standard Operating Procedures provide a comprehensive outline of methods used for fauna survey and are available on request.

3.2.3 Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by the Environment, Energy and Science Group under the *National Parks and Wildlife Act 1974* (SL100758, expiry date 31 March 2023). Fauna survey was conducted under approval TRIM 17.892 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2024).

3.3 Limitations

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases these factors do not present a significant limitation to assessing the overall ecological values of a site.

The current flora and fauna assessment was conducted in winter, which is considered sub-optimal time for survey due to lower levels of activity by fauna, and the potential dormancy of reproductive structures such as flowers during the colder months. However, the survey effort was sufficient to assess the general values within the study area.

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

3.4 Mapping

Aerial photography and site plans were supplied by Sydney Water/Near Maps (2021).

Mapping was conducted using hand-held (uncorrected) Tablet Personal Computer units (GDA94) and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally ± 7 metres) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files containing the relevant flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently precise for detailed design purposes.

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4 Results

The ecological values of the study area are described below and mapped on Figure 4.

4.1 Landscape context

Current land uses of the study area and surrounding areas include residential land, agricultural land, public open space, rail infrastructure and industrial land. The impact area is comprised of mixed land uses, with the south-eastern alignment predominantly located within native vegetation. The study area is directly linked to remnant vegetation, providing a good level of connectivity to bushland across the broader landscape and facilitating the movement of fauna throughout the local area. Additionally, there are small, remnant patches of native vegetation throughout the study area which also provide some connectivity to bushland, facilitating the movement of fauna throughout the landscape.

The landforms within the study area includes Hawkesbury, Blacktown, South Creek, Luddenham and Gymea soils of the Penrith Soil Landscape (Bannerman & Hazelton 1990). These soil landscapes and their parent geology are described further below.

Hawkesbury

Hawkesbury Sandstone geology consisting of medium to coarse-grained quartz sandstone with minor shale and laminite lenses. Rugged, rolling to very steep hills on Hawkesbury sandstone. Local relief varies from 40 to 200 metres. Slope gradients range from 25% to 70%. Narrow crests and ridges, narrow incised valleys, steep side slopes with rocky benches, broken scarps and boulders. Slopes are moderately inclined to precipitous. Valleys are narrow and incised.

Blacktown

Blacktown geology consisting of gently undulating rises on Wianamatta Group shales and Hawkesbury shale. Local relief to 30 metres with slopes up to 4 per cent. Broad rounded crests and ridges with gently inclined slopes. Shallow to moderately deep red and brown podzolic soils on crests, upper slopes and well-drained areas, and yellow podzolic soils and soloths on lower slopes and poor-drainage areas. This soil landscape is also characterized by its low fertility, poor soil drainage, and highly reactive plastic subsoil (Bannerman & Hazelton 1990).

South Creek

The riparian corridors within the study area support South Creek soils. South Creek soils occur on the present floodplains of many drainage networks of the Cumberland Plain. South Creek soils are influenced by an underlying geology of Quaternary alluvium derived from Wianamatta Group shales and Hawkesbury sandstone, and are often very deep layered sediments over bedrock or relief soils. Landscapes are characterised by flat to gently sloping alluvial plains with occasional terraces or levees providing low relief. Native vegetation of this soil type is typically suited to moderately regular inundation. This soil landscape is affected by erosional hazards and frequent flooding (Bannerman & Hazelton 1990).

Luddenham

Luddenham soils are erosional and are characterised by undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury sandstone. The area has been extensively cleared, however formerly supported wet sclerophyll forest and open woodlands. On crests, moderately deep dark podzolic soils are present, whereas moderately deep yellow podzolic soils and prairie soils are present on lower slopes

and drainage lines. The underlying shale provides enriched soil that is highly influential on the diversity of vegetation found within this landscape (Bannerman & Hazelton 1990).

Gymea

Gymea geology consists of undulating to rolling rises and low hills on Hawkesbury sandstone. Local relief of 20 to 80 metres with slopes of 10 to 25 per cent. Broad convex crests, moderately inclined side slopes with wide benches, localised rock outcrop on low broken scarps.

4.2 Vegetation communities and fauna habitat

The vegetation within the study areas is present in a variety of conditions (Table 4, Table 5, Table 6, Table 7, Table 8, Table 9, Table 10, Table 11, Table 12, Table 13, Table 14, Table 15, Table 16 and Table 17). Within the footprint of each treatment plant, vegetation has been heavily impacted during construction and operation of these areas, with native vegetation limited to lower condition remnant trees that have been retained. Between Riverstone WWTP and Rouse Hill WRP, much of the native vegetation has been cleared for agricultural activities and subdivision of large agricultural lots. Areas of better quality vegetation are fragmented by road infrastructure and easements, which has resulted in the majority of the remnant vegetation within the study area being degraded by edge effects including significant weed infestation.

The higher quality vegetation within the study area extends from Rouse Hill WRP to Castle Hill WRP, which contains intact native vegetation patches where disturbances are primarily in the form of well used fire trails and past clearing for the installation of above ground pipelines.

All vegetation within the study area has been degraded by weed encroachment and only small areas within the southern extent contain a low cover of weed species. These areas of higher condition vegetation are also not subjected to the disturbances described above, with no agricultural practices or fire trails present.

The study area supports a range of ecological values including areas of native vegetation, TECs, scattered trees, hollow-bearing trees and waterways. The ecological values are outlined below, divided by the vegetation communities they occur in (refer also to Figure 4).

Table 4 Vegetation communities of the study area – PCT 724

724 - Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion	
PCT	*724 - Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion* (Castlereagh Shale Gravel Transition Forest)
Extent within study area	Approximately 2.42 ha of Castlereagh Shale-gravel Transition Forest was recorded in the west of the study area, outside the road verges on the north and south boundaries of Otago Road.
Description including fauna habitat	Castlereagh Shale Gravel Transition Forest typically occurs as a low to tall open eucalypt forest with a mid-storey of White-feather Honey-myrtle *Melaleuca decora* and a mixed understorey of shrubs, grasses, sedges and forbs. Within the study area, this vegetation type contains an upper stratum dominated by Broad-leaved Ironbark *Eucalyptus fibrosa* with subdominant Grey Box *E. moluccana* and Narrow-leaved Ironbark *Eucalyptus crebra* over a mid-storey of Black Wattle *Acacia decurrens,* White-feather Honey-myrtle and Prickly-leaved Tea-tree *Melaleuca nodosa*. The understorey consists of; White Wattle *Acacia linifolia,* Hickory Wattle *Acacia implexa,* Parramatta Wattle *Acacia parramattensis,* Native Blackthorn *Bursaria spinosa* and Tick Bush *Kunzea ambigua,* over an ground layer of grasses and forbs such as Weeping Grass *Microlaena stipoides,* Common Couch *Cynodon dactylon,* Poison Rock Fern *Cheilanthes sieberi,* Gorse Bitter Pea *Daviesia ulicifolia,* Berry Saltbush *Einadia hastata,* Bordered Panic *Entolasia*

724 - Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion	
	marginata, Amulla *Eremophila debilis,* Whiteroot *Lobelia purpurascens* and Forest Nightshade *Solanum prinophyllum.* Exotic species recorded within this community included, Bridal Creeper, Crab Grass *Digitaria sanguinalis,* African Lovegrass *Eragrostis curvula,* Corky Passionfruit *Passiflora suberosa,* Fireweed *Senecio madagascariensis,* Slender Pigeon Grass *Setaria gracilis* Black-berry Nightshade *Solanum nigrum* and Paddy's Lucerne *Sida rhombifolia.*
Condition	The community is in moderate condition, with edge effects evident adjacent along Otago Road. The vegetation within the study area is part of a larger intact patch.
Threatened ecological community	Commonwealth EPBC Act: *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* a CEEC. Vegetation along Otago Road and satisfies listing requirements as the patch is > 0.5 ha with a native perennial understorey > 50 %. Within Riverstone WWTP does not meet EPBC Act requirements as the patch size is less than 0.5 ha. NSW BC Act: *Shale-gravel Transition Forest within the Sydney Basin Bioregion* a CEEC under the BC Act. This PCT satisfies listing under the BC Act due to location within the Sydney basin bioregion, species assemblage and location over clay soils associated with the Wianamatta Group.
Photograph: Castlereagh Shale-gravel Transition Forest along Otago Road, Riverstone	

Table 5 Vegetation communities of the study area – PCT 781

781 Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion	
PCT	*781 Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion* (Freshwater Wetlands)
Extent within study area	Approximately 0.18 ha of Freshwater Wetlands was recorded within the southern extent of the alignment from Riverstone WWTP to Rouse Hill WRP within the centre of the study area.
Description including fauna habitat	Freshwater Wetland typically occurs as a freshwater lagoon or swamp covered by a range of sedges, rushes and aquatic herbs with fringing shrubs and small trees occurring on the margins of the wetlands. Within the study area, this vegetation unit contained Broadleaf Cumbungi *Typha orientalis*, Common Rush *Juncus usitatus*, Common Reed *Phragmites australis* and Slender Knotweed *Persicaria decipiens*.

781 Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion	
	Outside of the study area this community was fringed by Swamp Oak *Casuarina glauca* and Cabbage Gum *Eucalyptus amplifolia.* Exotic species recorded within this community included; Blackberry, Paddy's Lucerne and Kikuyu *Cenchrus clandestina*.
Condition	The community is in poor condition due to disturbance and degradation from surrounding agricultural properties.
Threatened ecological community	Commonwealth EPBC Act: Not applicable NSW BC Act: *Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (EEC). PCT 781 satisfies listing under the BC Act due to location within the Sydney basin bioregion, species assemblage and location within freshwater lagoons, swamps and dams.
Photograph: Freshwater Wetlands	

Table 6 Vegetation communities of the study area – PCT 835

835 – Forest Red Gum-Rough-barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin	
PCT	*835 – Forest Red Gum-Rough-barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin* (River-flat Eucalypt Forest)
Extent within study area	Approximately 7.68 ha of River-flat Eucalypt Forest was recorded within the northern extent of Rouse Hill WRP, along Seconds Ponds riparian corridor and along the riparian corridor of Cattai Creek, Second Ponds and Caddie's Creek.
Description including fauna habitat	River-flat Eucalypt Forest typically occurs as an open Eucalypt forest on alluvial flats of rivers, streams and creeks with a canopy of Rough-barked Apple *Angophora floribunda*, Broad-leaved Apple *A. subvelutina*, Cabbage Gum and/or Forest Red Gum *Eucalyptus tereticornis.* This community contains a mid-storey of paperbarks *Melaleuca* spp. and wattles *Acacia* spp. with a lower shrub layer of Blackthorn over an understory of abundant grasses, small forbs and ferns. Within the study area, this vegetation unit contain an upper stratum dominated by Rough-barked Apple, Broad-leaved Apple and Cabbage Gum with subdominant Grey Box and Forest Red Gum over a disturbed mid-storey of Black Wattle, Hickory Wattle and Swamp Oak. In areas of better condition vegetation along Caddie's Creek, the understorey consists of Parramatta Wattle, Native Blackthorn over a ground layer of Common Couch, Blue Flax-lily *Dianella caerulea*, Weeping Grass,

835 – Forest Red Gum-Rough-barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin	
	Berry Saltbush, Bordered Panic and Whiteroot. Exotic species recorded within this community included, African Olive, Bridal Creeper African Lovegrass, Fireweed, Blackberry, Blackberry Nightshade, and Paddy's Lucerne.
Condition	The community is generally in moderate to poor condition due to disturbances such as weed invasion from surrounding agricultural properties.
Threatened ecological community	Commonwealth EPBC Act: *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria* (CEEC). The community forms a contiguous patch with other native vegetation within the riparian corridors specified above, and therefore, satisfies listing for Good Condition as the patch is > 2 ha, has a >50% perennial native understorey, > 6 native species per sample plot and a least 10 large trees per ha. NSW BC Act: *River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* Endangered Ecological Community (EEC). Justification: PCT 835 satisfies listing under the BC Act due to species assemblage, location within a riverflat landscape location in the Sydney Basin Bioregion and overlying clay soils.
Photograph: Swamp Oak Floodplain Forest	

Table 7 Vegetation communities of the study area – PCT 849

849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	
PCT	*849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion* (Cumberland Plain Woodland)
Extent within study area	Approximately 1.41 ha of Cumberland Plain Woodland was recorded along the southern boundary of the intersection of Otago Road with Windsor Road, along the south boundary of Riverstone WWTP and with Hynd's Road reserve.
Description including fauna habitat	Cumberland Shale Plains Woodland typically occurs as an open grassy woodland on gently undulating plains with a canopy of Grey Box and Forest Red Gum with Narrow-leaved Ironbark or Broad-leaved Ironbark subdominant, and occasionally Spotted Gum. The understorey contains a sparse cover of shrubs over abundant grasses and forbs. Patches of vegetation within Riverstone WWTP and within the eastern extent of Otago Road contain an upper stratum dominated by; Forest Red Gum and Grey Box with a sub-dominance of

849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	
	Broad-leaved Ironbark and Narrow-leaved Ironbark *Eucalyptus crebra* over a mid-storey of Native Blackthorn. The understorey contains; Weeping Grass, Kidney Weed, Blue Trumpet *Brunoniella australis*, Variable Glycine *Glycine tabacina*, Kangaroo Grass *Themeda triandra*, Blueberry Lily, Ringed Wallaby Grass *Rytidosperma caespitosum* and Basket Grass *Oplismenus aemulus*. Exotic species recorded within this community included, African Olive, Bridal Creeper African Lovegrass, Fireweed, Slender Pigeon Grass, Black-berry Nightshade, and Paddy's Lucerne.
Condition	The community within the study area is generally in poor condition with high levels of weed species present and low species diversity. The patch located along the southern boundary of Otago Road forms part of a high quality large patch.
Threatened ecological community	Commonwealth EPBC Act: *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* is a CEEC. The community along Otago Road forms part of a patch with vegetation with better quality vegetation and therefore, would satisfy listing requirements for Condition Class A as per the listing advice as the patch is > 0.5 ha with an overall native perennial understorey > 50 %. The patch within Riverstone WWTP and along Hynd's Road does not meet EPBC Act listing as the patch size is less than 0.5 ha. NSW BC Act: *Cumberland Plain Woodland in the Sydney Basin Bioregion* a CEEC under the BC Act. PCT 849 satisfies listing under the BC Act due to location within the Sydney basin bioregion, species assemblage and location over clay soils associated with the Wianamatta Group.
Picture: Cumberland Shale Plains Woodland along Otago Road, Box Hill	

Table 8 Vegetation communities of the study area – PCT 1071

1071 Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	
PCT	*1071 Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion* (Coastal Freshwater Wetlands)
Extent within study area	Approximately 0.09 ha of Coastal Freshwater Wetlands was recorded along the western half of the Riverstone WWTP to Rouse Hill WRP alignment. As additional area of artificial Coastal Freshwater Wetlands has been assessed as present at the outlet location norther of the Rouse Hill WRP.
Description including fauna	Coastal Freshwater Wetland typically occurs within freshwater manmade drainage lines that contain a dominance of Broad-leaved Cumbungi and Common Reed.

1071 Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	
habitat	Within the study area, this vegetation unit contained Broad-leaved Cumbungi and Common Reed within man-made or highly modified drainage lines connected to Caddie's Creek.
Condition	The community is low condition due to level of disturbance from adjacent agricultural properties.
Threatened ecological community	Commonwealth EPBC Act: Not applicable NSW BC Act: *Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (EEC). PCT 1071 satisfies listing under the BC Act due to location within the Sydney basin bioregion, species assemblage and location within freshwater lagoons, swamps and dams. The artificial Coastal Freshwater Wetlands north of Rouse Hill WRP does not confirm to the BC Act listing for the EEC.
Photograph: Coastal Freshwater Wetlands	

Table 9 Vegetation communities of the study area – PCT 1081

1081 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion	
PCT	*1081 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion* (Sydney Hinterland Transition Forest)
Extent within study area	Approximately 3.70 ha of Sydney Hinterland Transition Forest was recorded, along the western boundary of Mile End Road south west of the Rouse Hill WTP and along the western bank of Cattai Creek.
Description including fauna habitat	This is an exposed sandstone community distributed across the central and north-western Woronora Plateau as well as the western margin of the Hornsby plateau in north-west Sydney. It comprises a low-growing open eucalypt canopy with a dense shrub layer and an open ground cover of sedges and forbs. Within the study area, this vegetation unit contain an upper stratum dominated by Grey Gum *Eucalyptus punctata* with subdominant species Broad-leaved Ironbark and Narrow-leaved Apple *Angophora bakeri* over a mid-storey of Parramatta Wattle, Hickory Wattle and Swamp Oak. The understorey consists of; Silver-stemmed Wattle *Acacia parvipinnula,* Black She-oak *Allocasuarina littoralis,* Native Blackthorn, Common Couch, Blue Flax-lily, Berry Saltbush, Bordered Panic, Weeping Grass, Whiteroot and Sweet Pittosporum *Pittosporum undulatum*.

1081 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion	
	Exotic species recorded within this community included, African Olive, Bridal Creeper African Lovegrass, Fireweed, Slender Pigeon Grass, Blackberry, Blackberry Nightshade, and Paddy's Lucerne.
Condition	The community is generally in good condition due to high diversity of species, lack of fragmentation and minimal edge effects from the road corridor. All patches of this vegetation that occur within the study area form part of large intact patches of native vegetation.
Threatened ecological community	EPBC Act: *Shale Sandstone Transition Forest of the Sydney Basin Bioregion.* This community meets listing requirement under the EPBC Act due to presence of two characteristic canopy species, patch size is > 0.5 ha, contains >30% native understorey and contains at least one hollow-bearing tree. BC Act: Sydney Hinterland Transition Forest does not form part of the BC Act listing as per the final determination (NSW Scientific Committee 2019)
Photograph: Sydney Hinterland Transition Forest	

Table 10 Vegetation communities of the study area – PCT 1083

1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	
PCT	*1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion* (Sydney Hinterland Sandstone Woodland)
Extent within study area	Approximately 3.62 ha of Sydney Hinterland Sandstone Woodland was recorded primarily within the most southern portion of the Rouse Hill WRP to Castle Hill WRP, however is also located in other area associated within the Cattai Creek riparian corridor.
Description including fauna habitat	Sydney Hinterland Sandstone Woodland typically occurs as a low open forest, with a diverse shrub layer over an open sedgy groundcover. The patch within the study area has been thinned and contains an upper stratum dominated by Red Bloodwood *Corymbia gummifera* and Narrow-leaved Scribbly Gum *Eucalyptus haemastoma,* with Grey Gum and Sydney Peppermint subdominant. An open midstorey includes Black She-oak, Narrow-leaved Geebung *Persoonia linearis*, Coast Acacia *Acacia longifolia*, Old Man's Banksia *Banksia serrata* and Hairpin Banksia *Banksia spinulosa.* The understorey contains Curly Wig *Caustis flexuosa,* Barbed-wire Grass *Cymbopogon refractus,* Rough Saw-sedge *Gahnia aspera,* Bracken Fern

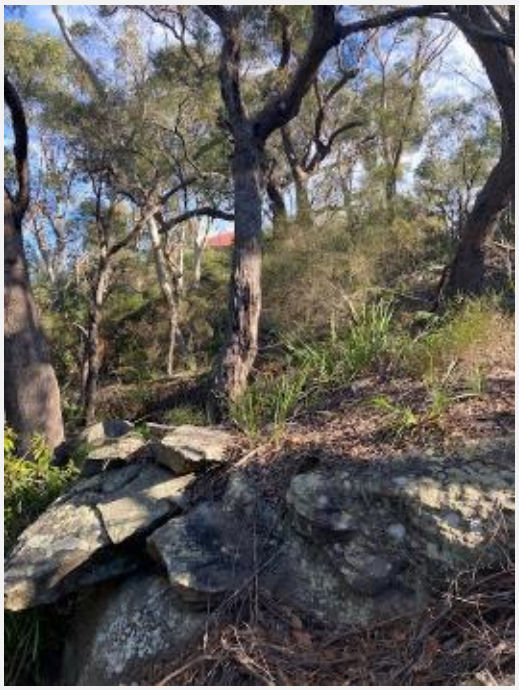
1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	
	Pteridium esculentum, Scrambling Lily *Geitonoplesium cymosum,* Spiny-headed Mat-rush *Lomandra longifolia*, Bordered Panic, Variable Sword-sedge and Rock Xanthosia *Xanthosia tridentata.* Exotic species recorded within this community included Lantana, Mickey Mouse Plant *Ochna serrulata*, and Cobbler's Pegs.
Condition	The community is generally in good condition due to low weed ingress, high species diversity and only minor disturbance.
Threatened ecological community	No associated threatened ecological community.
Photograph: Sydney Hinterland Sandstone Woodland	

Table 11 Vegetation communities of the study area – PCT 1181

1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	
PCT	*1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion* (Hinterland Sandstone Gully Forest)
Extent within study area	Approximately 8.10 ha of Hinterland Sandstone Gully Forest was recorded back from the banks of Cattai Creek along rocky outcrops above PCT 1841.
Description including fauna habitat	Hinterland Sandstone Gully Forest is an open eucalypt forest with an abundant sclerophyll shrub stratum and a groundcover dominated by sedges. Within the study area, this vegetation unit contains an upper stratum dominated by Silver-top Ash *Eucalyptus sieberi* and Sydney Peppermint with a sub-dominance of Red Mahogany *Eucalyptus resinifera* and Smooth-barked Apple over a mid-storey of Coast Wattle, Large-leaved Hopbush *Dodonaea triquetra* and Narrow-leaved Geebung. The understorey contains Graceful Bush-pea *Pultenaea flexilis, Lasiopetalum ferrugineum,* Tantoon *Leptospermum polygalifolium, Platysace linearifolia*, Bracken Fern, Spiny-head Mat-rush, Wiry Panic, Poison Rock Fern and Pilose-leafed Zieria *Zieria pilosa.*

1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	
	Exotic species recorded within this community included; Lantana, Giant Reed and Fireweed.
Condition	The community is generally in good condition due to low weed cover, minimal disturbance and high species diversity.
Threatened ecological community	No associated threatened ecological community
Photograph: Hinterland Sandstone Gully Forest	

Table 12 Vegetation communities of the study area – PCT 1255

PCT 1255 - Sydney sandstone hinterland dry sclerophyll forests	
PCT	*1255 – Sydney sandstone hinterland dry sclerophyll forests of the Sydney Basin Bioregion* (Sydney Sandstone Hinterland Forest)
Extent within study area	Approximately 0.02 ha of PCT 1255 was recorded along the south western and southern boundaries of Castle Hill WRP.
Description including fauna habitat	This community with the study area was characterised by a disturbed community that was subject to a high level of weed ingress located on the very edges of the study area surrounding Castle Hill WRP. Within the study area, canopy species were limited to Sydney Peppermint and Narrow-leaved Apple *Angophora bakeri*. The community was distinguished from PCT 1181 by lower occurrence of Sydney Red Gum and lower presentation of mesic species. On the southern portion of the site this community occurred as slightly better condition containing a dense mid-storey of Parramatta Wattle and Sweet Pittosporum, with an understorey containing Weeping Meadow Grass, Whiteroot *Lobelia purpurascens* and Bordered Panic *Entolasia stricta.*
Condition	The community is generally in poor condition with high weed ingress and low species diversity.
Threatened ecological community	This PCT does not form part of TEC.

PCT 1255 - Sydney sandstone hinterland dry sclerophyll forests	
Picture: *Sydney sandstone hinterland dry sclerophyll forests*	

Table 13 Vegetation communities of the study area – PCT 1292

1292 - Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin Bioregion	
PCT	*1292 - Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin Bioregion* (Sandstone Riparian Scrub)
Extent within study area	Approximately 0.96 ha of Sandstone Riparian Scrub occurs along the riparian corridor of Cattai Creek close to Castle Hill WWTP within the southern section of the alignment and just north of the WWTP.
Description including fauna habitat	This depauperate warm-temperate rainforest is found on sandy alluvium or rocky streams in deep protected sandstone gully systems across the greater Sydney region. In the study area this community was dominated by Water Gum *Tristaniopsis laurina,* Black Wattle *Callicoma serratifolia* within a highly disturbed understorey containing Bracken Fern, Poison Rock Fern. Exotic species found in this community include; Large-leaved Privet *Lucidum Ligustrum,* Small-leaved Privet *Lucidum sinense,* Lantana, African Olive.
Condition	The community is generally in poor condition due to high weed infestation and low species diversity.
Threatened ecological community	No associated threatened ecological community

1292 - Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin Bioregion	
Photograph: Sandstone Gallery Forest	

Table 14 Vegetation communities of the study area – PCT 1395

1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	
PCT	*1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion* (Shale-sandstone Ironbark Forest)
Extent within study area	Approximately 2.37 ha of Shale-sandstone Ironbark Forest was recorded primarily located within the limits of the Rouse Hill WRP however, a small patch of vegetation was recorded within the Cattai Creek riparian corridor.
Description including fauna habitat	It is a moderately tall eucalypt forest with a mixed understorey of sclerophyll shrubs and grasses. Sites invariably have either Broad-leaved Ironbark or Narrow-leaved Ironbark present in the canopy along with Grey Gum *Eucalyptus punctata* and Red Bloodwood *Corymbia gummifera*. In the study area this vegetation community within the study area is dominated by Grey Gum *Eucalyptus punctata* with a sub-dominance of Broad-leaved Ironbark *Eucalyptus fibrosa*. The understorey is variable across the site with an overall lack of native species due to previous disturbances with species limited to Parramatta Wattle, Fringed Wattle *Acacia fimbriata,* Silver-stemmed Acacia, Hickory Wattle, Native Blackthorn, Kangaroo Grass with scattered Black She-oak. The understorey cover of dense Weeping Meadow Grass and Kidney Weed. Exotic species recorded in this vegetation unit include Cobbler's Peg, Paddy's Lucerne, Paspalum, Green Cestrum, Fireweed, Asparagus Fern, and Bridal Creeper.
Condition	The community is generally in moderate condition due to presence of native species across three stratum, high weed presence and previous disturbance.
Threatened ecological community	Commonwealth EPBC Act: *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* The patch of vegetation within the Rouse Hill WRP meets EPBC listing requirements. This patch of vegetation forms part of a larger patch that continues outside of the study area. Therefore, this community forms part of a moderate condition class EPBC Act listed community as the patch size is > 0.5 ha, contains >30% native understorey and contains at least one hollow-bearing tree. Other patches within the study area do not meet listing requirements as they are less than 0.5 ha. NSW BC Act: *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* (CEEC). PCT 1395 satisfies listing requirement under the BC Act due to species assemblage, located over transitional soil between the Blacktown and Gymea landscapes, occurrence of two canopy species (Grey Gum and

1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	
	Broad-leaved Ironbark) and location in the Sydney Basin Bioregion.
Photograph: Shale-sandstone Transition Forest	

Table 15 Vegetation communities of the study area – PCT 1800

1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	
PCT	*1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley* (Swamp Oak Floodplain Forest)
Extent within study area	Approximately 1.22 ha of Swamp Oak Floodplain Forest was recorded located within the inner riparian corridor of Caddie's Creek and along Eastern Creek.
Description including fauna habitat	Cumberland Swamp Oak Riparian Forest typically occurs on the riverflats of the Cumberland Plain as a stand of Swamp Oak with occasional Rough-barked Apple, Forest Red Gum and Grey Box over an open grassy and herbaceous understorey. Within the study area this vegetation unit contain an upper stratum dominated by Swamp Oak and occasional Cabbage Gum. The understorey contains; Spiny-headed Mat-rush *Lomandra longifolia*, Cockspur Flower *Plectranthus parviflorus*, Native Wandering Jew, Berry Saltbush, Knotweed Goosefoot *Einadia polygonoides*, Common Couch, Weeping Grass and Swamp Dock *Rumex brownii*. Exotic species recorded within this community included; Panic Veldtgrass, Trad, Madeira Vine *Anredera cordifolia*, Cobbler's Pegs and Black-berry Nightshade.
Condition	The community is generally in moderate condition due to; good connectivity within the landscape, with a primarily disturbed understory.
Threatened ecological community	Commonwealth EPBC Act: *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* with a patch >0.5 ha with a mostly native understorey. However, the patch along Eastern Creek does not meet listing requirements as patch < 0.5 hectares. NSW BC Act: *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.* PCT 1800 satisfies listing under the BC Act due to location within the Sydney basin bioregion, species assemblage and location within a riparian corridor.

1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	
Photograph: Swamp Oak Floodplain Community along Caddie's Creek.	

Table 16 Vegetation communities of the study area – PCT 1841

1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region	
PCT	*1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region* (Coastal Enriched Moist Forest)
Extent within study area	Approximately 11.25 ha of Coastal Enriched Moist Forest was recorded, primarily within wetter areas along streams, creeks and drainage lines. This community was primarily associated with Cattai Creek.
Description including fauna habitat	Coastal Enriched Moist Forest is a tall open eucalypt forest with a distinctive mesic shrub and small tree layer. The canopy may be dominated by various combinations of eucalypts although Smooth-barked Apple is invariably present. In the study area this vegetation community within the study area is dominated by Sydney Blue Gum *Eucalyptus saligna x botryoides* with a sub-dominance of Sydney Peppermint and Smooth-barked Apple. The understorey is variable across the site with areas present with high levels of disturbance and weed ingress due to previous disturbances with species limited to Parramatta Wattle, White Wattle, Coast Wattle, Hickory Wattle, Tick Bush, Bracken Fern, Sweet Pittosporum, Blueberry Ash *Elaeocarpus reticulatus,* Cabbage Tree Palm *Livistona Australia,* Coral Fern *Calochlaena dubia* and Bracken Fern. Exotic species recorded in this vegetation unit include Large-leaved Privet, Small-leaved Privet, Lantana, African Olive, Giant Reed, Cobbler's Peg, Paddy's Lucerne, Paspalum, Green Cestrum, Fireweed, Asparagus Fern, and Bridal Creeper.
Condition	The community is generally in moderate condition due to; high presence of transformer weed, erosion influence from Cattai Creek however, contains native species across three stratum and high species diversity.
Threatened ecological community	No associated threatened ecological community

1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region	
Photograph: Coastal Enriched Moist Forest	

Table 17 Vegetation communities of the study area – PCT Urban Native/Exotic – planted vegetation

Urban Native/Exotic – planted vegetation	
PCT	Urban Native/Exotic
Extent within study area	Approximately 29.10 ha of Urban Native/Exotic was recorded located primarily within landscaped areas of the treatment plants and within maintained road verges.
Description including fauna habitat	Within the study area Urban Native/Exotic primarily occurs as maintained grass with planted native species within road verges. The planted species include Spotted Gum *Corymbia maculata,* Lemon-scented Gum *C. citriodora* and Narrow-leaved Bottlebrush *Callistemon linearis*. Large areas of exotic grassland were also located within the pipeline alignment from Riverstone WRP to Rouse Hill WRP. This community is highly disturbed due to historical and current rural uses.
Threatened ecological community	No associated threatened ecological community
Photograph: Urban Native/Exotic	

4.3 Aquatic habitats

The study area supports aquatic and riparian habitats that occur within and adjacent to the impact area. The most significant waterways that occur within the study area, considered most likely to support higher quality aquatic habitats, include:

- Eastern Creek.
- Killarney Chain of Ponds.
- Caddies Creek.
- Cattai Creek.
- Second Ponds Creek.
- First Ponds Creek.

Although these waterways were generally observed to have substantial weed infestation along their banks, the majority are likely to also have permanent flows and also support areas native vegetation along the banks, and potentially instream. These areas have broadly been assessed as being consistent with Key Fish Habitat (KFH). The study area also contains seven first and two second Strahler order streams, which were generally found to occur in poor condition.

Riparian environments have been mapped for terrestrial vegetation type and condition at the three outlet sites associated with Castle Hill WRP (Cattai Creek), Rouse Hill WRP (Second Ponds Creek) and Riverstone WWTP (Eastern Creek) (Figure 4). Although weed species were present at all riparian corridor, native vegetation persisted at each location. Currently, no direct impacts are expected within the riparian (terrestrial) environments of Cattai Creek or Second Ponds Creek, however direct impacts to the bank and associated vegetation may occur at Eastern Creek, resulting from the construction of the Riverstone WWTP discharge main.

The outlet location to the north of the Rouse Hill WRP has been assessed via desktop mapping only and is considered to support moderate to low condition native vegetation downstream of an artificially created wetland area. Increases to discharges in this location, as a result of the proposal, are not expected to negatively impact upon native vegetation or habitats. Desktop assessment is considered appropriate given the low level of risk and lack of direct impacts.

An assessment of aquatic habitat does not form part of this report however, it is understood that a separate aquatic assessment will be undertaken for the proposal.

4.4 Threatened biota

Threatened biota includes all flora and fauna species, populations and ecological communities listed under the EPBC Act and BC Act. Lists of threatened biota recorded or predicted to occur within 5 kilometres of the study area are provided in Appendix 1 (flora) and Appendix 2 (fauna). A total of 35 threatened flora species are known or predicted to occur within 5 kilometres of the study area, with a total of 71 threatened fauna species known or predicted to occur within that assessment area. An assessment of the likelihood of these species occurring in the study area and impact area, along with an indication of the likelihood of the proposal resulting in a significant impact/effect, is included in these appendices. Areas and habitat values referred to in Appendix 1 (flora) and Appendix 2 (fauna), as well as Table 18, relate to Non-BioCertified areas only, except where explicitly noted.

No areas of critical habitat for flora or fauna species have been declared within or surrounding the study area. Thirty-one species (13 flora and 18 fauna species) and six TECs were initially identified as having a medium or greater likelihood of occurrence within the impact area. Table 18 discusses confirmed areas of

habitat value, results of survey, and potential impacts for these, and determines the need for further assessment in the form of a SIC assessment or ToS.

Known habitats for migratory species have been considered and are addressed in Appendix 2.

Table 18 Threatened biota likely to occur in the study area

Species name	EPBC status	BC status	Relevance to study area and potential for impact	ToS	SIC
Ecological communities					
Cumberland Plain Woodland	CE	CE	Cumberland Plain Woodland occurs within three separate areas in the study area; at the intersection of Otago Road and Windsor Road, on along the southern Boundary of Riverstone WWTP and within the road reserve along Hynd's Road. Cumberland Plain Woodland primarily occurs within Existing Certified land however the proposal is likely to impact 0.01 ha of the community therefore, a ToS and SIC has been prepared in Appendix 4 and 5.	Y	Y
River-Flat Eucalypt Forest on Coastal Floodplains	CE	EN	River-flat Eucalypt Forest occurs along the Caddies Creek, Cattai Creek and Second Ponds riparian corridor. The proposal is likely to impact 1.57 ha of the community therefore, a ToS and SIC has been prepared in Appendix 4 and 5.	Y	Y
Shale Gravel Transition Forest	CE	EN	Shale Gravel Transition Forest occurs along the northern and southern boundaries of Otago Road. Shale-gravel Transition Forest wholly occurs within Existing Certified land and therefore no further assessments are required.	N	N
Shale Sandstone Transition Forest	CE	CE	Shale Sandstone Transition Forest occurs within the Rouse Hill WRP and along the alignment between Rouse Hill WRP and Castle Hill WRP as both PCT 1395 and PCT 1081. The proposal is likely to impact 1.35 ha of the community therefore, a ToS and SIC has been prepared in Appendix 4 and 5.	Y	Y
Swamp Oak Floodplain Forest	EN	EN	Swamp Oak Floodplain was recorded along the Caddie's Creek riparian corridor. The proposal is likely to impact 0.11 ha of the community therefore, a ToS and SIC has been prepared in Appendix 4 and 5.	Y	Y
Coastal Freshwater Wetlands	-	EN	Coastal Freshwater Wetlands occurs as two PCTs within the study area, and is only associated with Caddie's Creek. Although under boring has been undertaken to avoid impact to this community, a total of 0.03 ha is likely to be impacted by the proposal. Therefore, a ToS has been prepared in Appendix 4.	Y	N
Flora					
Bynoe's Wattle *Acacia bynoeana*	VU	EN	Habitat for the species was found to be degraded and the species was not located during targeted survey.	N	N
Darwinia biflora	VU	VU	Good quality habitat identified within the alignment between Rouse Hill WRP and Castle Hill WRP however the species was not recorded in the study area after targeted surveys for the species. A ToS and SIC have been undertaken for removal of habitat, see Appendix 4 and 5.	Y	Y

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Species name	EPBC status	BC status	Relevance to study area and potential for impact	ToS	SIC
Dillwynia tenuifolia	-	VU	Habitat within the study area found to be degraded and the species was not recorded during field surveys. However 48 records of the species occur within 5 kilometres of the study area, with the closest record was approximately 150 metres from the study area.	Y	N
Epacris purpurascens* var. *purpurascens	-	VU	Good quality habitat identified within the alignment between Rouse Hill WRP and Castle Hill WRP. Species was recorded within the study area, as part of a population comprising approximately 200 individuals, of which it is expected that 12 individuals will be impacted by the proposal. A ToS has been undertaken for removal of habitat and individuals, see Appendix 4.	Y	N
***Eucalyptus* sp. Cattai**	CE	CE	Good quality habitat identified within the alignment between Rouse Hill WRP and Castle Hill WRP however the species was not recorded in the study area after targeted surveys for the species. A ToS and SIC have been undertaken for removal of habitat, located in Appendix 4 and 5.	Y	Y
Grevillea juniperina* subsp. *juniperina	-	VU	Species recorded within the impact area, however is located within land mapped as Existing Certified land. No further assessment required.	N	N
Hibbertia superans	-	EN	Good quality habitat identified within the alignment between Rouse Hill WRP and Castle Hill WRP however, the species was not located in the study area after targeted surveys were undertaken. A ToS has been undertaken for removal of habitat, located in Appendix 4.	Y	N
Leucopogon fletcheri	-	EN	Good quality habitat identified within the alignment between Rouse Hill WRP and Castle Hill WRP however, the species was not located in the study area after targeted surveys were undertaken. No further assessments required.	N	N
Hairy Geebung *Persoonia hirsuta*	EN	EN	Habitat within the study area was found to be heavily degraded along Caddie's Creek and Otago Road. Species was not recorded during field surveys and therefore is unlikely to occur. No further assessment required.	N	N
Nodding Geebung *Persoonia nutans*	EN	EN	Habitat within the study area was found to be heavily degraded along Caddie's Creek and Otago Road. Species was not recorded during field surveys and therefore is unlikely to occur. No further assessment required.	N	N
Spiked Rice-flower *Pimelea spicata*	EN	EN	Moderate quality habitat identified in the study area however, the species was not recorded during targeted surveys. The impact area will not remove areas of good quality habitat, and as such no further assessment is required.	N	N

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Species name	EPBC status	BC status	Relevance to study area and potential for impact	ToS	SIC
Pultenaea parviflora	VU	EN	Habitat within the study area was found to be heavily degraded along Caddie's Creek and Otago Road. Species was not recorded during field surveys and therefore is unlikely to occur. No further assessment required.	N	N
Tetratheca glandulosa	-	VU	Moderate quality habitat identified in the study area however the species was not recorded during targeted survey. The impact area will not remove areas of good quality habitat, and as such no further assessment is required.	N	N
Fauna					
Dusky Woodswallow ***Artamus cyanopterus cyanopterus***	-	VU	Dry, open forests and woodlands are present in the study area. Though there has been some disturbance to habitat, the study area may be utilised by the species, and may be impacted by the proposal.	Y	N
Glossy Black-Cockatoo ***Calyptorhynchus lathami***	-	VU	Breeding habitat for the species consists of large hollow-bearing eucalypts with a minimum diameter of 14 cm (ACT Government 2013, DPE 2017). While there was some hollows on site, the breeding habitat is of poor quality. Field investigations yielded no observations of breeding. Foraging habitat in the form of *Allocasuarina* spp. and *Casuarina* spp. are present within the study area, therefore presence is likely to be limited to transient foraging.	Y	N
Varied Sittella ***Daphoenositta chrysoptera***	-	VU	Eucalypt forests and woodlands are present in the study area. Though there has been some disturbance to habitat, the study area may be utilised by the species, and may be impacted by the proposal.	Y	N
Little Lorikeet ***Glossopsitta pusilla***	-	VU	Dry and open eucalypt forests and woodlands, including hollow-bearing trees and foraging resources in the form of flowering shrubs and trees, are present within the study area and will be impacted by the proposal.	Y	N
Turquoise Parrot ***Neophema pulchella***	-	VU	Open woodlands, though disturbed, are present in the study area and include hollow-bearing trees, and may be impacted by the proposal.	Y	N
Scarlet Robin ***Petroica boodang***	-	VU	Dry forests and woodlands with an open and grassy understorey is present in the study area. Though there has been some disturbance to habitat, the study area may be utilised by the species, and may be impacted by the proposal.	Y	N
Flame Robin ***Petroica phoenicea***	-	VU	Open woodlands are present in the study area. Though there has been some disturbance to habitat, the study area may be utilised by the species, and may be impacted by the proposal.	Y	N

Species name	EPBC status	BC status	Relevance to study area and potential for impact	ToS	SIC
Large-eared Pied Bat ***Chalinolobus dwyeri***	VU	VU	The study area contains habitat features suitable for roosting in the form of rocky outcrops and overhangs, however there are no caves or mines within 5 km of the study area. The species' forages in open areas adjacent to well-timbered areas containing gullies, therefore there is potentially suitable foraging habitat in the study area.	Y	Y
Eastern Coastal Free-tailed Bat ***Micronomus norfolkensis***	-	VU	Habitat in the form of hollow-bearing trees within dry eucalypt forest and woodland are present in the study area and are likely to be impacted by the proposal. The species' forage habitat will also be impacted by the proposal.	Y	N
Little Bent-winged Bat ***Miniopterus australis***	-	VU	The study area contains habitat features suitable for roosting in the form of culverts and stormwater drains. There are no habitat features suitable for breeding within 5 km of the study area (i.e. caves, mines or tunnels). The species' forage habitat will be impacted by the proposal.	Y	N
Large Bent-winged Bat ***Miniopterus orianae oceanensis***	-	VU	The study area contains habitat features suitable for roosting in the form of culverts and stormwater drains. There are no habitat features suitable for breeding within 5 km of the study area (i.e. caves, mines or tunnels). The species' forage habitat will be impacted by the proposal.	Y	N
Southern Myotis ***Myotis macropus***	-	VU	Breeding and foraging habitat was considered to be present within the study area due to the presence of hollow-bearing trees within 200 metres of watercourses, and it is likely to be impacted.	Y	N
Yellow-bellied Sheathtail-bat ***Saccolaimus flaviventris***	-	VU	Habitat in the form of hollow-bearing trees within forest and woodland are present in the study area and are likely to be impacted by the proposal. The species' forage habitat will also be impacted by the proposal.	Y	N
Greater Broad-nosed Bat ***Scoteanax rueppellii***	-	VU	Habitat in the form of hollow-bearing trees within forest and woodland are present in the study area and are likely to be impacted by the proposal. The species' forage habitat will also be impacted by the proposal.	Y	N
Eastern Cave Bat ***Vespadelus troughtoni***	-	VU	The study area contains habitat features suitable for roosting in the form of culverts and stormwater drains, and sandstone overhangs. There are no habitat features suitable for breeding within 5 km of the study area (i.e. caves, mines or tunnels). The species' forage habitat will be impacted by the proposal.	Y	N
Grey-headed Flying-fox ***Pteropus poliocephalus***	VU	VU	No breeding or roost camps were found to occur within the study area, however the species is considered highly likely to utilise native (and potentially exotic) vegetation, which will be removed by the proposal, as a forage resource.	Y	Y

Species name	EPBC status	BC status	Relevance to study area and potential for impact	ToS	SIC
Cumberland Plain Land Snail ***Meridolum corneovirens***	-	EN	Habitat for this species includes Cumberland Plain Woodland, Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and River-Flat Eucalypt Forest. These TECs are present in the study area and potential habitat exists in the form of leaf litter, which will be impacted by the proposal.	Y	N
Dural Land Snail ***Pommerhelix duralensis***	EN	EN	Habitat for this species includes forested habitats with native ground cover and woody debris, which exists within the study area and will be impacted by the proposal. Multiple records of the species presence occur within the broader area surrounding the study area, including a record in the south-western portion of the Rouse Hill WRP.	Y	Y

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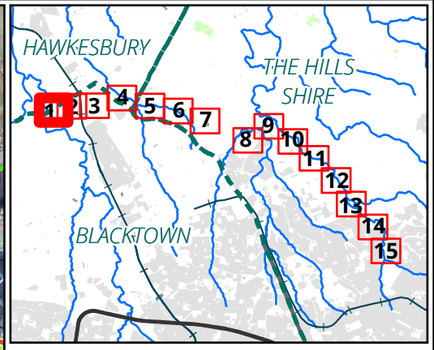

Legend

- Study area
- Hollow-bearing tree

Impact area

- Vegetation removal

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)

Plant Community Type

- Urban Native / Exotic
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
- 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley

Figure 4.1 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Matter: 34968,
Date: 13 April 2022 ,
Prepared for: AIHW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F4_EcoFeatures
Project: P:\34900s\34968\Mapping\
34968_NW_Hub.aprx

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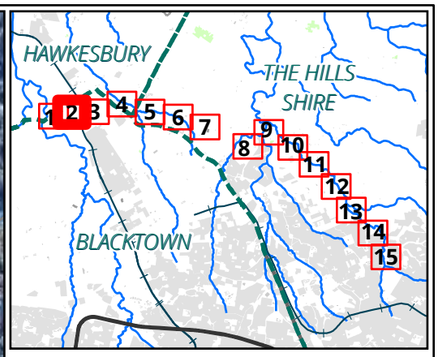

Legend

- Study area
- SW offset area
- Hollow-bearing tree

Impact area

- Vegetation removal

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)

Plant Community Type

- Urban Native / Exotic
- 724 - Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
- 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley

Figure 4.2 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Date: 12 July 2022 ,
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34968_NW_Hub.aprx

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Legend

- Study area
- *Grevillea juniperina* subsp. *juniperina*
- HDD no impact

Impact area

- Vegetation removal

Biodiversity certification

- Land subject to RBM 12

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)
- Impacted ENV

Plant Community Type

- Urban Native / Exotic
- 724 - Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion
- 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

Figure 4.3 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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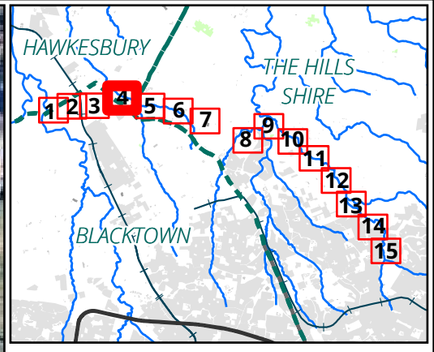

Legend

- Study area
- Hollow-bearing tree
- HDD no impact

Impact area

- Vegetation removal
- Vegetation trimming

Biodiversity certification

- Land subject to RBM 12

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)
- Impacted ENV

Plant Community Type

- Urban Native / Exotic
- 781 - Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
- 1071 - Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion

Figure 4.4 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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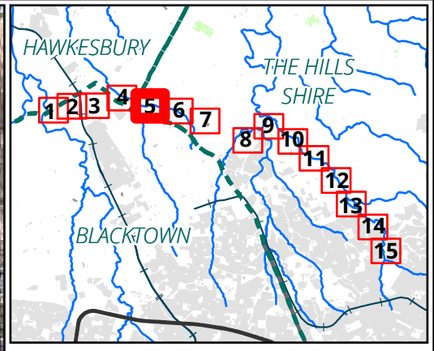
Commercial Road

Boundary Road

First Ponds Creek

Killarney Chain Of Ponds



Legend

- Study area
- Hollow-bearing tree
- HDD no impact

Impact area

- Vegetation removal
- Vegetation trimming

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)
- Impacted ENV

Plant Community Type

- Urban Native / Exotic
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley

Figure 4.5 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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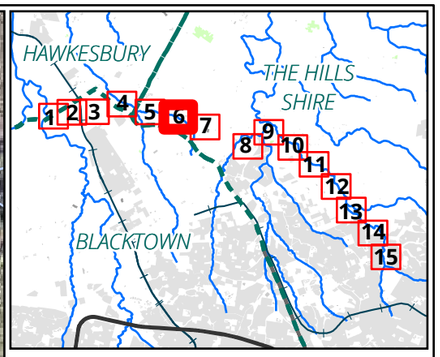

Legend

- Study area
- HDD no impact

Impact area

- Vegetation removal
- Vegetation trimming

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)

Plant Community Type

- Urban Native / Exotic
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley

Figure 4.6 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Legend

- Study area

Impact area

- Vegetation removal

Growth Centre Land Certfication

- Existing certified
- Existing non-certified

Plant Community Type

- Urban Native / Exotic
- 781 - Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion
- 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

Figure 4.7 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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34968_NW_Hub.aprx

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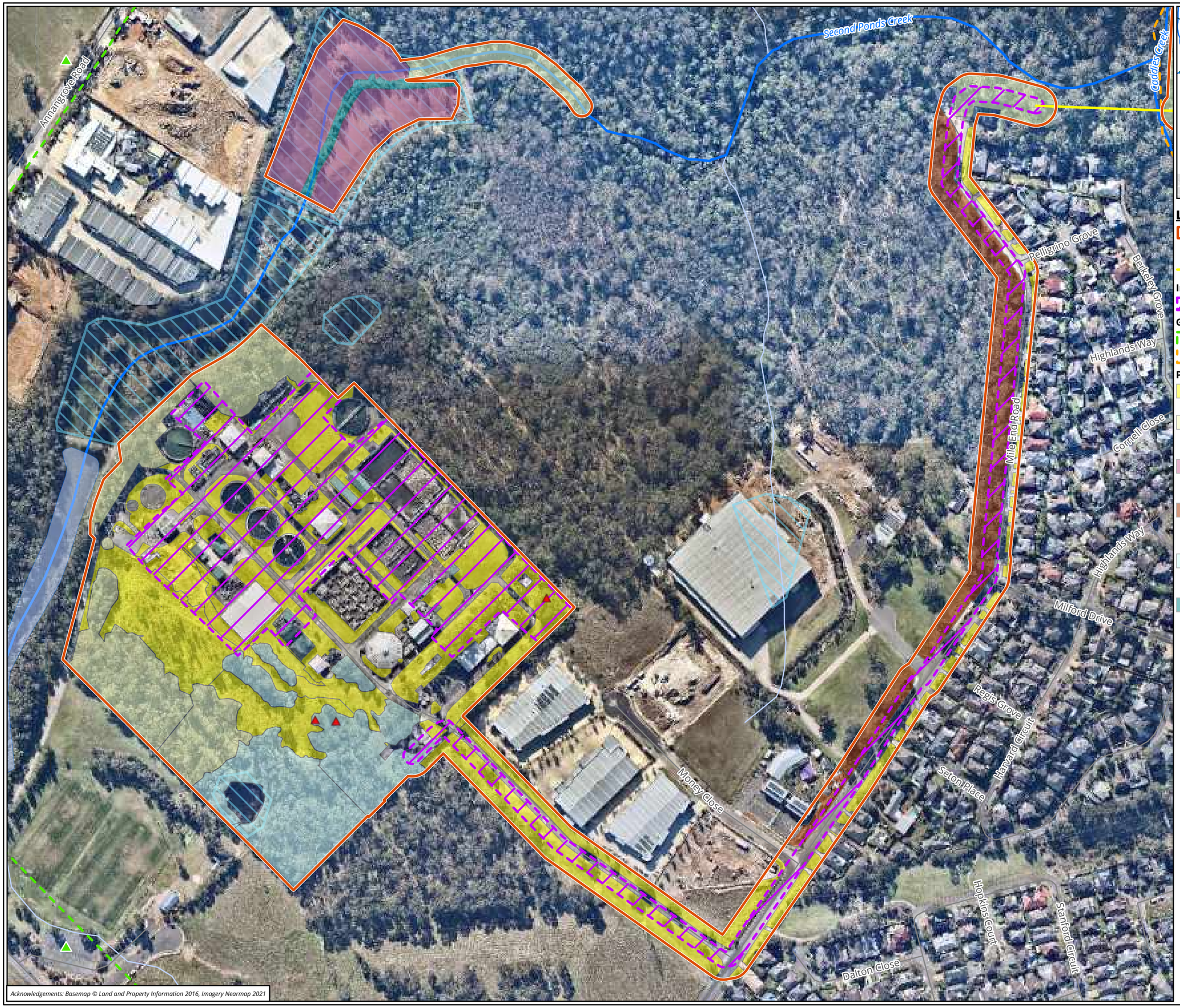

Legend

- Study area
- Hollow-bearing tree
- HDD no impact

Impact area

- Vegetation removal

Growth Centre Land Certfication

- Existing certified
- Existing non-certified

Plant Community Type

- Urban Native / Exotic
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 1071 - Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion
- 1081 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion
- 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion
- 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley

Figure 4.8 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Matter: 34968,
Date: 13 April 2022 ,
Prepared for: AIHW, Prepared by: AM, Last edited by: amackegard
Layout: 34968_F4_EcoFeatures
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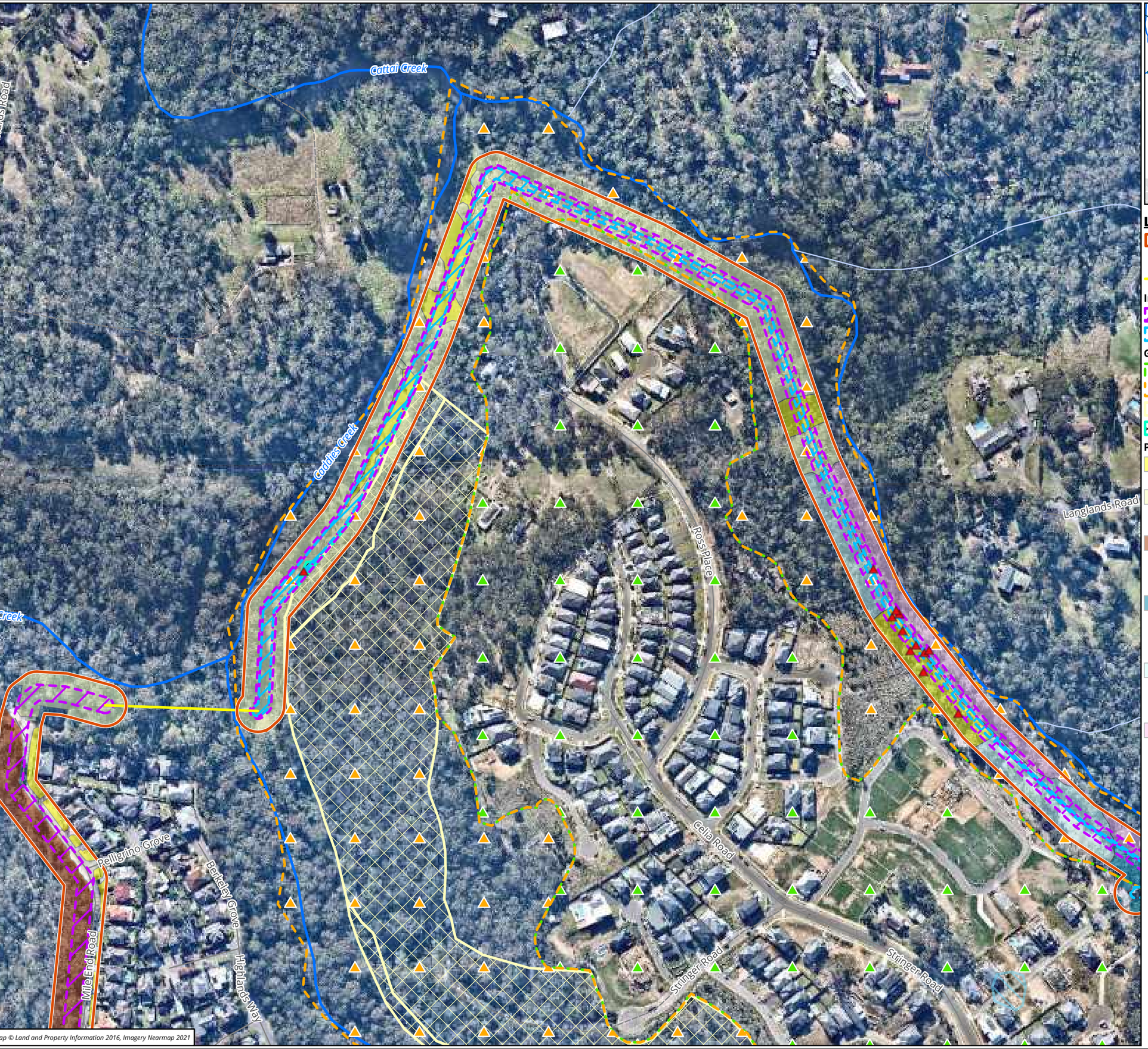

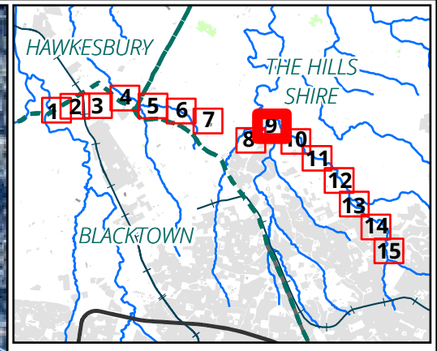

Legend

- Study area
- Hollow-bearing tree
- HDD no impact

Impact area

- Vegetation removal
- Vegetation trimming

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)
- Impacted ENV

Plant Community Type

- Urban Native / Exotic
- 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
- 1081 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion
- 1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion
- 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion
- 1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region

Figure 4.9 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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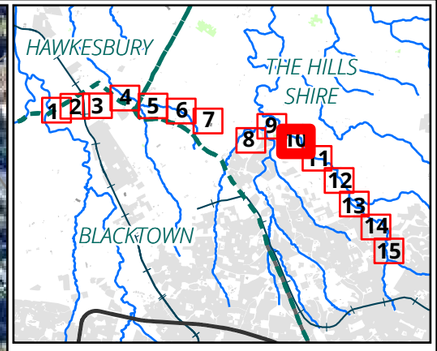

Legend

- Study area
- Hollow-bearing tree
- Sandstone outcrop

Impact area

- Vegetation removal
- Vegetation trimming

Growth Centre Land Certfication

- Existing certified
- Existing non-certified

Plant Community Type

- Urban Native / Exotic
- 1081 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion
- 1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion
- 1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion
- 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion
- 1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region

Figure 4.10 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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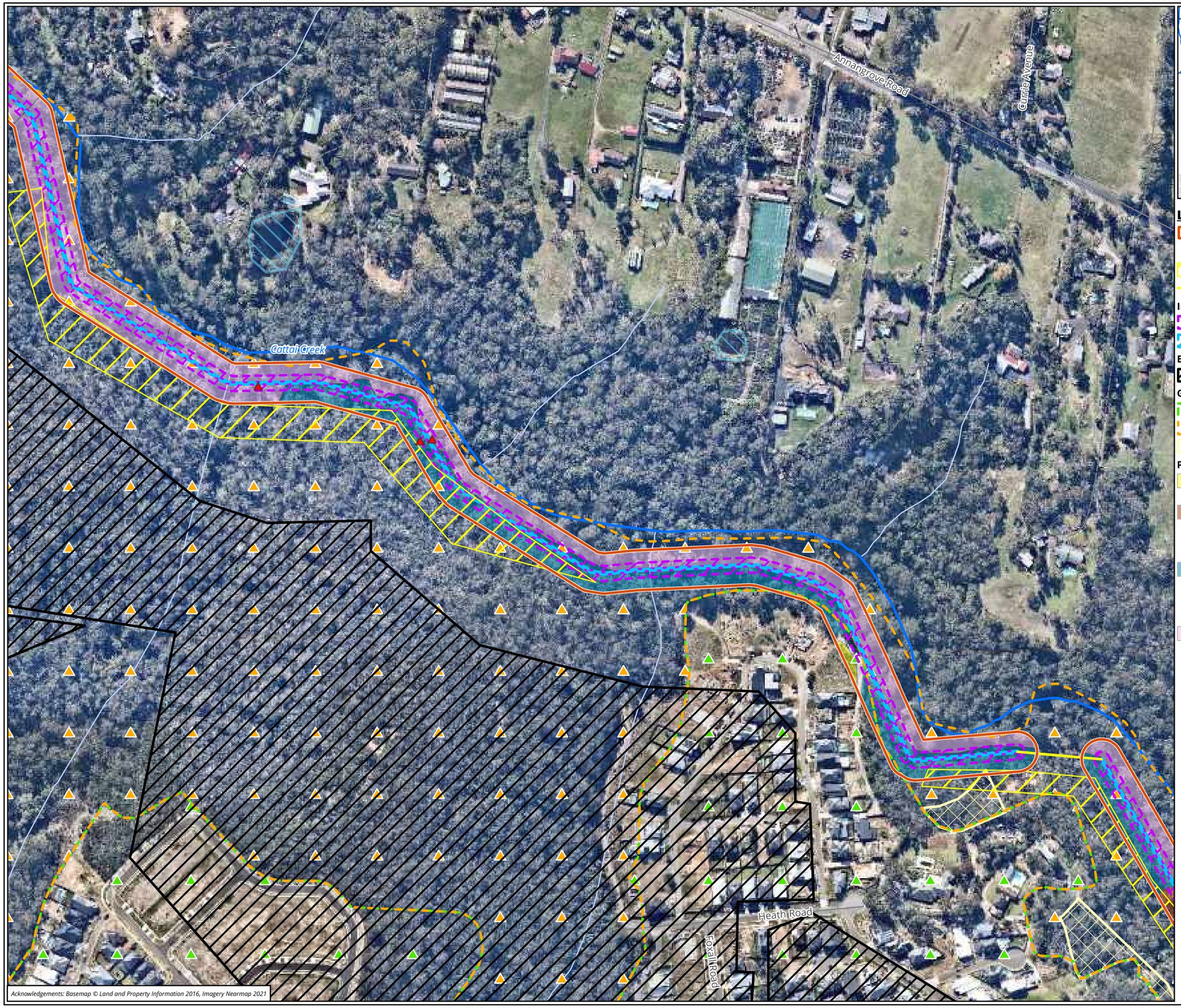

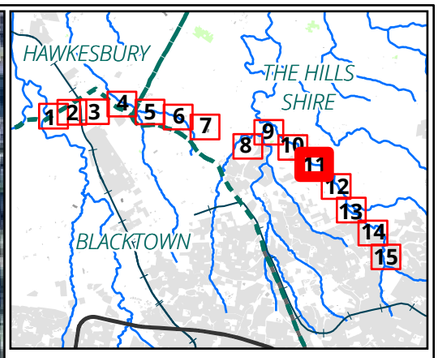

Legend

- Study area
- Hollow-bearing tree
- Sandstone outcrop
- HDD no impact

Impact area

- Vegetation removal
- Vegetation trimming

Biodiversity certification

- Land subject to RBM 14, 17, 18

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)

Plant Community Type

- Urban Native / Exotic
- 1081 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion
- 1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion
- 1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region

Figure 4.11 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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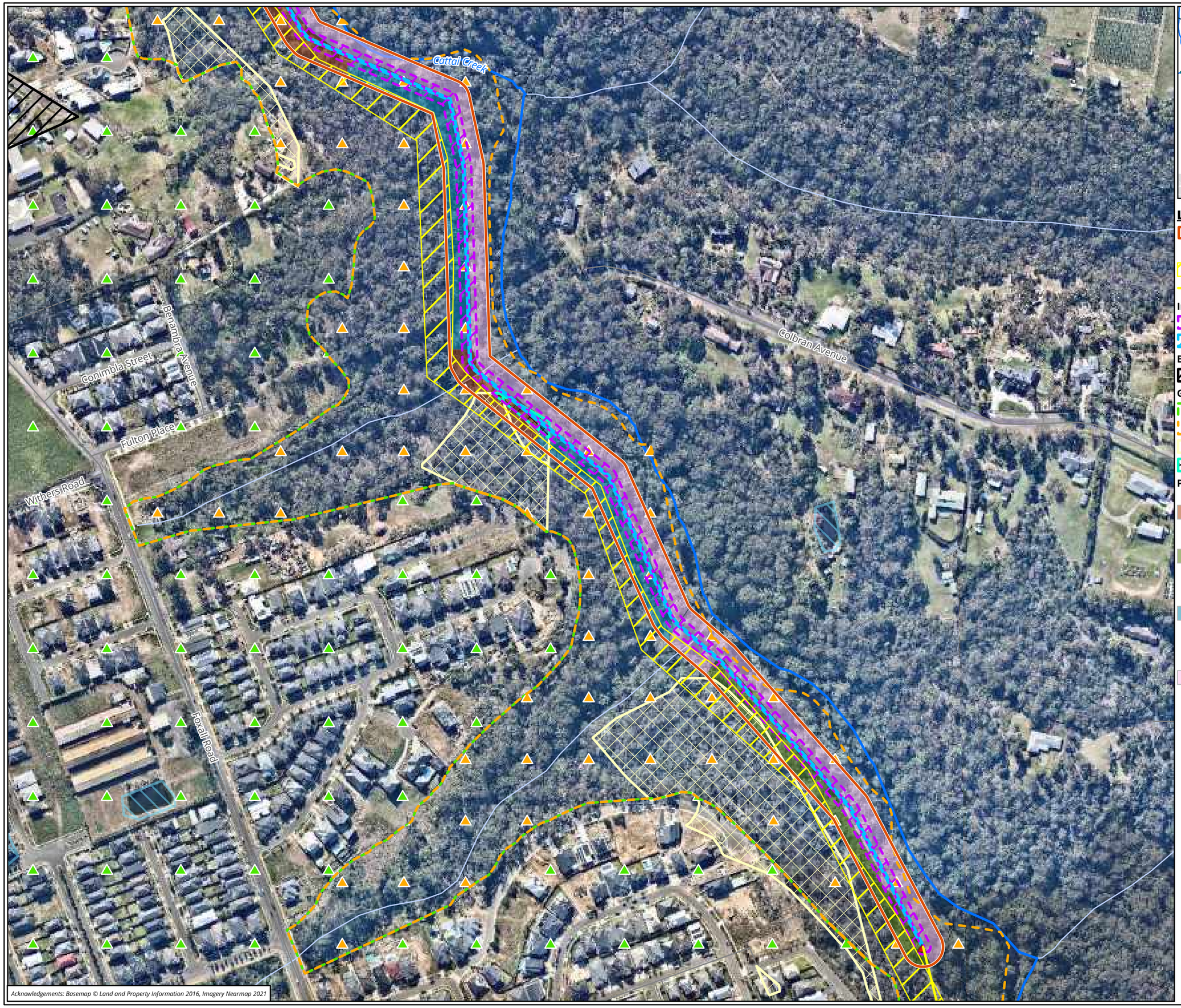

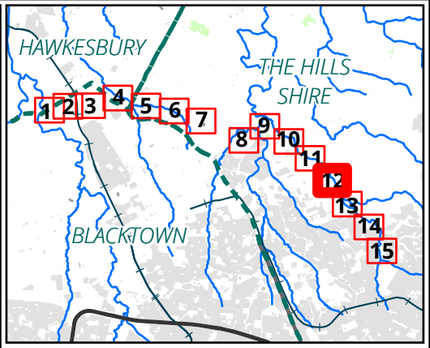

Legend

- Study area
- Hollow-bearing tree
- Sandstone outcrop
- HDD no impact

Impact area

- Vegetation removal
- Vegetation trimming

Biodiversity certification

- Land subject to RBM 14, 17, 18

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)
- Impacted ENV

Plant Community Type

- 1081 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion
- 1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion
- 1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion
- 1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region

Figure 4.12 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Matter: 34968,
Date: 13 April 2022 ,
Prepared for: AIHW, Prepared by: AM, Last edited by: amackegard
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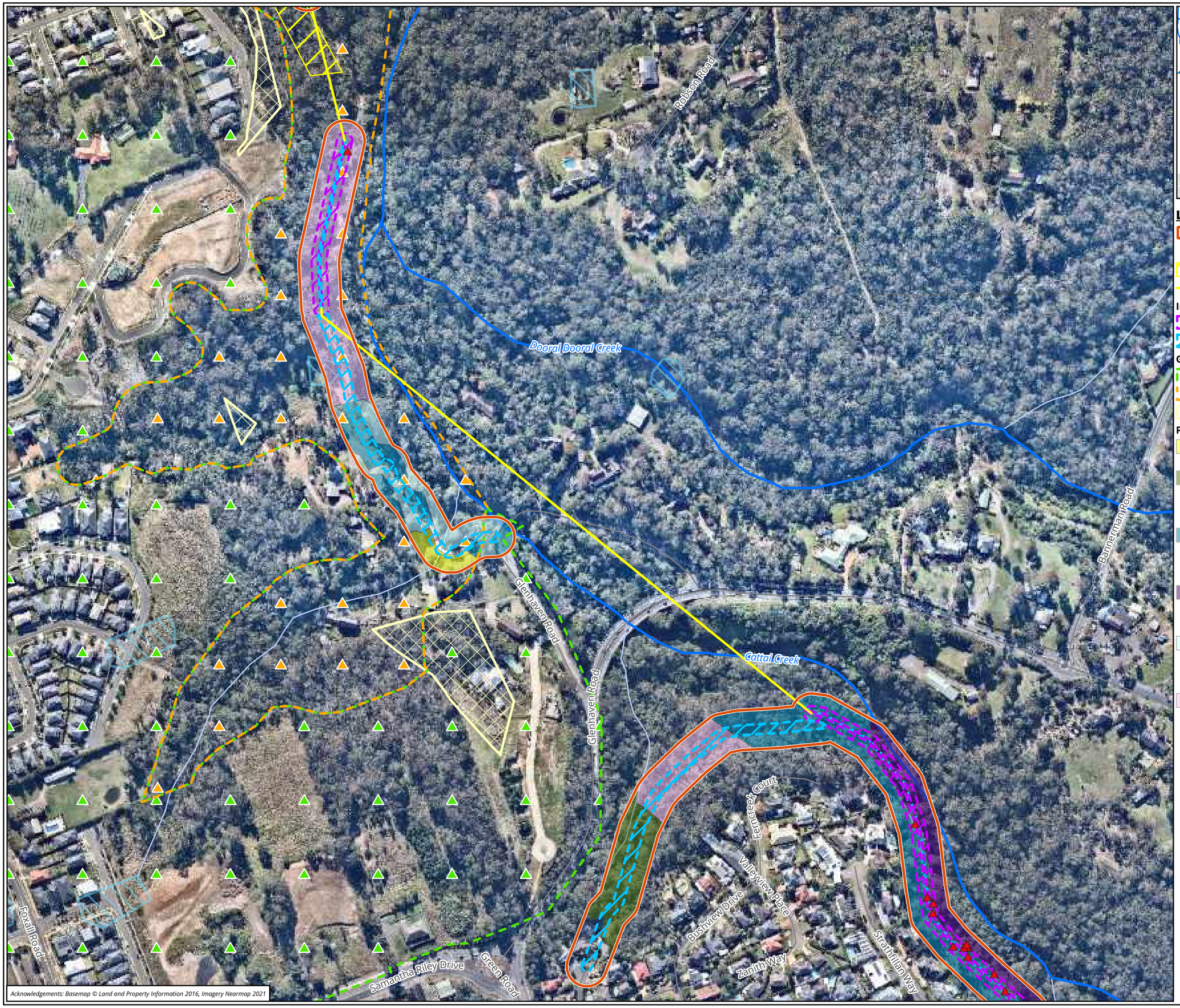

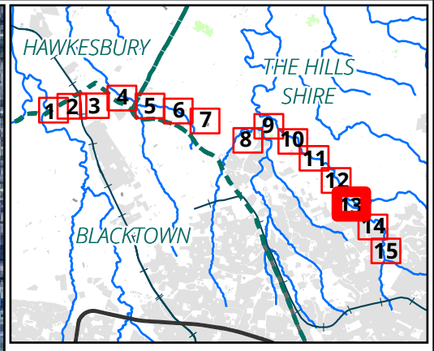

Legend

- Study area
- Hollow-bearing tree
- Sandstone outcrop
- HDD no impact

Impact area

- Vegetation removal
- Vegetation trimming

Growth Centre Land Certfication

- Existing certified
- Existing non-certified
- Existing Native Vegetation (ENV)

Plant Community Type

- Urban Native / Exotic
- 1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion
- 1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion
- 1292 - Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin Bioregion
- 1395 - Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion
- 1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region

Figure 4.13 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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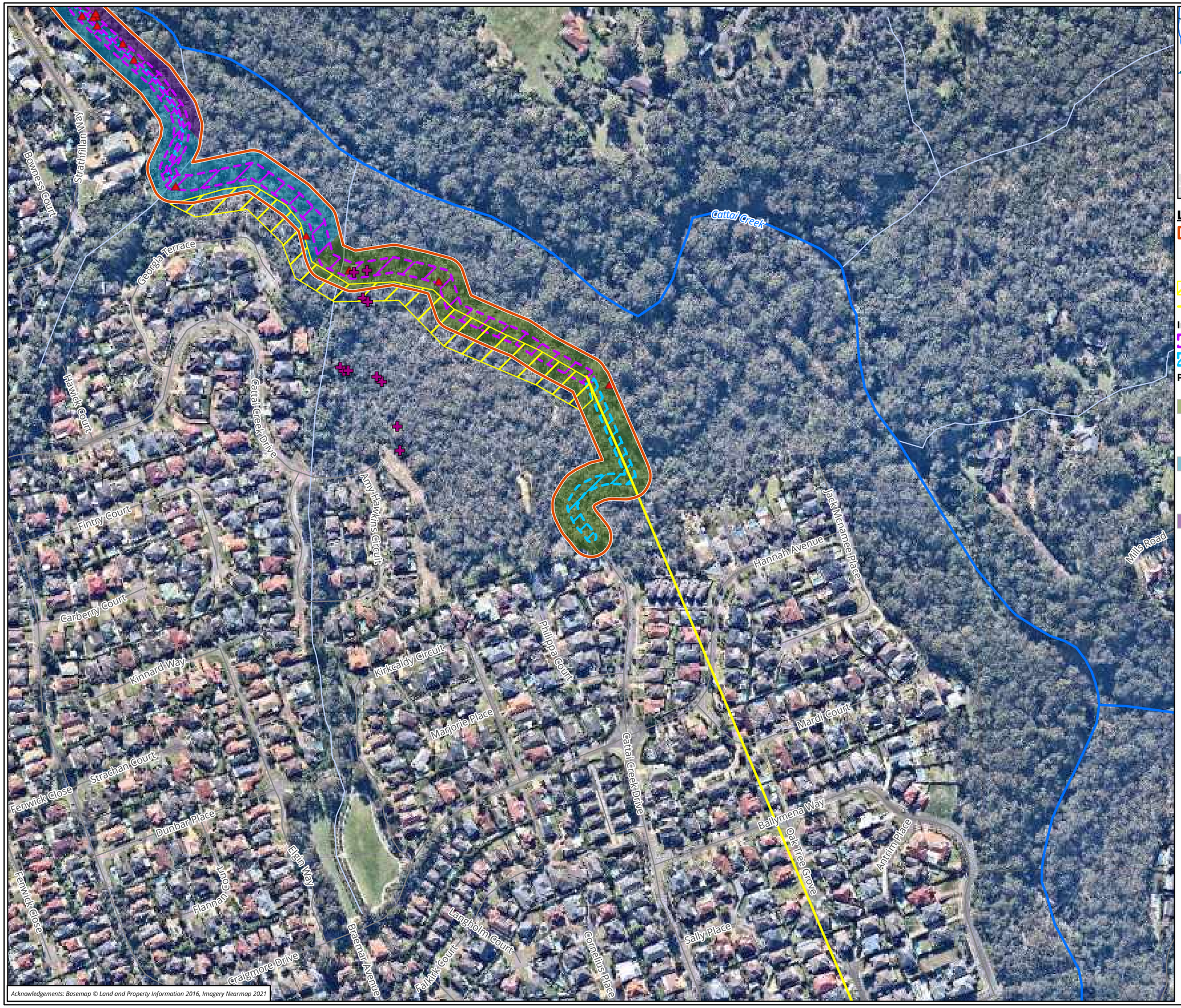

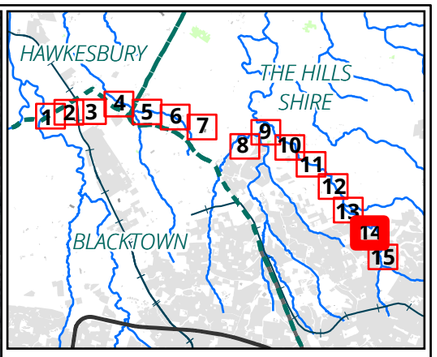

Legend

- Study area
- *Epacris purpurascens*
- Hollow-bearing tree
- Sandstone outcrop
- HDD no impact

Impact area

- Vegetation removal
- Vegetation trimming

Plant Community Type

- 1083 - Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion
- 1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion
- 1292 - Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin Bioregion

Figure 4.14 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Matter: 34968,
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Layout: 34968_F4_EcoFeatures
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34968_NW_Hub.aprx

Legend

- Study area
- Castle Hill Treatment Plant (completed assessment)
- Hollow-bearing tree
- HDD no impact

Impact area

- Vegetation removal

Plant Community Type

- 1292 - Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin Bioregion
- 1255 - Sydney sandstone hinterland dry sclerophyll forests of the Sydney Basin Bioregion

Figure 4.15 Ecological values of the study area

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 34968,
Date: 13 April 2022 ,
Prepared for: AIHW, Prepared by: AM, Last edited by: amackegard
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5 Impact assessment

5.1 Terrestrial biodiversity impacts

This section identifies the potential impacts of proposed development on the ecological values of the study area and includes recommendations to assist Sydney Water to design a development to minimise impacts on ecological values.

The principal means to reduce impacts on ecological values will be to minimise removal of native vegetation and habitat. Under the current proposal a total of 9.56 hectares of native vegetation occurring on Non-BioCertified land will be subject to direct removal, and a further 3.71 hectares of vegetation on Non-BioCertified land will be subject to indirect impacts as a result of trimming adjacent to an existing fire trail. The amount of vegetation to be cleared within the impact area has been based on a 15 metre wide corridor along the alignment, which has been reduced to minimise impacts, to the current level of unavoidable residual vegetation removal. Under boring will also occur under several riparian corridors that cross the study area to avoid vegetation impacts, including Cattai Creek.

A summary of ecological impacts, potential implications of development of the study area and recommendations to minimise impacts further during the design phase of the proposal is provided in Table 19 which includes standard Sydney Water safeguards.

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Table 19 Ecological values, impacts and recommendations

Ecological value	Impacts	Recommendations
Threatened ecological communities	• Direct removal of 2.96 ha of native vegetation, consisting of five TECs listed under the BC and EPBC Act: – 0.01 ha of Cumberland Plain Woodland (PCT 849). – 1.24 ha of Shale Sandstone Transition Forest (PCT 1395 and PCT 1081). – 1.57 ha of River-flat Eucalypt Forest (PCT 835). – 0.11 ha of Swamp Oak Floodplain Forest (PCT 1800). – 0.03 ha of Coastal Freshwater Wetlands (PCT 781 and PCT 1071). • Indirect impacts of trimming to of 1.10 ha native vegetation, consisting of two TECs listed under the BC and EPBC Act: – 0.50 ha of Shale Sandstone Transition Forest (PCT 1395 and PCT 1081). – 0.60 ha of River-flat Eucalypt Forest (PCT 835).	• Further risk of impacts to the TECs and individual native trees can be managed by implementing appropriate safeguards in further planning and carrying out the construction works including: – Avoid clearing of individual native trees if feasible. – Minimise all trimming activities, and avoid the removal of hollo-bearing limbs. – Identifying the locations the retained TECs as No Go zones during the site induction. This should include discussion of the implications of the BC Act (potential fines and possible offsets) should there be an incident that impacts on the TECs. – Install appropriate exclusion fencing to the boundary of the TECs and any construction areas where there is some potential for accidental encroachment. Include appropriate signage. • Offsetting inside NWGA: – In accordance with Biodiversity Certification Order RBM 8 (refer Section 6.2, and Figure 4) where relevant. – In accordance with *Sydney Water Biodiversity Offset Guidelines* in Existing Non-Certified areas, where RBM 8 does not apply. • Offsetting outside NWGA: – Offsetting to follow *Sydney Water Biodiversity Offset Guidelines.*
Threatened flora/fauna habitat	• Direct removal of 9.56 ha of threatened flora/fauna habitat, consisting of: – 2.96 ha listed as TECs. – 6.60 ha listed as non-threatened native vegetation. • Indirect impacts of trimming to 3.71 ha of threatened aerial/arboreal fauna habitat.	• Removal of hollow-bearing trees and trimming of hollow-bearing limbs is to be avoided wherever possible. • Hollow-bearing trees that cannot be avoided, are to be removed in a two stage process.

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Ecological value	Impacts	Recommendations
	• Removal of 32 Hollow-bearing trees, and 8 additional trees containing nest boxes.	• Pre-clearance inspections for Dural Land Snail and Cumberland Plain Land Snail in areas of high quality habitat as determined by a project ecologist post-approval, including relocation to adjacent retained habitats if individuals are observed during works. – High quality habitat is described in Table 25. • Offsetting inside NWGA: – In accordance with Biodiversity Certification Order RBM 8 (refer Section 6.2, and Figure 4) where relevant. – In accordance with *Sydney Water Biodiversity Offset Guidelines* in Existing Non-Certified areas, where RBM 8 does not apply. • Offsetting outside NWGA: – Offsetting to follow Sydney Water Biodiversity Offset Guidelines.
Existing Native Vegetation (ENV)	• Removal of 0.49 hectares of ENV on Existing Non-certified land (further detailed in Section 6.2)	• Offsetting In accordance with Biodiversity Certification Order RBM 8 (refer Section 6.2, and Figure 4).
Riparian vegetation	• Direct impacts to native riparian vegetation (comprising a portion of the total direct impacts) include: – 1.57 ha of River-flat Eucalypt Forest (PCT 835) – 0.11 ha of Swamp Oak Floodplain Forest (PCT 1800) – 3.09 ha of Coastal Enriched Moist Forest (PCT 1841) • Indirect impacts of trimming to: – 0.60 ha of River-flat Eucalypt Forest (PCT 835) – 0.85 ha of Coastal Enriched Moist Forest (PCT 1841) • Impacts to native vegetation at Eastern Creek are not expected to occur as a result of construction of the Riverstone WWTP discharge main.	• Ensure retained vegetation is protected by exclusion fencing and proper erosion and sedimentation controls. • Offsetting inside NWGA: – In accordance with Biodiversity Certification Order RBM 8 (refer Section 6.2, and Figure 4) where relevant. – In accordance with *Sydney Water Biodiversity Offset Guidelines* in Existing Non-Certified areas, where RBM 8 does not apply. • Offsetting outside NWGA: – Offsetting to follow Sydney Water Biodiversity Offset Guidelines.

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Ecological value	Impacts	Recommendations
Non-threatened native vegetation	• Direct removal of 6.60 ha of native vegetation, consisting of four non-threatened native vegetation communities: – 0.68 ha of Sydney South Exposed Sandstone Woodland (PCT 1083) – 2.60 ha of Hinterland Gully Forest (PCT 1181) – 3.09 ha Coastal Enriched Moist Forest (PCT 1841) – 0.02 ha of Sydney Sandstone Hinterland Forest (PCT 1255) – 0.21 ha Sandstone Riparian Scrub (PCT 1292). • Indirect impacts of trimming to of 2.61 ha native vegetation, consisting of four non-threatened native vegetation communities: – 0.75 ha of Sydney South Exposed Sandstone Woodland (PCT 1083) – 0.97 ha of Hinterland Gully Forest (PCT 1181) – 0.85 ha Coastal Enriched Moist Forest (PCT 1841) – 0.04 ha Sandstone Riparian Scrub (PCT 1292).	• Wherever possible retain vegetation within the study area to maintain fauna habitats. • Offsetting inside NWGA: – In accordance with Biodiversity Certification Order RBM 8 (refer Section 6.2, and Figure 4) where relevant. – In accordance with *Sydney Water Biodiversity Offset Guidelines* in Existing Non-Certified areas, where RBM 8 does not apply. • Offsetting outside NWGA: – Offsetting to follow *Sydney Water Biodiversity Offset Guidelines.*
Number of locally indigenous native trees and tree hollows to be removed that are not part of a vegetation community	• A total of 32 hollow-bearing trees are present within the study area and expected to be removed however, all form part of vegetation communities address above. • A total of 57 locally indigenous trees, not part of a vegetation community, are expected to be removed. These trees occur within areas assessed and mapped as Urban Native/Exotic vegetation.	• Offsetting to follow *Sydney Water Biodiversity Offset Guidelines*.
Number of non-locally indigenous native or exotic trees and tree hollows to be removed	• No non-locally indigenous or exotic trees to be removed.	• N/A
Existing certified land impacts	• Direct and indirect impacts to of 2.35 ha native vegetation within Existing Certified land: – 0.05 ha of Coastal Freshwater Wetlands (PCT 781). – 0.73 ha of Shale Gravel Transition Forest (PCT 724). – 0.62 ha of Cumberland Plain Woodland (PCT 849).	• No offsets required for native vegetation removal within certified land.

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Ecological value	Impacts	Recommendations
	– 0.13 ha of River-flat Eucalypt Forest (PCT 835) – 0.43 ha of Sydney Hinterland Transition Forest (PCT 1081) – 0.08 ha of Sydney South Exposed Sandstone Woodland (PCT 1083) – 0.04 ha of Sydney Hinterland Gully Forest (PCT 1181). – 0.02 ha of Shale Sandstone Transition Forest (PCT 1395) – 0.26 ha of Swamp Oak Floodplain Forest (PCT 1800).	

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5.2 Groundwater dependent ecosystems

High probability Groundwater Dependent Ecosystems (GDEs) are mapped by the *Spatial Layer of Probable Vegetation Groundwater Dependent Ecosystems in NSW* (DPI 2016) in multiple locations relevant to the project alignment. Those being along the more major watercourses in proximity to the project area including; Cattai Creek, Caddies Creek, Second Ponds Creek, Killarney Chain of Ponds, and Eastern Creek.

Biosis has mapped the following vegetation at each of the locations where high probability GDEs have been mapped as likely to occur by DPI (2016):

- Cattai Creek
  - PCT 835, PCT 1081, PCT 1083, PCT 1181, PCT 1292, PCT 1395, PCT 1841, Exotic vegetation
- Caddies Creek
  - PCT 835, Exotic vegetation
- Second Ponds Creek
  - PCT 835, PCT 1071 (artificial), PCT 1800, Exotic vegetation
- Killarney Chain of Ponds (and second order tributary)
  - PCT 781, PCT 1071, PCT 835, PCT 849, PCT 1800, Exotic vegetation
- Eastern Creek
  - PCT 1800, Exotic vegetation

All of the terrestrial PCTs listed above are expected to have some form of groundwater interaction and reliance based on their location in the landscape (on floodplains, near watercourses) and presence of large trees able to access deeper groundwater if/when required. The wetland PCTs (PCT 781 and PCT 1071) may be groundwater dependent, based on the depth of groundwater at the locations where they occur. Wetland plants in generally have shallower root systems, and groundwater dependence is based on the presence of a shallow water table that can be accessed by the plants. If the groundwater is too deep, the wetlands are less likely to be groundwater dependent, and more likely to be maintained by surface run-off and rainfall draining into the depression that support the wetland vegetation.

The NSW Department of Planning and Environment–Water have assigned these high probability GDEs an ecological value based on the Commonwealth Government's High Ecological Value Aquatic Ecosystem (HEVAE) framework. The HEVAE framework uses a number of categories including; Naturalness, Vital habitat, Distinctiveness and Diversity, and assigns each high probability GDE a value form Very Low to Very High ecological value. The high probability GDEs within the study area have been assigned an ecological value (priority) ranging from Low to High (DPE 2019), with these scores likely driven by the threatened nature of the vegetation, but their generally lower condition and smaller patch sizes. There is not considered to be any evidence or reason to alter or disagree with this range of assigned HEVAE scores.

With limited knowledge of the potential for the project to intercept groundwater during trenching and/or underboring works, and the level at which potential impacts such as; induced drawdowns, groundwater seepage, lateral migration along pipeline backfill material, disruption of surface water and groundwater connectivity, or groundwater contamination may occur, it has been assumed that there is some potential for GDEs to be impacted by the project.

However it is again assumed that the potential impacts would most likely occur during the construction phase of the project and therefore be temporary in nature, and be localised due to the linear nature of the

excavations and underboring. Therefore it is expected that sufficient mitigation measures could be implemented to arrest any more substantial groundwater interactions that could have the potential to cause a higher level of impact to the GDEs. We would recommend consultation with groundwater specialists to determine suitable construction and operational mitigation measures to ensure any impacts relating to potential groundwater interactions can be managed, and are unlikely to result in ongoing negative pressures on the retained vegetation.

Assuming any potential negative interactions with groundwater are confined to being temporary and localised in nature, there are not expected to be any substantial or significant impacts to BC Act or EPBC Act listed GDEs as a result of the project. However due to the extent of mapped high probability GDEs across the study area, if there is any uncertainty around the potential for proposed mitigation measures to sufficiently prevent indirect impacts to retained native vegetation GDEs, ongoing monitoring is recommended for signs of impacts, combined with an adaptive management strategy to identify and rectify (and possibly offset) any potential unexpected impacts.

6 Assessment against key biodiversity legislation

6.1 *Environment Protection and Biodiversity Conservation Act 1999*

An assessment of the impacts of the proposed development on Matters of NES, as outlined in, *Matters of National Environmental Significance Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia 2013) was prepared to determine whether referral of the proposal to the Commonwealth Minister for the Environment and Energy is required. Matters of NES relevant to the proposal are summarised in Table 20.

Table 20 Assessment of the proposal against the EPBC Act

Matter of NES	Proposal specifics	Assessment against Commonwealth of Australia (2013)
Threatened species (flora and fauna)	Two flora species and three fauna species have been recorded or are predicted to occur in the study area. An assessment of the likelihood of these species occurring in the study area is provided in Appendix 1 (flora) and Appendix 2 (fauna). Assessments against the Significant Impact Criteria (CoA 2013) have been prepared for these species (Appendix 3).	The following species are considered to have a medium or greater likelihood of occurring within the study area: • *Eucalyptus* sp. *Cattai* • *Darwinia biflora* • Dural Land Snail • Large-eared Pied Bat • Grey-headed Flying-fox SIC assessments have been prepare for these species (Appendix 3) and concluded that a significant impact is not likely to result from the proposal.
Threatened ecological communities	Three Critically Endangered Ecological Communities (CEEC) and one Endangered Ecological Community (EEC) have been mapped within the study area: • Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest CEEC • Shale Sandstone Transition Forest CEEC • River-flat Eucalypt Forest CEEC • Coastal Swamp Oak (*Casuarina glauca*) Forest EEC. SIC assessments have been prepare for these TECs (Appendix 3).	SIC assessments have been prepare for these TECs (Appendix 3) and concluded that a significant impact was not likely to result from the proposal. Although several of these TECs will experience clearing and disturbance over 1 ha in area, the scale of impacts are considered an over-estimation as effective construction stage measures are proposed to minimise the extent of clearing. Furthermore, most impacts are confined to the edges of patches and these impacts are considered unlikely to contribute to substantial community fragmentation or major local scale reduction in the extent and functionality of the TECs.
Migratory species	The study area does not provide important habitat for an ecologically significant proportion of any migratory species.	While some of these species would be expected to use the study area on occasions, some may do so regularly and others may be resident. The study area does not provide important habitat for an ecologically significant proportion of any of these species.

Matter of NES	Proposal specifics	Assessment against Commonwealth of Australia (2013)
Wetlands of international importance (Ramsar sites)	There are 12 Ramsar sites in NSW, the closest one being Towra Point Nature Reserve located approximately 37 km south-east of the study area.	The study area does not flow directly into a Ramsar site and the development is not likely to result in a significant impact.

On the basis of criteria outlined in Commonwealth of Australia (2013) it is considered unlikely that a significant impact on a Matter of NES would result from the proposal.

6.2 Environmental Planning and Assessment Act 1979

An assessment of the proposal against the relevant sections of the EP&A Act is provided below.

Test of Significance

Test of Significance (ToS) were completed for 24 threatened species and five TECs recorded within the study area or considered to have a medium or greater likelihood of occurrence within the study area. ToS are provided in Appendix 4.

As summarised in Table 21 below, each assessment concludes that a significant effect is not likely to result from the proposal. Application of the Biodiversity Offset Scheme (BOS) or preparation of a Species Impact Statement (SIS) is therefore not required.

Table 21 Summary of Tests of Significance

Scientific name	Common name	Criteria 1 summary	Criteria 2 summary	Criteria 3 summary	Criteria 4 summary	Criteria 5 summary	Significant effect?
Cumberland Plain Woodland in the Sydney Basin Bioregion	Cumberland Plain Woodland	No	No	No	No	No	No
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Shale Sandstone Transition Forest	No	No	No	No	No	No
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	No	No	No	No	No	No
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Swamp Oak Floodplain Forest	No	No	No	No	No	No
Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Freshwater Wetlands	No	No	No	No	No	No
***Eucalyptus* sp. cattai**	-	No	No	No	No	No	No
Hibbertia superans	-	No	No	No	No	No	No
Leucopogon fletcheri* subsp. *fletcheri	-	No	No	No	No	No	No
Epacris purpurascens* subsp. *purpurascens	-	No	No	No	No	No	No
Darwinia biflora	-	No	No	No	No	No	No
Dillwynia tenuifolia	-	No	No	No	No	No	No
Meridolum corneovirens	Cumberland Plain Land Snail	No	No	No	No	No	No
Pommerhelix duralensis	Dural Land Snail	No	No	No	No	No	No
Calyptorhynchus lathami	Glossy Black-Cockatoo	No	No	No	No	No	No

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Scientific name	Common name	Criteria 1 summary	Criteria 2 summary	Criteria 3 summary	Criteria 4 summary	Criteria 5 summary	Significant effect?
Artamus cyanopterus cyanopterus	Dusky Woodswallow	No	No	No	No	No	No
Daphoenositta chrysoptera	Varied Sittella	No	No	No	No	No	No
Glossopsitta pusilla	Little Lorikeet	No	No	No	No	No	No
Neophema pulchella	Turquoise Parrot	No	No	No	No	No	No
Petroica boodang	Scarlet Robin	No	No	No	No	No	No
Petroica phoenicea	Flame Robin	No	No	No	No	No	No
Chalinolobus dwyeri	Large-eared Pied Bat	No	No	No	No	No	No
Miniopterus australis	Little Bent-winged Bat	No	No	No	No	No	No
Miniopterus orianae oceanensis	Large Bent-winged Bat	No	No	No	No	No	No
Vespadelus troughtoni	Eastern Cave Bat	No	No	No	No	No	No
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	No	No	No	No	No	No
Myotis macropus	Southern Myotis	No	No	No	No	No	No
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	No	No	No	No	No	No
Scoteanax rueppellii	Greater Broad-nosed Bat	No	No	No	No	No	No
Pteropus poliocephalus	Grey-headed Flying-fox	No	No	No	No	No	No

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State Environmental Planning Policies

SEPP Sydney Region Growth Centres 2006

A total of 11.35 hectares of native vegetation is proposed to be directly removed within the study area under the current proposal. This includes:

- 1.79 ha on Existing Certified land.
- 7.12 ha on Existing Non-certified land.
- 2.44 ha on land not subject Biodiversity Certification (i.e. outside the NWGA).

The areas that are associated with the SEPP Sydney Region Growth Centres are presented in Figure 3. Areas that form part of the land application map for the SEPP Sydney Region Growth Centres yet was not subject to Biodiversity Certification are defined on Figure 3 as Existing Non-certified. The study area is located within the precincts of:

- Riverstone West
- Riverstone
- Vineyard Stage 1
- Box Hill
- Box Hill Industrial
- North Kellyville.

Prior to any clearing of native vegetation in Existing Non-certified land in the NWGA, Sydney Water are required to notify the Department of Planning as per Clause 18A (2) of the Growth Centres SEPP.

"A public authority, or a person acting on behalf of a public authority, must not carry out development comprising the clearing of native vegetation (within the meaning of the Native Vegetation Act 2003) on land that is not subject land (within the meaning of clause 17 of Schedule 7 to the Threatened Species Conservation Act 1995) unless the authority or person has:

a) given written notice of the intention to carry out the development to the Department of Planning and Infrastructure, and
b) taken into consideration any response to the notice that is received from that Department within 21 days after the notice is given."

Clearing of native vegetation is defined as:

a) cut down, fell, uproot, kill, poison, ringbark, burn or otherwise destroy the vegetation, or
b) lop or otherwise remove a substantial part of the vegetation.

Vegetation identified on land mapped as Existing Certified is not subjected to further assessments under the BC Act or EPBC Act, however is still subject to local planning instruments and development controls under the SEPP.

All vegetation to be cleared located within Existing Non-certified land or not subject to Biodiversity Certification (i.e. outside the NWGA) is subject to further assessment under the BC Act and/or EPBC Act, as contained in this assessment report.

Order to confer biodiversity certification on the SEPP (Sydney Region Growth Centres) 2006

The Biodiversity Certification Order outlines 41 conditions, known as the Relevant Biodiversity Measures (RBMs), to ensure consistency with the biodiversity certification for the growth centres during future development. A number of these RBMs are relevant to the proposal including:

- RBM 8 and RBM 11 pertaining to removal of vegetation on Existing Non-certified land.
- RBM 12 pertaining to removal of vegetation within special provision area.

RBM 8 and RBM 11 relate to the removal of 'existing native vegetation' (ENV) from Existing Non-certified land, and provides details on offsetting requirements for any impacts that may occur.

RBM 8 states that the clearing of any ENV in the Existing Non-certified land will be offset by:

a) the protection of an equal or greater area of existing native vegetation elsewhere in the Growth Centres; or

b) the revegetation and/or restoration of an area of land elsewhere in the Growth Centres, subject to a number of additional conditions relating to the protection, size, ongoing management, and any potential additionally of proposed revegetation/restoration.

The proposal will impact upon 0.49 hectares of ENV subject to RBM 8 and RBM 11, where the impact area runs along the riparian corridors of Cattai Creek, Caddie's Creek, and Killarney Chain of Ponds (Figure 4). Impacts to this vegetation will occur as a result of a need undertake works via to open trenching within vegetation forming the creeks' riparian corridors. To reduce impacts to ENV in this location, the impact area has been primarily located within disturbed corridors that do not contain native vegetation, however some ENV is still impacted by the proposal.

Impacts associated with the clearing of 0.49 hectares of ENV on Existing Non-certified land, subject to RBM 8, RBM 11 are subject to specific offsetting requirements as outlined in the Biodiversity Certification Order. Sydney Water is committed to securing these offsets within the Growth Centres as required by the Biodiversity Certification Order. Offsets will be secured though either revegetation / restoration at an offsetting ratio of 3:1 (in accordance with the requirements of RBM 8). Table x provides details on the ENV impacted by the project

Table 22 Summary of ENV impacted by the proposal (Figure 4)

PCT	TEC	Impact (Ha)
781 - Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion	Freshwater Wetlands (BC Act)	0.01
835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	River-flat Eucalypt Forest (EPB Act and BC Act)	0.34
849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland (EPB Act and BC Act)	0.01
1071 - Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Freshwater Wetlands (BC Act)	0.01
1081 - Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion	-	0.04
1181 - Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	-	0.01

PCT	TEC	Impact (Ha)
1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	Swamp Oak Floodplain Forest (EPBC Act and BC Act)	0.06
1841 - Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region	-	0.01

RBM 12 states that within lands marked by a red hatching on the biodiversity certification maps (including vegetation on the corner of Otago Street and Windsor Road) must not be cleared unless it is in accordance with a plan of management or unless such clearance has been agreed to by the DECC (now DPIE). The current proposal indicates vegetation will not be impacted within this area, with all potential impacts located adjacent to this vegetation (Figure 4.2). Standard mitigation measure, including installation of no-go fencing should be implemented surrounding this land to reduce risk of impact.

Although there are proposed impacts to Existing Non-certified areas mapped as containing NVR within the precinct plans, Clause 8 of Section 6.3 of the Growth Centres SEPP states, neither permits nor offsetting is required for works undertaken under the *Sydney Water Act 1994,* which applies to the proposed works.

6.3 Biodiversity Conservation Act 2016

An assessment of the likelihood of threatened biota occurring within the study area is provided in Appendix 1 (flora) and Appendix 2 (fauna) along with an assessment of whether the proposal has potential to result in a significant effect. These assessments determined that five TECs and 24 threatened species have either been identified within, or have a medium or greater likelihood of occurring, within Non-BioCertified lands. Tests of Significance have been prepared for the threatened biota that are deemed likely to be subject to adverse impacts and are provided in Appendix 4.

Tests of Significance indicate that a significant effect is not likely to result from the proposal. Application of the Biodiversity Offset Scheme (BOS) or preparation of a Species Impact Statement (SIS) is therefore not required.

6.4 Fisheries Management Act 1994

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

No predicted habitat for threatened aquatic species has been mapped on the DPI spatial data portal within the study area. No records of threatened aquatic species have been recorded within 10 kilometres of the study area on the BioNet Atlas of NSW. The field investigation identified a low to moderate degree of channel modification, riparian degradation and weed ingress along with diffuse (e.g. roads and development) and point source pollution inputs (e.g. stormwater outlets) at all sites. No threatened aquatic species, populations or communities listed under the FM Act are considered likely to occur or be impacted by the proposed works within the study area. However further detailed aquatic ecological assessment, undertaken by other specialists separately to this biodiversity assessment, may superseded this conclusions.

Six streams located within or adjacent to the study area; Eastern Creek, Killarney Chain of Ponds, Cattai Creek, Caddies Creek and Seconds Ponds Creek, are mapped as KFH and satisfy definitions under the FM Act. An additional seven first order and two second order streams are located within the study area. Impacts within two creeks, Cattai Creek and Seconds Ponds Creek, are not expected due to alignment location. Two creeks that are mapped as KFH, Caddie's Creek, Killarney Chain of Ponds, as well as one second order stream are

being under-bored, and hence are not expected to be impacted. However, it is expected that Eastern Creek, First Ponds Creek, a further seven first order streams, and one second order stream are likely to be directly impacted by the works at various points along the alignment. Riparian and instream vegetation ranges in condition from largely exotic at Eastern Creek and First Ponds Creek, to higher more native dominant condition at other lower order streams along the alignment.

A number of standard precautions and mitigations relevant to the protection of fish habitat are provided in section 3.3.2 of *Policy and guidelines for fish habitat conservation and management* (Fairfull 2013), these should be considered and deployed as relevant. In particular the following management measures should be taken as relevant to the type of works:

- Silt curtains or a coffer dam should be deployed around instream work sites and stormwater outlet headwall construction zones where required. In addition to standard erosion and sediment control measures, to protect against any impacts to water quality.
- The stockpiling of sediment should be located as far away from the waterway as possible and managed so that it is secure against flooding, to at least the 1 in 10 year flood interval.
- Any runoff from stockpiled sediment must be managed to prevent any sediment entering the waterway.
- Instream works should be limited to calm weather conditions.
- Instream works should be undertaken during low flow periods wherever possible.

The following recommendations should be considered during proposal construction to protect the aquatic ecological values of the study area:

- Appropriate erosion and sediment controls that take into account the flood prone nature of the land should be employed to protect against any impacts to water quality or indirect impacts to retained vegetation.
- Where natural banks exist (e.g. not constructed from gabions or lined with concrete), these banks should be reformed or remediated to resemble the pre-works condition and form to the fullest extent practicable.
- Any plant or equipment used in-stream should be washed down and cleaned prior to and following use to reduce the translocation risk of aquatic weed species.
- To the fullest extent practicable, minimise disturbance to any native vegetation, including aquatic vegetation within the study area. This may include the demarcation of areas of native vegetation to be retained during works.
- Minimise soil transportation within, into or out of the study area to reduce the spread of weeds.

Sydney Water should undertake consultation with the Minister for Primary Industries and obtain a permit to obstruct the free passage of fish prior to works as relevant to the scope of works. Under Section 199 of the FM Act, consultation with the Minister for Primary Industries is required for reclamation work involving trenching across a waterway. However, Biosis understands that Sydney water has previous advice stating no requirement for consultation unless the waterway constitutes KFH. As one waterway constituting KFH is proposed to be impacted, consultation with Minister for Primary Industries is recommended. Best practice sediment and erosion should be implemented.

6.5 Biosecurity Act 2015

Eleven priority weeds for Greater Sydney LLS region, which includes The Hills, Hawksbury and Blacktown LGAs that have been recorded in the study area are listed in Table 23, along with their associated Duty (where relevant to the proposal).

Table 23 Priority weeds within the study area

Scientific name	Common name	General biosecurity duty
Arundo donax	Giant Reed	***Regional Recommended Measure*** *Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment.*
Olea europaea* subsp. *cuspidata	African Olive	***Regional Recommended Measure*** *Land managers prevent spread from their land where feasible. Land managers reduce impacts from the plant on priority assets.*
Asparagus virgatus	Asparagus Fern	
Alternanthera philoxeroides	Alligator Weed	*All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.*
Anredera cordifolia	Madeira Vine	
Asparagus aethiopicus	Ground Asparagus	
Asparagus asparagoides	Bridal Creeper	
Cestrum parqui	Green Cestrum	
Lantana camara	Lantana	
***Rubus fruticosus* sp. agg.**	Blackberry	
Senecio madagascariensis	Fireweed	

As such to prevent the above listed biosecurity impacts from occurring as a result of the presence of the above listed priority weeds within the study area, all practical steps should be taken to control and eradicated the weeds from the study area prior to or during vegetation removal.

7 Conclusions and recommendations

This report is an assessment of the potential impact of the proposed works on ecological values within the study area in accordance with the EP&A Act, EPBC Act, BC Act and the FM Act.

The proposed activities that will result in impacts to ecological values include:

- Direct removal of up to 9.56 ha native vegetation on Non-BioCertified land (of which 2.44 ha is outside the NWGA), including:
  - the following TECs (totalling 2.96 ha):
    - 0.01 ha of Cumberland Plain Woodland (CEEC, EPBC Act and BC Act).
    - 1.24 ha of Shale Sandstone Transition Forest (CEEC, EPBC Act and BC Act).
    - 1.57 ha of River-flat Eucalypt Forest (CEEC, EPBC Act and BC Act).
    - 0.11 ha of Swamp Oak Floodplain Forest (EEC, EPBC Act and BC Act).
    - 0.03 ha of Coastal Freshwater Wetlands (EEC, BC Act).
  - the following non threatened native vegetation communities (totalling 6.60 ha):
    - 0.68 ha of Sydney South Exposed Sandstone Woodland (PCT 1083).
    - 2.60 ha of Hinterland Gully Forest (PCT 1181).
    - 3.09 ha Coastal Enriched Moist Forest (PCT 1841).
    - 0.02 ha of Sydney Sandstone Hinterland Forest (PCT 1255).
    - 0.21 ha Sandstone Riparian Scrub (PCT 1292).
- Indirect impacts to up to 3.71 ha native vegetation to be trimmed across the fire trail path and for access requirements including:
  - 0.60 ha of River-flat Eucalypt Forest (CEEC, EPBC Act and BC Act).
  - 0.50 ha of Shale Sandstone Transition Forest (CEEC, EPBC Act and BC Act).
  - 0.75 ha of Sydney South Exposed Sandstone Woodland (PCT 1083)
  - 0.97 ha of Hinterland Gully Forest (PCT 1181)
  - 0.85 ha Coastal Enriched Moist Forest (PCT 1841)
  - 0.04 ha Sandstone Riparian Scrub (PCT 1292).
- Removal of 12 individual *Epacris purpurascens* (Vulnerable, BC Act) from Non-BioCertified areas outside the NWGA.
- Removal of (9.56 ha), or disturbance to (3.71ha), threatened species habitat including:
  - 32 Hollow-bearing trees
  - 8 tree containing next boxes.

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- Of the 9.56 ha of vegetation to be removed on Non-BioCertified land, 0.49 hectares of ENV in Existing Non-certified land will be removed, subject to RBM 8, RBM 11 at Cattai Creek, Caddie's Creek, and Killarney Chain of Ponds.
    - Sydney Water is committed to securing these offsets within the Growth Centres as required by the Biodiversity Certification Order. Offsets will be secured though either revegetation / restoration at an offsetting ratio of 3:1 (in accordance with the requirements of RBM 8).
- Impacts to 2.36 ha (comprising 1.79 ha direct removal, 0.57 ha indirect impacts i.e. trimming) of native vegetation within Existing Certified land.
- Impacts to exotic vegetation (only) on the banks of Eastern Creek during construction of the Riverstone WWTP discharge main.

It should be noted that the proposal will avoid impacts to vegetation subject to RBM 12 on the corner of Otago Street and Windsor Road.

A SIC assessment was prepared for two threatened flora species, three threatened fauna species and four TECs. On the basis of criteria outlined in (CoA 2013) it is considered unlikely that a significant impact on a Matter of NES would result from the proposal. Although impacts to entities listed under the EPBC Act will occur to areas of greater than 1 hectare, these impacts have been sited on the edges of vegetation and within previously disturbed corridors such that the impacts are unlikely to place the protected matters at risk of extinction or significant decline.

A ToS was prepared for 18 threatened fauna species, seven threatened flora species and five TECs. It was concluded that the proposal will not have a significant effect on the ecological communities or threatened species, therefore a SIS or BDAR is not required as impacts to communities are sited on the edge of communities and in heavily modified areas such that impacts will not increase fragmentation or put the local populations/habitats at risk of extinction.

One BC Act listed threatened flora species, *Epacris purpurascens,* was recorded in the study area, outside the NWGA boundary, during targeted surveys and will likely be impacted by the proposal. Up to 12 individuals are expected to be impacted, which form part of a larger populations of over 200 individuals. Therefore, the proposal is unlikely to constitute a significant effect on the species.

One flora species, Juniper-leaved Grevillea, listed under the BC Act was recorded during the field investigation, however it is located within Existing Certified land and therefore no further assessment was required for its removal.

One stream, First Ponds Creek, constituting KFH is likely to be directly impacted by the works. Therefore, consultation with Department of Primary Industries is recommended as part of the REF process. Biosis understands that Sydney water has previous advice stating there is no requirement for consultation unless the waterway constitutes KFH, which lower order streams (i.e. first and second order stream) do not.

Given the potential for the removal of all native vegetation within the impact area, the focus of the recommendations is to minimise disturbance to any surrounding native vegetation, fauna habitat and riparian areas. These are provided in Table 24 and Table 25.

Sydney Water's standard safeguards are to be employed and are provided in Table 24 below.

Table 24 Sydney Water environmental safeguards

Safeguard category	Safeguard information	Location
Topography, geology and soils		
2.1	Appropriate erosion and sediment control measures should be installed at all sites to avoid sedimentation of receiving water bodies or other indirect impacts to surrounding biodiversity values including: • Divert surface runoff away from disturbed soil and stockpiles. • Install sediment and erosion controls before construction starts. • Reuse topsoil where possible and stockpile separately. • Inspect controls at least weekly and immediately after rainfall. • Rectify damaged controls immediately. • Remove controls once surfaces have been stabilised, including removing trapped sediment in drainage lines.	All locations
2.2	Minimise ground disturbance and stabilise disturbed areas progressively.	All locations
2.6	Stop work during heavy rainfall or in waterlogged conditions when there is a risk of sediment loss off site.	All locations
2.7	Sweep up any sediment/soil transferred off site at least daily, or before rainfall.	All locations
2.7	Eliminate ponding and erosion by restoring natural landforms to the pre-works condition.	All locations
Water and drainage		
3.1	Use appropriate controls to avoid potential sedimentation to waterbodies (e.g. floatation boom).	All locations
3.3	Minimise the impacts to creeks where creek crossings are required. Prior to construction the methodology will be assessed based on: • Geotechnical and constructability issues (e.g. depth of cover, potential for future scouring). • Construction footprint and duration. • Ease of reinstatement. • Environmental issues (flora and fauna, geomorphology, contamination, heritage, water quality and hydrology). • Any issues raised during consultation with Department of Primary Industries.	All locations
3.6	Bund potential contaminants and store on robust waterproof membrane, away from drainage lines.	All locations
3.8	Locate portable site amenities away from watercourses or drainage lines.	All locations
3.16	Conduct refuelling, fuel decanting and vehicle maintenance in compounds where possible. If field refuelling is necessary, designate an area away from waterways and drainage lines with functioning spill kits close by.	All locations
Flora and fauna		
4.2	Residual impacts to native vegetation and trees will be offset in accordance with the Sydney Water Biodiversity Offset Guideline.	All Non-BioCertified locations

Safeguard category	Safeguard information	Location
4.5	Minimise vegetation clearance and disturbance, including impacts to standing dead trees and riparian zones. Where possible, limit clearing to trimming rather than the removal of whole plants.	All locations
4.6	Physically delineate vegetation to be cleared and/or protected on site and install appropriate signage prior to works commencing.	All locations
4.7	Adjust methodology (e.g. avoid area, hand excavate, implement exclusion fencing) to protect sensitive areas where possible (such as mature trees, known threatened species, populations or ecological communities).	All locations
4.8	Protect trees in accordance with the requirements of Australian Standard 4970-2009 for the Protection of Trees on Development Sites. Do not damage tree roots unless absolutely necessary, and engage a qualified arborist where roots >50mm are impacted within the Tree Protection Zone	All locations
4.11	Retain dead tree trunks, bush rock or logs in-situ unless they are in the impact area and moving is unavoidable. Reposition material elsewhere on the site or approved adjacent sites. If native fauna is likely to be present, a licenced ecologist should inspect the removal and undertake fauna relocation.	All locations
4.12	Inspect vegetation for potential fauna prior to clearing or trimming. If fauna is present, or ecological assessment has determined high likelihood of native fauna presence, including removal of hollow-bearing trees, engage a licenced ecologist to inspect and relocate fauna before works.	All locations
4.13	If native fauna is encountered on site, stop work and allow the fauna to move away un-harassed. Engage a licenced ecologist if assistance is required to move fauna	All locations
4.14	Avoid impeding/blocking fish passage. Retain snags and natural obstructions in waterways where possible.	All locations
4.17	Stop work immediately and notify the Sydney Water Project Manager if any threatened species (flora or fauna) is discovered during the works. Work will only recommence once the impact on the species has been assessed and appropriate control measures provided.	All locations
4.19	Manage biosecurity in accordance with: • *Biosecurity Act 2015* (see NSW Weedwise), including reporting new weed infestations or invasive pests • Contemporary bush regeneration practices, including disposal of sealed bagged weeds to a licenced waste disposal facility.	All locations
4.21	To prevent spread of weeds: • Clean all equipment including PPE prior to entering or leaving the work sites. • Wrap straw bales in geo-fabric to prevent seed spread.	All locations
4.27	Minimise impacts on native vegetation in non-certified areas, native vegetation retention areas and areas outside the growth centre. Options to consider where feasible include: • Alternative construction methodologies (under bore vegetation and waterways, compressed construction corridors).	All locations

Safeguard category	Safeguard information	Location
	• avoiding impact to hollow bearing and habitat trees.	
4.28	Vegetation removal must not occur until the following are complete: • The area to be removed has been physically delineated. • The Contractor's Environmental Representative has confirmed consistency with approval documentation. • Pre-clearing surveys, if relevant. • Written authorisation to commence clearing from Sydney Water Project Manager.	All locations

Table 25 Additional safeguards

Safeguard information	Location
During detailed design and/or construction of the Riverstone WWTP discharge main the following safeguards will be employed: • Impacts to mapped native vegetation comprising PCT 1800 and Swamp Oak Floodplain Forest TEC (BC Act) at Eastern Creek will be avoided. • All impacts to native vegetation will be located in Existing Certified land.	Riverstone WWTP discharge main alignment
All stockpile and compound areas are to be located within existing cleared areas and existing access tracks, and will be rehabilitated at the end of construction.	All locations
All hollow-bearing trees are to be removed in a two stage process: • Stage 1: All surrounding vegetation to be cleared and grubbed. • Stage 2: 24 to 48 hours later (or in accordance with approval documentation) the hollow-bearing trees are to be inspected by an ecologist. If resident fauna is observed, the hollow section is to be lowered to the ground and the animal allowed to move on of its own volition. If injured, the fauna to be taken to a WIRES carer or appropriate veterinarian for care.	All identified HBTs as per Figure 4 and any additional trees identified during pre-clearing inspections
Pre-clearance inspections for Dural Land Snail and Cumberland Plain Land Snail, including relocation to adjacent retained habitats if individuals are observed during works will occur within impacted PCT 724, PCT 849, PCT 835, PCT 1081 and PCT 1395 (refer Figure 4) that support high quality habitat as determined by a project ecologist post-approval. • High quality habitat is defined as areas with low levels of ground disturbance, with a moderate to high litter cover of bark, leaves and logs / woody debris, or grass clumps.	As adjacent
All staff on site are to be educated on the ID characteristics of the threatened flora species present within the study area during toolbox talks. The population of *Epacris purpurascens* var *purpurascens* is to be flagged as a no-go zone prior to commencement of vegetation clearing. Once clearing limits have been established, the no-go zone should remain around all individuals outside the proposal's impact area. The no-go zone is to remain in place until completion of construction and any associated rehabilitation works.	All locations
All vehicles and equipment are to be clean of mud and debris to prevent the spread of weeds.	All locations

Safeguard information	Location
No-go fencing installed for retained vegetation to ensure surrounding area remains undisturbed.	All locations

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Appendices

Appendix 1 Flora

Likelihood table for threatened flora species within the study area

Threatened flora species and ecological communities

The following table includes a list of the threatened flora species and ecological communities that have potential to occur within the study area. The list of species is sourced from the NSW BioNet Wildlife Atlas and the Protected Matters Search Tool (DAWEE; accessed on 3 May 2021).

Examples of criteria for determining the likelihood of occurrence for threatened biota as a guide for writing the rationale for likelihood have been listed below.

Likelihood of occurrence	Potential criteria
High	• Species/ecological communities recorded in study area during current or previous assessment/s. • Sufficient good quality habitat is present in study area or in connected waterbodies in close proximity to the study area (aquatic species). • Study area is within species natural distributional range (if known). • Species has been recorded within 5 km or from the relevant catchment/basin.
Medium	• Records of terrestrial biota within 5 km of the study area.. • Habitat limited in its capacity to support the species due to extent, quality, or isolation.
Low	• No records within 5 km of the study area. • Marginal habitat present (low quality & extent). • Substantial loss of habitat since any previous record(s).
Negligible	• Habitat not present in study area • Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded.

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Table A.26 Threatened flora species recorded / predicted to occur within 5 kilometres of the study area

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Acacia bynoeana	Bynoe's Wattle	VU	EN	2008#		Moderate	Study area contains open disturbed vegetation over sandy along southern alignment.	Semi prostrate shrub growing in central eastern NSW spanning from the Hunter District, west to the Blue Mountains and south to the Southern Highlands. Grows in a variety of communities including; Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Prefers open, slightly disturbed sites on sandy soils.
Acacia pubescens	Downy Wattle	VU	VU	2007#		Low	Study area is outside the region whereby this species is primarily found	A spreading shrub primarily confined to the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows in Cooks/River Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland, usually within roadside and bushland remnants. Grows on shale, sandstone, alluvium and gravely soils, often including ironstone.
Allocasuarina glareicola		EN	EN	#		Low	Study area contains sandy lateritic soil. However, there have been no recent record of this species.	Small, depauperate shrub restricted to a few populations in the Richmond district with an outlier population at Voyager Point in Liverpool. Grows in Castlereagh Woodlands, Cumberland Dry Sclerophyll Forest, Sydney Hinterland Dry Sclerophyll Forest, Sydney Sand Flats Dry Sclerophyll Forests. Grows in lateritic soil.
Asterolasia elegans		EN	EN	#		Low	Study area is within the range where this species is	Tall, thin shrub found growing north of Sydney in the Baulkham Hills, Hawkesbury and Hornsby districts. Could also occur in the Goulburn area. Grows in wet sclerophyll forest on moist hillsides in Sydney Coastal Dry Sclerophyll Forests,

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Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							normally found. However, soil composition of the study area does not match the preferred habitat of the species.	Sydney Hinterland Dry Sclerophyll Forests and North Coast Wet Sclerophyll Forests. Grows on Hawkesbury sandstone.
Caladenia tessellata	Thick Lip Spider Orchid	VU	EN	#		Low	Study area contains sandy soils and this species is cryptic in nature. Microhabitat required for this species is not located within the study area.	Small orchid recorded from the Wyong, Ulladulla and Braidwood regions with the Kiama and Queanbeyan populations believed to be extinct. Found in a wide variety of communities including Central Gorge Dry Sclerophyll Forests, Cumberland Dry Sclerophyll Forests, Coastal Floodplain Woodlands and Subalpine Woodlands. Grows on clay loam or sandy soils.
Callistemon linearifolius	Netted Bottle Brush		VU	2016		Negligible	Location of the study area matches the habitat description of this species. Records show	Shrub recorded from the Georges River to the Hawkesbury River, north of the Nelson Bay area and south at Coalcliff in the Illawarra region. Grows on the coast and adjacent ranges in a variety of communities including Cumberland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Sydney Coastal Heaths and North Coast Wet Sclerophyll Forests.

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Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							this species has recently been found. However, this species is easily detectable and was not located within habitat in the study area.	
Cryptostylis hunteriana	Leafless Tongue Orchid	VU	VU	#		Low	Study area contains sandy soils and this species is cryptic in nature. Micro habitats required for this species is not located within the study area.	Orchid with a distribution spanning from Gibraltar Range National Park southwards to the coastal area near Orbost in Victoria. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Coastal Heath Swamps, New England Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows in sandy soils.
Cynanchum elegans	White-flowered Wax Plant	EN	EN	#		Low	Preferred habitat of species does not match the habitat present	Climbing vine restricted to eastern NSW from Brunswick Heads to Gerroa in the Illawarra region. Grows in rainforest gully scrub and scree slope on the edge of dry rainforests in a variety of communities including Coastal Floodplain Wetlands, Maritime Grasslands, Coastal Valley Grassy Woodlands and Northern Hinterland Wet Sclerophyll Forests.

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Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							in the study area.	
Darwinia biflora		VU	VU	2019#		High	Location of the study area matches the habitat description of this species. Records show this species has recently been found. This species is also cryptic in nature and would require targeted surveys.	Erect shrub distributed in the Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. Grows on edges of weathered shale capped ridges in the vicinity of an intergrade with Hawkesbury sandstone in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows in shale-sandstone transitional soils.
Dillwynia tenuifolia			VU	2019		Low	Location of the study area matches the habitat description of this species. Records show this species has recently been found. Survey did not locate	Low, spreading shrub restricted to the Cumberland Plain in Western Sydney. Grows in scrubby or heathy areas within a variety of communities including Castlereagh Ironbark Forest, Shale Gravel Transition Forest, Castlereagh Scribbly Gum Woodland and Sydney Hinterland Dry Sclerophyll Forests. Grows on tertiary alluvium, laterised clays and in shale-sandstone transitions.

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Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							the species during field investigations.	
Epacris purpurascens var. *purpurascens*			VU	2018		High	Location of the study area matches the habitat description of this species. Records show this species has recently been found. Targeted surveys recorded 12 individuals within the impat area.	Erect shrub distributed from Gosford in the north, Silverdale to the west, Narrabeen in the east and Avon Dam in the south. Grows in scrubs and swamps in a variety of communities including Cumberland Dry, Sydney Hinterland Dry, Northern Hinterland Wet, and Southern Tableland Wet Sclerophyll Forests, Eastern Riverine Forests, and Coastal Valley Grassy Woodlands. Grows in soils with a strong shale influence on sandstone substrates.
Eucalyptus sp. *Cattai*		CR	CR	2020#		Negligible	Location of the study area matches the habitat description of this species. However, this species is easily detectable and was not	Small tree or mallee distributed between Colo Heights and Castle Hill in north-western Sydney. Grows as an emergent tree on flats and ridgetops in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows on sandstone substrates in laterised clays and occasionally on sandy soils.

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							recorded during the field investigation.	
Genoplesium baueri	Bauer's Midge Orchid	EN	EN	#		Low	This microhabitat required for this species are not present within the study area.	Terrestrial orchid with 13 populations totalling 200 plants distributed between Ulladulla and Port Stephens. Grows on moss gardens in a variety of communities including Sydney Coastal Dry sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths, Southern Lowland Wet Sclerophyll Forests and Sydney Hinterland Dry Sclerophyll Forests. Grows on sandstone substrates.
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea		VU	2019		High	Location of the study area matches the habitat description of this species. This species was recorded during field investigations.	Spreading to erect medium sized shrub endemic to Western Sydney with a distribution spanning from Blacktown, Erskine Park, Londonderry and Windsor and outlying populations at Kemps Creek and Pitt Town. Grows at elevations <50 m in Cumberland Plain Woodland, Castlereagh Ironbark Forest, Castlereagh Scribbly Gum Woodland, Shale/Gravel Transition Forest, Sydney Sand Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands. Grows in sandy to clay loam soils and red pseudolateritic gravels derived from Wianamatta Shale and Tertiary Alluvium.
Haloragis exalata subsp. *exalata*	Square Raspwort	VU	VU	#		Low	Prefers a damp environment which does not match the description of the study area.	Small to medium sized shrub found growing in four widely scattered locations in eastern NSW including the central coast, south coast and north western slopes. Grows in damp, protected and shaded areas in riparian zones in a variety of communities including South East Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Montane Bogs and Fens and Northern Warm Temperate Rainforests.

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Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Hibbertia superans			EN	2019		High	Study area contains sandy soils and is within the natural range of this species	Low spreading shrub recorded from 16 sites with a distribution spanning from Baulkham Hills to South Maroota. Grows on sandstone ridgetops near shale/sandstone transitions in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Northern Hinterlands Wet Sclerophyll Forests, Coastal Valley Grassy Woodlands, and Sydney Coastal Heaths. Grows on sandstone substrates.
Isotoma fluviatilis subsp. *fluviatilis*		Extinct		2008		Low	Preferred habitat of disturbed soils are present in the study area, however there have been no recent records of this species.	Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain Woodland) ecotone. May be an early successional species that benefits from some disturbance. Possibly out competed when overgrown by some species such as Cyndon dactylon.
Lasiopetalum joyceae		VU	VU	1955		Low	Preferred habitat of sandstone substrates are present in the study area, however there have been no recent records of this species	Erect, medium sized shrub restricted to 34 sites within the Hornsby Plateau from Berrilee to Duffys Forest. Grows on lateritic or shale influenced ridgetops in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows on sandstone substrates.
Leucopogon fletcheri subsp. *fletcheri*			EN	2008		Moderate	Preferred soils are present in	Erect, densely branched shrub restricted to north-west Sydney between St Albans in the north to Annangrove in the south.

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Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							the study area, however there have been no recent records of this species	Grows along ridges and spurs on flat to gently sloping terrain in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Grows on lateritic soils.
Macadamia integrifolia	Macadamia Nut	VU		2017		Low	Despite recent records, study area is too south for this species.	Medium sized tree found growing from Mount Bauple, near Gympie to Currumbin Valley in the Gold Coast hinterland in south-east Queensland. Occurs in the Northern Rivers region of NSW in remnant rainforest, mixed notophyll forest and rainforest margins.
Melaleuca deanei	Deane's Paperbark	VU	VU	2007#		Low	Species is generally found at higher elevations to what is present at the study area.	Medium sized shrub found growing in two distinct populations in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas along with a few outliers at Springwood and in the Wollemi National Park, Yalwal and the Central Coast regions. Grows in ridgetop woodland in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, South East Dry Sclerophyll Forests, Sydney HInterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths. Grows on sandstone substrates in alluvial soils.
Micromyrtus minutiflora		VU	EN	2003		Negligible	General region of this species is in close proximity to the study area. Preferred habitat of this species is	Slender, spreading shrub restricted to the western edge of the Cumberland Plain between Richmond and Penrith. Grows in Cumberland Dry Sclerophyll Forests and Sydney Sand Flats Dry Sclerophyll Forests including Castlereagh Scribbly Gum Woodlands, Castlereagh Ironbark Forests, and Shale/Gravel Transition Forests. Grows in tertiary alluvium and consolidated river sediments.

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							present in the study area. However, habitat is limited in the study area and the field survey did not locate the species.	
Persicaria elatior	Tall Knotweed	VU	VU	#		Low	No recent records of species. This species prefers damp, moist soils. Study area contains mostly dry degraded soils.	Erect herb found growing in south-eastern NSW at Mount Dromedary, Moruya State Forest near Turlinjah, Upper Avon River catchment north of Robertson, Bermagui and Picton Lakes. Also grows in northern NSW around Raymond Terrace near Newcastle and Cherry Tree and Gibberagee State Forests in the Grafton area. Grows in damp places usually on the margins of waterbodies and in swamp forests in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons and Coastal Heath Swamps.
Persoonia hirsuta	Hairy Geebung	EN	EN	2016#		Moderate	Location of the study area matches the habitat description of this species. Records show this species has	Spreading, hairy shrub with a scattered distribution throughout Sydney from Singleton to the north, the east coast of Bargo to the south and the Blue Mountains to the west. Grows at elevations between 350 - 600 metres in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Western Slopes Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Southern Escarpment

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							recently been found.	Wet Sclerophyll Forests. Grows in sandy soils on sandstone substrates.
Persoonia mollis subsp. *maxima*		EN	EN	1996		Low	No recent records of this species. Generally prefers higher elevations than what is present at the study area.	Tall, spreading shrub restricted to three populations in the Hornsby Heights - Mount Colah area. Grows in sheltered aspects of deep gullies or on the steep upper hillsides of narrow gullies in Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests and North Coast Wet Sclerophyll Forests. Grows on Hawkesbury sandstone substrates.
Persoonia nutans	Nodding Geebung	EN	EN	2021#		Negligible	Location of the study area matches the habitat description of this species. Records show this species has recently been found. However, habitat is limited in the study area and the field survey did not locate the species.	Erect or spreading shrub with a disjunct distribution restricted to the Cumberland Plain between Richmond in the north and Macquarie Fields in the south with core distribution occurring in the Penrith and to a lesser extent, Hawkesbury regions. Grows in Cumberland Dry Sclerophyll Forests including Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland, Cooks River/Castlereagh Ironbark Forest and Shale-Sandstone Transition Forest as wel as Sydney Sand Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands. Grows in sandy soils derived from aeolian or alluvial sediments as well as in tertiary alluviums to the south of its range.

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Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Pimelea curviflora var. *curviflora*		VU	VU	2018#		Negligible	Location of the study area matches the habitat description of this species. Records show this species has recently been found. Survey did not locate this species in habitats within the impact area.	Small to medium sized shrub restricted to the coastal areas of Sydney between northern Sydney and Maroota with an outlying population at Croom Reserve near Albion Park in the Illawarra region. Grows on ridgetops and upper slopes amongst grasses and sedges in a variety of communities including Cumberland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Northern Hinterland Wet Sclerophyll Forests. Can be inconspicuous amongst grasses and sedges although easier to find in October to May when flowering. Grows on sandstone substrates in shale/lateritic soils and shale/sandstone transition soils.
Pimelea spicata	Spiked Rice-flower	EN	EN	2001#		Negligible	Location of the study area matches the habitat description of this species. Habitat is limited in the study area and the field survey did not locate the species.	Small erect or spreading shrub with populations occurring in two disjunct areas, one occurring on the Cumberland Plain from Marayong and Prospect Reservoir south to Narellan and Douglas Park, and the other occuring in the Illawarra from Landsdowne to Shellharbour and north Kiama. Grows in Maritime Grasslands and Coastal Valley Grassy Woodlands including Cumberland Plain Woodlands and Moist Shale Woodlands within the Cumberland Basin and in Coast Banksia Open Woodland Coastal Grasslands in the Illawarra region. Grows on well-structured clay soils.
Pomaderris brunnea	Brown Pomaderris	VU	EN	2015		Low	Location of the study area	Medium sized shrub with a distribution limited to the area around the Colo, Nepean and Hawkesbury Rivers including

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							matches the habitat description of this species however, the species is not known to occur in the area.	the Bargo area and near Camden. Grows on floodplains and creeklines in a variety of communities including Sydney Hinterland Dry Sclerophyll Forests, Central Gorge Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Valley Grasslands and North Coast Wet Sclerophyll Forests. Grows in clay and alluvial soils.
Pterostylis gibbosa	Illawarra Greenhood	EN	EN	#		Low	Preferred associated species are found in the study area. However, there are no recent records indicating an absence of this species.	Deciduous terrestrial orchid with a disjunct distribution from the Milbrodale in the Hunter Region, Albion Park and Yallah in the Illawarra Region and Nowra in the Shoalhaven Region. Found growing amongst grasses on flat or gently sloping land with poor drainage in woodland dominated by Forest Red Gum *Eucalyptus tereticornis*, *Woolybutt E. longifolia*, and White Feather Honey-myrtle *Melaleuca decora.* In Nowra, the orchid can be found growing in association with Spotted Gum *Corymbia maculata*, Forest Red Gum and Grey Ironbark *E. paniculata*. In the Hunter Region, the orchid is associated with Narrow-leaved Ironbark *E. crebra*, Forest Red Gum and Black Cypress Pine *Callitris endlicheri*. Grows in red brown loam soils.
Pterostylis saxicola	Sydney Plains Greenhood	EN	EN	#		Low	Location of the study area matches the habitat description of this species. Micro habitats required for this species are	Deciduous terrestrial orchid restricted to a few small populations located in Western Sydney between Freemans Reach in the north and Picton in the south including Georges River National Park. Found growing near streams in depression on sandstone rock shelves above cliff lines faces, moist, sheltered ridges and creek banks on mossy rocks in Temperate Montane Grasslands, Northern Warm Temperate Rainforests, Southern Warm Temperate Rainforests and Southern Tableland Wet Sclerophyll Forests. Grows in small

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							not present within the study area.	pockets of shallow shale or shale/sandstone transition soils over sandstone substrates.
Pultenaea parviflora		VU	EN	2021#		Low	The study area contains the preferred habitat of this species and is within its known distribution. However, habitat is degraded and fragmented within the study area, and the species was not detected during the field investigations.	Small erect, branching shrub endemic to the Cumberland Plain from Windsor to Penrith east to Dean Park with outlying populations at Kemps Creek and Wilberforce. Found growing in Cumberland Dry Sclerophyll Forests including Castlereagh Ironbark Forest, Shale Gravel Transition Forest and Castlereagh Scribbly Gum Woodland, Sydney Coastal Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Southern Lowland Wet Sclerophyll Forests. Grows in soils derived from Wianamatta shale, laterite or alluvium.
Syzygium paniculatum	Magenta Lilly Pilly	VU	EN	2016#		Low	Habitat description does not match the study area. This species is generally	Small to medium sized rainforest tree restricted to a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Found growing on stabilized dunes near the sea in South Coast Sands Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Headland Heaths, Littoral Rainforests, Northern Hinterland Wet Sclerophyll Forests and Southern

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
							found in more coastal environments.	Lowland Wet Sclerophyll Forests. Grows on grey sandy, gravelly, silty or clay soils over sandstone substrates.
Tetratheca glandulosa			VU	2011		Moderate	General region of this species is in close proximity to the study area. Preferred habitat of this species is present in the study area	Small, spreading shrub with 150 populations confined to the Baulkham Hills, Gosford, Hawkesbury, Ku-ring-gai, Pittwater, Ryde and Wyong Local Government Areas. Found growing in a variety of communities including Sydney Sandstone Ridgetop Woodland, Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley Grassy Woodlands, Sydney Montane Heaths and North Coast Wet Sclerophyll Forests. Grows in the shallow, yellow clay/sandy loams that are typical of shale/sandstone transition soils where shale caps occur over sandstone substrates such as the Lucas Heights, Gymea, Lambert and Faulconbridge soil landscapes.
Thesium australe	Austral Toadflax	VU	VU	#		Low	No recent recordings of this species. Preferred habitat is damp grasslands. Study area contains mostly disturbed sandy soil.	Small, straggling herb with a distribution comprising of small populations scattered along the coast of eastern NSW including the Northern and Southern Tablelands, Tasmania, Queensland and eastern Asia. A root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands often in association with Kangaroo Grass Themeda triandra in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.

* - habitat descriptions have been adapted by qualified ecologists from the DAWE Species Profile and Threats (SPRAT) Database, EES Threatened Species online profiles and the NSW Scientific Committee final determinations for listed species, references within the above table are provided within the report reference list.

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Appendix 2 Fauna

Likelihood table for threatened fauna species within the study area

The following table includes a list of the threatened fauna species that have potential to occur within the study area. The list is based on database searches outlined in Section 3.1.

Notes to tables:

Conservation status – EPBC Act:	**Conservation status – BC Act:**
CR – Critically Endangered EN – Endangered VU – Vulnerable	E1 – endangered species (Part 1, Schedule 1) E2 – endangered population (Part 2, Schedule 1) E4 – presumed extinct (Part 4, Schedule 1) E4A – critically endangered V1 – vulnerable (Part 1, Schedule 2)
Most recent record # species predicted to occur by the PMST (not recorded on other databases). ## species predicted to occur based on natural distributional range and suitable habitat despite lack of records in the databases searched. 2017 recorded during current survey.	

Examples of criteria for determining the likelihood of occurrence for threatened biota as a guide for writing the rationale for likelihood have been listed below.

Likelihood of occurrence	Potential criteria
High	• Species recorded in study area during current or previous assessment/s. • Aquatic species recorded from connected waterbodies in close proximity to the study area during current or previous assessment/s. • Sufficient good quality habitat is present in study area or in connected waterbodies in close proximity to the study area (aquatic species). • Study area is within species natural distributional range (if known). • Species has been recorded within <5 or 10 kilometres > or from the relevant catchment/basin.
Medium	• Records of terrestrial species within <5 or 10 kilometres > of the study area or of aquatic species in the relevant basin/neighbouring basin. • Habitat limited in its capacity to support the species due to extent, quality, or isolation.
Low	• No records within <5 or 10 kilometres > of the study area or for aquatic species, the relevant basin/neighbouring basin. • Marginal habitat present (low quality and extent). • Substantial loss of habitat since any previous record(s).
Negligible	• Habitat not present in study area • Habitat for aquatic species not present in connected waterbodies in close proximity to the study area. • Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded.
Transient/ Nomadic	• Migratory or nomadic fauna species/individuals that may occur in the study area from time to time, but are not considered resident.

Table A.27 Threatened fauna species recorded, or predicted to occur, within 5 kilometres of the study area

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
Birds							
Anthochaera phrygia	Regent Honeyeater	CR	CR	1968#	Negligible	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nest in tall mature eucalypts and sheoaks.	The study area is not included on the Important Areas map for the species (DPIE 2021).
Artamus cyanopterus cyanopterus	Dusky Woodswallow		VU	2018	Medium	Primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other	Dry, open forests and woodlands are present in the study area. Though there has been some disturbance to habitat, the study area may be utilised by the species.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	
Botaurus poiciloptilus	Australasian Bittern	EN	EN	2002#	Low	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including Typha spp. and *Eleocharis* spp. Typically this bird forages at night on frogs, fish and	The habitat for this species is not present in the study area, as it does not contain terrestrial or estuarine wetlands. While there are waterways present in the study area, observations are generally from brackish or freshwater wetlands.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.	
Calidris ferruginea	Curlew Sandpiper	CR	EN	#	Negligible	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.	The habitat for this species is not present in the study area, as it is over 5 km from coastal waterbodies. While there are waterways present in the study area, observations are generally from high quality freshwater wetlands. This species has not been observed within 5 km of the study area. The study area is not included on the Important Areas map

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
							for the species (DPIE 2021).
Callocephalon fimbriatum	Gang-gang Cockatoo		VU	2018	Transient	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	Old growth forests and woodland habitats preferred by the species are not present in the study area. No suitable hollows for breeding are available in the study area. Presence is likely to be limited to transient foraging.
Calyptorhynchus lathami	Glossy Black-Cockatoo		VU	2020	Medium	Inhabits forest with low nutrients, characteristically with	Breeding habitat for the species consists of large hollow-

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						key Allocasuarina species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.	bearing eucalyptus trees with a minimum diameter of 14 cm (DPIE 2017, ACT Government 2013). While there was some hollows on site, the breeding habitat is of poor quality. Field investigations conducted during the required survey period (March to August) yielded no observations of breeding. Foraging habitat in the form of *Allocasuarina* and *Casuarina* spp. are present within the study area, therefore presence is likely to be limited to transient foraging.
Chthonicola sagittata	Speckled Warbler		VU	2018	Low	Chthonicola sagittata occurs on the hills and tablelands of the Great Dividing Range.	Large and relatively undisturbed remnants are required for Speckled

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						Found in eucalypt and cypress woodlands with a grassy understorey, often on ridges or gullies. The species nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground for arthropods and seeds.	Warbler to persist in an area. The habitat within the study area consists of disturbed roadsides and urbanised patches.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)		VU	2004	Low	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present.	Eucalypt woodlands without a dense shrub layer are present within the study area. Though uncommon east of the Great Dividing Range, there is a low likelihood of occurrence.
Daphoenositta chrysoptera	Varied Sittella		VU	2020	Medium	The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually	Eucalypt forests and woodlands are present in the study area. Though there has been some disturbance to

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts. The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	habitat, the study area may be utilised by the species.
Dasyornis brachypterus	Eastern Bristlebird	EN	EN	#	Negligible	Found in coastal woodlands, dense	Habitat within the study area does not

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						scrub and heathlands, particularly where it borders taller woodlands.	constitute preferred habitat for this species, as it does not include a healthy understorey. This species has not been recorded within 5 km of the study area.
Glossopsitta pusilla	Little Lorikeet		VU	2019	Medium	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts.	Dry and open eucalypt forests and woodlands, including hollow-bearing trees and foraging resources in the form of flowering shrubs and trees, are present within the study area.

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						Most breeding records come from the western slopes.	
Grantiella picta	Painted Honeyeater	VU	VU	#	Low	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.	Dry and open woodlands are present within the study area, but the density of Mistletoes is low. This species has not been observed within 5 km of the study area.
Haliaeetus leucogaster	White-bellied Sea-Eagle		VU	2020	Transient	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish,	This species nests on cliff ledges, headlands or at the top of large trees near coasts or rivers. Nests are usually in sight of large waterbodies. The breeding habitat for this species is present in the study area as it contains mature tall open forest. There are several small waterways present in the study area, but these do not

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						mammals, crustaceans and carrion. Roosts and makes nest in trees.	constitute sufficient breeding habitat. No nests or evidence of breeding were observed during the field investigations. The study area may be used on occasion for transient foraging.
Hieraaetus morphnoides	Little Eagle		VU	2019	Transient	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.	This species nests in tall living trees within a remnant patch of open eucalypt forest. While there is habitat present within the study area, it is degraded. No nests or evidence of breeding was observed during the field investigations. The study area may be used on occasion for transient foraging.
Hirundapus caudacutus	White-throated Needletail	VU		2015#	Transient	An aerial species found in feeding concentrations over	The species has been recorded roosting in trees in forests and

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						cities, hilltops and timbered ranges. Breeds in Asia.	woodlands, though little is known about the species. The species does not breed in Australia and nearby sightings are likely vagrants.
Irediparra gallinacea	Comb-crested Jacana		VU	2000	Negligible	Occurs in freshwater wetlands, lagoons, Billabongs, swamps, lakes, rivers and reservoirs, generally with abundant floating aquatic vegetation.	The habitat for this species is not present in the study area, as it does not contain freshwater wetlands. While there are waterways present in the study area, observations are generally from waterways containing floating aquatic vegetation. Large waterways will not be impacted by the proposal, as they will be under-bored. Small waterways are unlikely to be used by the species due to high levels of urban disturbance.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
Ixobrychus flavicollis	Black Bittern		VU	1985	Low	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation. The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates. The breeding season extends from December to March. Nests are constructed of reeds	The habitat for this species is not present in the study area, as it does not contain terrestrial or estuarine wetlands. While there are waterways present in the study area, observations are generally from brackish or freshwater wetlands. The small freshwater wetlands located in the study area are significantly degraded or urban environments and would not form quality habitat for the species.

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						and sticks in branches overhanging the water.	
Lathamus discolor	Swift Parrot	CR	EN	2019#	Negligible	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and	The study area is not included on the Important Areas map for the species (DPIE 2021).

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	
Lophoictinia isura	Square-tailed Kite		VU	2020	Low	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	Breeding habitat for this species includes large eucalypts in preferred vegetation types located along or near watercourses. Timbered watercourses are present in the study area. No nests or evidence of breeding were observed during the field investigations.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						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.	
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)		VU	1988	Negligible	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas.	Temperate woodlands are not present in the study area, in addition has been some disturbance to habitat and layers are not structurally diverse.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)		VU	2002	Low	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts. It is rarely	Eucalypt woodland vegetation is present in the study area, though there is a low likelihood of presence due to high

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						recorded east of the Great Dividing Range.	disturbance to the vegetation and locality east of the Great Dividing Range.
Neophema pulchella	Turquoise Parrot		VU	2017	Medium	Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs. Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies. Nest in hollow-bearing trees, either dead or alive; also in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies that are moist.	Open woodlands, though disturbed, are present in the study area and include hollow-bearing trees.
Ninox connivens	Barking Owl		VU	2017	Low	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense	Breeding habitat in the form of large hollow-bearing trees are not present in the study area. Field

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.	investigations conducted during the required survey period (May to December) yielded no observations of breeding. There have been no sightings within 5 km of the study area.
Ninox strenua	Powerful Owl		VU	2019	Low	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows	The species requires living or dead trees with hollows greater than 20 cm diameter for breeding habitat. No suitable hollow-bearing trees are present. Field investigations conducted during the required survey period (May to August) yielded no observations of breeding.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.	
Numenius madagascariensis	Eastern Curlew	CR		#	Negligible	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	The habitat for this species is not present in the study area, as it is over 5 km from coastal waterbodies. This species has not been observed within 5 km of the study area.
Pandion cristatus	Osprey		VU	#	Low	Found in coastal waters, inlets, estuaries and	Breeding habitat for this species consists of dead trees or

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	artificial structures that are located within 100 m of a floodplain, with a preference for coastline, therefore the habitat is absent in the study area. No nests or evidence of breeding were found during the field investigations. This species has not been observed within 5 km of the study area.
Petroica boodang	Scarlet Robin		VU	2013	Medium	The Scarlet Robin inhabits dry eucalypt forests and woodlands. The understorey is usually open and grassy with few	Dry forests and woodlands with an open and grassy understorey is present in the study area. Though there has been some

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						scattered shrubs. During autumn and winter it moves to more open and cleared areas. The Scarlet Robin forages amongst logs and woody debris for insects. The nest is an open cup of plant fibres and cobwebs, sited in the fork of a tree.	disturbance to habitat, the study area may be utilised by the species.
Petroica phoenicea	Flame Robin		VU	2018	Medium	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The preferred habitat in summer includes moist eucalyptus forests and open woodlands, in winter prefers open woodlands and farmlands. It is considered migratory. Diet	Open woodlands are present in the study area. Though there has been some disturbance to habitat, the study area may be utilised by the species.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						consists mainly of invertebrates.	
Petroica rodinogaster	Pink Robin		VU	1975	Low	The Pink Robin is found in dense, dank forests and tree fern gullies. During the winter months the Pink Robin disperses north (as far up as the central coast of NSW) and west (as far as the ACT area) into more open forests, woodlands and scrublands. The diet consists mainly of spiders and insects.	Habitat in the form of rainforest and densely vegetated gullies is absent within the study area.
Polytelis swainsonii	Superb Parrot	VU	VU	1982	Negligible	Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Forages primarily in grassy box woodland, feeding in trees and understorey shrubs	Open riparian River Red Gum forest or woodland is absent in the study area.

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						and on the ground and their diet consists mainly of grass seeds and herbaceous plants.	
Ptilinopus magnificus	Wompoo Fruit-Dove		VU	2004	Negligible	Mainly occurs in large undisturbed patches of tall tropical or subtropical rainforest. Occasionally occurs in patches of monsoon forest, closed gallery forest, wet sclerophyll forest, tall open forest, open woodland or vine thickets near rainforest.	Habitat in the form of rainforest is absent within the study area. Some tall open forest is present within the study area, however it is disturbed and unlikely to form suitable foraging habitat for the species.
Rostratula australis	Australian Painted Snipe	EN	EN	#	Negligible	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, but have been recorded in	The habitat for this species is not present in the study area, as it does not contain shallow inland wetlands. While there are waterways present in the study area, observations are generally from

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	freshwater wetlands. This species has not been observed within 5 km of the study area.
Thinornis rubricollis rubricollis	Hooded Plover	VU	CR	#	Negligible	Hooded Plovers forage in sand at all levels of the zone of wave-wash during low and mid-tide or among seaweed at high-tide, and occasionally in dune blowouts after rain. At night they favour the upper zones of beaches for roosting. When on rocks they forage in crevices in the wave-wash or spray zone, avoiding elevated rocky areas and boulder fields. In coastal lagoons they forage in damp or dry substrates and in shallow water, depending on the	Habitat in the form of coastal beaches are not present within the study area. This species has not been observed within 5 km of the study area.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						season and water levels.	
Tyto novaehollandiae	Masked Owl		VU	2013	Low	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.	This species breeds in moist eucalypt forests and woodlands. The species relies on large sized hollows with close proximity to open habitat. No suitable hollow-bearing trees are present.
Tyto tenebricosa	Sooty Owl		VU	1996	Low	The Sooty Owl is often found in tall old-growth forests, including temperate and subtropical rainforests. It is mostly found on escarpments with a mean altitude <500 m. This species nests and roosts in hollows of emergent trees,	This species prefers rainforests and moist eucalyptus forests. It also requires very large hollows for nesting. Such hollow-bearing trees are absent within the study area. Field investigations conducted during the required survey

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						mainly eucalypts often located in gullies.	period (April to August) yielded no observations of breeding.
Circus assimilis	Spotted Harrier		VU	2014	Negligible	The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast. Preferred habitat consists of open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation. The Spotted Harrier is more common in drier inland areas, nomadic part	Habitat suitable for the species is absent in the study area and the species in uncommon in coastal areas.

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees.	
Ephippiorhynchus asiaticus	Black-necked Stork		EN	1978	Low	Found in swamps, mangroves and mudflats. Can also occur in dry floodplains and irrigated lands and occasionally forages in open grassy woodland. Nests in live or dead trees usually near water.	Open grassy woodland for foraging is present within the study area, however critical habitat including swamps, mangroves and mudflats are not present.
Falco subniger	Black Falcon		VU	2013	Transient	Mainly occur in woodlands and open country where can hunt. Often associated with swamps, rivers and wetlands. Nest in tall trees along	Woodlands and watercourses are present in the study area but are located within disturbed areas. The species is uncommon in coastal areas. Presence is

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						watercourses.	likely to be limited to transient foraging.
Limosa limosa	Black-tailed Godwit		VU	1998	Negligible	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the	The habitat for this species is not present in the study area, as it does not contain estuarine wetlands or lakes. While there are waterways present in the study area, observations are generally from brackish or freshwater wetlands. The study area is not included on the Important Areas map for the species (DPIE 2021).

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						muddy shores are exposed. The species has been recorded within the Murray-Darling Basin, on the western slopes of the Northern Tablelands and in the far north-western corner of the state.	
Lophochroa leadbeateri	Major Mitchell's Cockatoo		VU	1982	Negligible	Found mainly in semi-arid and arid regions, in dry woodlands, particularly mallee - casuarina assemblages. They breed in the hollows of large trees, often near watercourse.	Critical habitat is absent from the study area. The species is uncommon in coastal regions.
Oxyura australis	Blue-billed Duck		VU	1989	Low	The Blue-billed Duck is widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up	Habitat in the form of large permanent wetlands and swamps are absent from the study area.

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						to 300 km away. It is generally only seen in coastal areas during summer. Prefers large permanent wetlands, feeding on the bottom of swaps.	
Stictonetta naevosa	Freckled Duck		VU	1983	Low	The Freckled Duck breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes, especially during drought. Often seen in groups on fallen trees and sand spits.	Habitat in the form of large permanent freshwater or brackish lakes or swamps are absent from the study area.
Turnix maculosus	Red-backed Button-quail		VU	1999	Low	Red-backed Button-quail inhabit grasslands, woodlands and cropped lands of warm temperate areas that annually receive 400 mm or more of summer rain. The species prefers sites near	This species usually inhabits grasslands and breeds in dense grass near water, therefore there is potential for habitat within the study area. There is only one record from within 5 km, over 20 years ago.

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						water, including grasslands and sedgelands near creeks, swamps and springs, and wetlands.	

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
Mammals							
Chalinolobus dwyeri	Large-eared Pied Bat	VU	VU	2019#	Medium	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler	The study area contains habitat features suitable for roosting in the form of rocky outcrops and overhangs, however there are no caves or mines within 5 km of the study area. They forage in well-timbered areas containing gullies, under the forest canopy, therefore there is unlikely to be any suitable foraging habitat in the study area.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.	
Dasyurus maculatus	Spotted-tailed Quoll	EN	VU	2001	Low	Occurs along the east coast of Australia and the Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. 70 % of the diet is	Woody debris and rock outcrops are present in the study area. Individuals require large areas of intact vegetation, which are absent from the study area and vegetation present is disturbed. No evidence of latrines were recorded during the field survey.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.	
Falsistrellus tasmaniensis	Eastern False Pipistrelle		VU	2019	Low	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and	There are some hollow-bearing trees within the study area, however habitat in the form of wet, high-altitude forests are absent.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes. Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails. Has a large foraging range, up to 136 ha. Records show movements of up to 12 km between roosting and foraging sites.	
Isoodon obesulus	Southern Brown	EN	EN	#	Negligible	This species prefers	Habitat in the form of

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
obesulus	Bandicoot (eastern)					sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	heath understorey on sandy soils is not present within the study area. This species has not been observed within 5 km of the study area.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat		VU	2020	Medium	Distribution extends east of the Great Dividing Range from southern Queensland to south of Sydney. Most records are from dry eucalypt forests and woodland. Individuals tend to forage in natural and artificial openings in forests, although it has also been caught foraging low over a rocky river within rainforest and wet sclerophyll forest habitats. The species generally roosts in hollow spouts of	Habitat in the form of hollow-bearing trees within dry eucalypt forest and woodland are present in the study area.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						large mature eucalypts (including paddock trees), although individuals have been recorded roosting in the roof of a hut, in wall cavities, and under metal caps of telegraph poles. Foraging generally occurs within a few kilometres of roosting sites.	
Miniopterus australis	Little Bent-winged Bat		VU	2019	Medium	Occurs from Northern Queensland to the Hawkesbury River near Sydney. Roost sites encompass a range of structures including caves, tunnels and stormwater drains. Young are raised by the females in large maternity colonies in caves in summer. Shows a preference for well-timbered	The study area contains habitat features suitable for roosting in the form of culverts and stormwater drains. There are no habitat features suitable for breeding within 5 km of the study area (i.e. caves, mines or tunnels).

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. The Little Bentwing bat forages for small insects (such as moths, wasps and ants) beneath the canopy of densely vegetated habitats.	
Miniopterus orianae oceanensis	Large Bent-winged Bat		VU	2020	Medium	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings,	The study area contains habitat features suitable for roosting in the form of culverts and stormwater drains. There are no habitat features suitable for breeding within 5 km of the study area (i.e. caves, mines or tunnels).

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.	
Myotis macropus	Southern Myotis		VU	2020	High	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and	Breeding and foraging habitat was considered to be present within the study area due to the presence of hollow-bearing trees within 200 m of watercourses.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects.	
Petauroides volans	Greater Glider	VU		#	Low	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.	Habitat in the form of hollow-bearing trees are present in the study area, however the hollows are in poor condition for this species, and vegetation has been disturbed. This species has not been observed within 5 km of the study area.
Petaurus australis	Yellow-bellied Glider		VU	2018	Low	Restricted to tall native forests in regions of high	Habitat in the form of hollow-bearing trees are present in the

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						rainfall along the coast of NSW. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types.	study area, however the hollows are in poor condition for this species, and vegetation has been disturbed.
Petrogale penicillata	Brush-tailed Rock-wallaby	VU	EN	#	Low	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices particularly with	Natural rocky escarpments, outcrops and cliffs, which are key habitat areas for this species, are absent from the study area. This species has not been observed within 5 km of the study area.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						northern aspects. The species forages on grasses and forbs.	
Phascolarctos cinereus	Koala	VU	VU	2020	Low	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include *Eucalyptus robusta, E. tereticornis, E. punctata, E. haemostoma* and *E. signata*. They are solitary with varying home ranges.	Native vegetation containing koala food trees are of poor quality, being heavily degraded by past disturbance and clearance. It is unlikely that the study area is used by individuals for foraging habitat due to the poor-quality of the vegetation.
Pseudomys novaehollandiae	New Holland Mouse	VU		#	Negligible	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales	Suitable habitat in the form of heathland understorey and vegetated sand dunes is absent from the study area. This species has not been

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely	observed within 5 km of the study area.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn.	
Pteropus poliocephalus	Grey-headed Flying-fox	VU	VU	2020#	Transient	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.	No camps (communal breeding/roosting sites) were identified within the study area during the field investigations. It is likely that the species uses the vegetation for transient foraging.
Saccolaimus	Yellow-bellied		VU	2019	Medium	Found throughout	Habitat in the form of

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Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
flaviventris	Sheathtail-bat					NSW in habitats including wet and dry sclerophyll forest, open woodland, acacia shrubland, mallee, grasslands and desert. They roost in tree hollows in colonies and have also been observed roosting in animal burrows, abandoned Sugar Glider nests, cracks in dry clay, hanging from buildings and under slabs of rock. Forages for insects above the canopy in forests.	hollow-bearing trees within forest and woodland are present in the study area.
Scoteanax rueppellii	Greater Broad-nosed Bat		VU	2019	Medium	Occurs along the Great Dividing Range and in coastal areas. Occurs in woodland and rainforest, preferring open habitats or openings in wetter forests. Often hunts along creeks or river	Habitat in the form of hollow-bearing trees within forest and woodland are present in the study area.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						corridors. Preys upon beetles and other large, flying insects, other bats and spiders. Roosts in hollow tree trunks and branches.	
Vespadelus troughtoni	Eastern Cave Bat		VU	2020	Medium	Found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. It roosts in small groups, often in well-lit overhangs and caves, mine tunnels, road culverts, and occasionally in buildings.	The study area contains habitat features suitable for roosting in the form of culverts and stormwater drains, and sandstone overhangs. There are no habitat features suitable for breeding within 5 km of the study area (i.e. caves, mines or tunnels).
Reptiles							
Hoplocephalus bungaroides	Broad-headed Snake	VU	EN	#	Negligible	Mainly occurs in association with communities occurring on Triassic	Habitat in for the form of rock crevices within close proximity to hollow-bearing

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer.	trees is not present within the study area. This species has not been observed within 5 km of the study area.
Frogs							
Heleioporus australiacus	Giant Burrowing Frog	VU	VU	#	Negligible	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the	This species is not known to occur within previously disturbed areas. It has also been reported as being potentially unwilling or unable to burrow into soil covered by grasses and crops (Penman & Mahony 2004). Whilst the

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250 m from breeding sites.	species spends most of its time in heath, woodland and dry sclerophyll forest areas, these areas are typically within 300 metres of breeding sites (DPIE 2019d). There are some potential breeding sites located in the study area, however the disturbance to the area makes it unlikely habitat. This species has not been observed within 5 km of the study area.
Litoria aurea	Green and Golden Bell Frog	VU	EN	2000#	Low	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC. The species is found in	Semi-permanent wet areas associated with a first order creekline are considered potential habitat for the species. There are several small waterways in the study area however they are degraded.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks , although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop, feed on algae and other vegetative	There is one record of Green and Golden Bell Frog from within the last ten years that is located within 5 km of the study area, however there is no connectivity to impacted waterways.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						matter. Adults eat insects as well as other frogs, including juveniles of their own species.	
Litoria littlejohni	Littlejohn's Tree Frog	VU	VU	#	Negligible	The species is distributed along the eastern slopes of the Great Dividing Range from Watagan State Forest near Wyong, south to Buchan in north-eastern VIC. It is not known from coastal habitats. Occurs in wet and dry sclerophyll forests and heath communities associated with sandstone outcrops between 280 and 1000 m. Littlejohn's Tree Frog prefers permanent and semi-permanent rock flowing streams, but individuals have also been collected from	Habitat in the form of heath-based forests and woodlands are absent from the study area. This species has not been observed within 5 km of the study area.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						semi-permanent dams with some emergent vegetation. Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. The species breeds in autumn but will also breed after heavy rainfall in spring and summer. The species has been recorded calling in all seasons with variously reported peak calling periods. Eggs are laid in loose gelatinous masses attached to submerged twigs; eggs and tadpoles are most often recorded in slow-flowing pools that receive extended exposure to sunlight.	

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
Mixophyes balbus	Stuttering Frog	VU	EN	#	Negligible	This species is usually associated with mountain streams, wet mountain forests and rainforests. It rarely moves very far from the banks of permanent forest streams, although it will forage on nearby forest floors. Eggs are deposited in leaf litter on the banks of streams and are washed into the water during heavy rains.	Breeding habitat for the species (i.e. stream and watercourses with rock shelves or shallow riffles) is not present within the study area. The vegetation within the study area is not considered suitable as foraging habitat due to the high level of exotic grasses and herbaceous annuals within the understorey stratum. This species has not been observed within 5 km of the study area.
Pseudophryne australis	Red-crowned Toadlet		VU	2018	Negligible	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species	The study area has low topographic relief, and while the study area does contain some sandstone overhangs, these are not associated with

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						typically breeds within small ephemeral creeks characterised by a series of shallow pools that feed into larger semi-perennial streams.	waterways therefore there is no suitable habitat for the species within the study area.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
Fish							
Macquaria australasica	Macquarie Perch	EN	EN	#	Negligible	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries	No suitable habitat for this species exists within the study area and the waterways are disconnected from suitable habitat. This species has not been observed within 5 km of the study area.
Prototroctes maraena	Australian Grayling	VU	EN	#	Negligible	The Australian Grayling occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range from Sydney southwards to the	No suitable habitat for this species exists within the study area and the waterways are disconnected from suitable habitat. This species has not been observed within

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						Otway Ranges in Victoria, and Tasmania. Australian grayling do not occur in the inland Murray–Darling Basin system. Grayling is a diadromous species; migrating between freshwater streams and the ocean. This species has been found in clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops, and also in muddy-bottomed, heavily silted habitats.	5 km of the study area.
Gastropods							
Meridolum corneovirens	Cumberland Plain Land Snail		EN	2020	High	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is	Habitat for this species includes Cumberland Plain Woodland, Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and River-flat

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge.	Eucalypt Forest. These TECs are present in the study area and potential habitat exists in the form of leaf litter.
Pommerhelix duralensis	Dural Land Snail	EN	EN	2019#	High	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have	Habitat for this species includes forested habitats with native ground cover and woody debris, which exists within the study area. The speices has been recorded recently by previous ecological assessment within the extent of the Rouse Hill WRP.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also 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.	
Insects							
Synemon plana	Golden Sun Moth	CR	EN	#	Negligible	The Golden Sun Moth is found in the area between Queanbeyan, Gunning, Young and Tumut. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands, with	There is no habitat critical to the species within the study area. This species has not been observed within 5 km of the study area.

Scientific name	Common name	Conservation status		Most recent record	Likely occurrence in study area	Habitat description	Rationale
		EPBC	BC/FM				
						ground layer dominated by wallaby grasses of the genus *Austrodanthonia*.	

Migratory species (EPBC Act listed)

The following table includes a list of migratory species that have potential to occur within the study area. The list is based on database searches outlined in Section 3.1.

Bold denotes species recorded in the study area during the current assessment.

Table A.28 Migratory fauna species recorded or predicted to occur within 5 kilometres of the study area

Scientific name	Common name	Most recent record
Actitis hypoleucos	Common Sandpiper	#
Apus pacificus	Fork-tailed Swift	2018#
Ardea ibis	Cattle Egret	2013
Calidris acuminata	Sharp-tailed Sandpiper	#
Calidris ferruginea	Curlew Sandpiper	#
Calidris melanotos	Pectoral Sandpiper	#
Calidris ruficollis	Red-necked Stint	2013
Gallinago hardwickii	Latham's Snipe	2015#
Haliaeetus leucogaster	White-bellied Sea-Eagle	2020
Hirundapus caudacutus	White-throated Needletail	2015#
Hirundo rustica	Barn Swallow	2010
Motacilla flava	Yellow Wagtail	#
Numenius madagascariensis	Eastern Curlew	#
Pluvialis squatarola	Grey Plover	2012
Tringa nebularia	Common Greenshank	#
Calidris subminuta	Long-toed Stint	1977
Limosa limosa	Black-tailed Godwit	1998
Merops ornatus	Rainbow Bee-eater	2010
Numenius minutus	Little Curlew	1981
Numenius phaeopus	Whimbrel	1999
Philomachus pugnax	Ruff	2003
Plegadis falcinellus	Glossy Ibis	2013
Pluvialis fulva	Pacific Golden Plover	2015
Tringa glareola	Wood Sandpiper	2015
Tringa stagnatilis	Marsh Sandpiper	2015

Appendix 3 Significant Impact Criteria assessments

The following section provides for Significant Impact Criteria assessments as outlined in the *Matters of National Environmental Significance: Significant impact guidelines 1.1* (CoA 2013) for all biota listed under the EPBC Act that have likelihood of impact or occurrence rated as medium or greater.

Threatened Ecological Communities

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest– Critically Endangered Ecological Community EPBC Act

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest represent certain occurrences of the coastal plain grassy eucalypt woodlands that are endemic to the shale hills and plains of the Sydney Basin Bioregion in NSW and which occur primarily in, but not limited to, the Cumberland Sub-region. The ecological community incorporates the grassy eucalypt shale hills and plains woodlands and the shale-gravel transition forests of this region.

The community typically occurs on flat to undulating or hilly terrain, at elevations up to approximately 350 metres above sea level. Some occurrences may extend onto locally steep sites at slightly higher elevations. Most occurrences are on clay soils derived from Wianamatta Group geology, with limited to rare occurrences on other soil types.

In 2009, the ecological community occupied a maximum area of approximately 12,300 hectares but is highly fragmented into generally small remnants, mostly under 10 hectares in size (Tozer 2003). The main and ongoing threats to the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community as outlined in the Approved Conservation Advice (TSSC 2009) include clearing for urban, industrial or rural development, the consequent fragmentation of native vegetation remnants, inappropriate grazing and fire regimes, weed invasion and the low level of protection in reserves. Vegetation clearance was, and continues to be, the major contributor to the loss and fragmentation of native vegetation across the Cumberland Plain. The continuing decline is predominately a consequence of dispersed, small scale clearing actions associated with urban development.

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest within the study area

Cumberland Plain shale Woodlands and Shale-Gravel Transition Forest aligns with PCT 849, and generally occurs in high quality or well-connected remnant within the study area. A total of 0.01 hectares of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest occurs within the impact area which is subject to self-assessment under the EPBC Act. An assessment of the impacts of this vegetation in accordance with the *Matters of National Environmental Significance Significant impact guidelines* is provided below.

Table A.29 SIC assessment for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest

SIC assessment for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
Reduce the extent of an ecological community.
The proposed works requires the removal of 0.01 hectares of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest CEEC which exists as a small strip along the edge of a larger patch of CEEC. The northern and southern alignment of the impact area contains large patches of contiguous Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest totalling greater than 20 ha. The vegetation to be impacted, either directly or indirectly, as a result of the

SIC assessment for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest

proposed works equates to less than 0.01% of the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest recorded within the study area and broader local area.

In addition, during the planning stages of the proposal, efforts were made to ensure that potential impacts to Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest are avoided and minimised. Sydney Water has taken a precautionary approach of including a 15 metre wide corridor within the impact area, which is an overestimate of the actual area of impact required for the proposal. Furthermore, a portion of the impacts to Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest within the study area relevant to the current proposal are in the form of canopy trimming, which will not constitute the complete removal of vegetation. Given this, it is unlikely that a relatively localised impact along the edge of the TECs extent of occurrence will result in a significant reduction of the extent of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest.

Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.

The proposed works requires vegetation clearance from within a 15 metre wide corridor, and the removal of 0.01 hectares of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest is expected. The occurrences of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest in the study area are predominantly along roadside reserves, where permanent man-made structures, including roads and buildings, contribute to existing fragmentation of the CEEC. Although the impact area dissects the CEEC at several points across the landscape, associated impacts are not considered substantial and will not result in substantial decreases in connectivity of canopy vegetation. Any resulting fragmentation will not significantly reduce connectivity as the impacts occur within already fragmented patches of the CEEC.

The approved conservation advice for the CEEC states that areas of vegetation further than 100 metres from one another are no longer defined as a patch. With this in consideration, the proposed removal of 0.01 hectares will not result in the physical fragmentation of linear occurrences of the CEEC. Edge effects may increase as a result of the proposal, but these are again not expected to be significant.

Adversely affect habitat critical to the survival of an ecological community.

The Matters of National Environmental Significance Significant impact guidelines (Commonwealth of Australia 2013) state the 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators),
- To maintain genetic diversity and long term evolutionary development, or
- For the reintroduction of populations or recovery of the species or ecological community.

No such habitat has been identified in a recovery plan for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, nor is it listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

The proposal will directly impact upon 0.01 hectares of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, which occurs largely in an edge-affected state. Given that the proposed works will impact on only the fringes of larger patches of the CEEC, and contiguous patches will remain in the broader landscape, it is unlikely that the proposal will have an adverse effect on any habitat that is critical to the community's survival.

Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.

Construction will result in localised disturbance to soil, hydrology and topography. However, the proposal is not expected to result in substantial alteration to surface water patterns as the impact area will be rehabilitated following completion of construction works. The final rehabilitated form of the areas of open trenching will ensure ground levels are re-profiled to a stable landform consistent with original contours. Alterations to hydrological patterns may also occur, but the area of the TEC impacted in this is not expected to be substantial due to its occurrence further back from the riverbank and on higher parts of the floodplain. Mitigation measures would ensure that downstream indirect impacts (such as sediment and

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SIC assessment for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
nutrient transportation) would be controlled and would not impact remaining areas of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest in the locality. As such, the proposal is not expected to result in impacts that modify or destroy abiotic factors necessary for the survival of the CEEC.
Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.
The occurrence of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest is defined as the patch of the community that occurs within the study area and extends into an adjacent area in a contiguous manner without major breaks in connectivity. All Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest in the local area occurs in a fragmented landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. Land use impacts from clearing and grazing have reduced community integrity and functionality in southern NSW (e.g. loss of small native mammals, reduced flora species richness, reduced genetic exchange across the community due to fragmentation). Clearing for the proposal is unlikely to further reduce species diversity and simplify community structure more broadly. The adjacent areas of the community within the broader area will remain intact and are unlikely to suffer substantial changes in species composition.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: - ***Assisting invasive species establishment*** ***- 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.***
All Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest within the study area is subject to existing weed invasion, pest animals, erosion and chemical inputs as a result of surrounding land uses. Nonetheless, the proposed works are not considered likely to increase weed or pest invasion, or cause mobilisation of fertilisers, herbicides or other chemical within the CEEC. Construction activities can be managed through standard practices to avoid further sedimentation and pollution. Therefore, the proposed works are unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the CEEC.
Interfere with the recovery of an ecological community.
There is no Commonwealth adopted Recovery Plan for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest. However, the CEEC is included in the Cumberland Plain Recovery Plan (DECCW 2010), a multi-entity recovery plan that has been prepared for 20 threatened species, populations and ecological communities that occur within the 'Cumberland Plain' region in western Sydney. The recovery plan has the following objectives: • To build a protected area network, comprising public and private lands, focused on the priority conservation lands. • To deliver best practice management for threatened biodiversity across the Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation. • To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program. • To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner The proposal requires the removal of 0.01 hectares of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest. This constitutes localised impacts to the CEEC that exists in an edge-effected and fragmented state. Hence, the proposal will not result in impacts likely to be adverse to any of the other objectives of the Cumberland Plain Conservation Plan. Interference with the commonwealth conservation advice can also be minimised by implementing management

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SIC assessment for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
strategies and ensuring any potential impacts are avoided if possible.
Conclusion
Based on the assessment provided above, it is concluded that Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest is unlikely to be significantly impacted by the proposal. This conclusion was made on the basis that the proposed action is unlikely to contribute to substantial fragmentation of the community, unlikely to contribute to local scale reduction in the extent and functionality of the community, is unlikely to adversely affect habitat critical to the community's survival and is unlikely to interfere with the recovery of the ecological community.

Shale Sandstone Transition Forest of the Sydney Basin Bioregion– Critically Endangered Ecological Community EPBC Act

Shale Sandstone Transition Forest is listed as Critically Endangered under the EPBC Act and occurs only in NSW, within the Sydney Basin Bioregion. The ecological community occurs between other ecological communities found respectively on shale or sandstone substrates. The ecological community is found to the west of Sydney, on the edges of the Cumberland Plain, as well as on the sandstone-dominated Hornsby, Woronora, and Lower Blue Mountains plateaux that adjoin the plain. Shale Sandstone Transition Forest generally occurs in areas receiving between 800 millimetres and 1100 millimetres mean annual rainfall. Typically, it occurs at elevations less than 200 metres above sea level. The vegetation of the CEEC is forest or woodland with an overstorey dominated by various Eucalypt species and an understorey comprising of sclerophyll shrubs, grasses and herbs. The structure and composition of vegetation are primarily determined by the transitional geology between Wianamatta shale and Hawkesbury sandstone and vary considerably depending on the degree and the source of shale influence.

Shale Sandstone Transition Forest within the study area

Shale Sandstone Transition Forest aligns with PCT 1395 and PCT 1081 in moderate condition within the study area. A total of 1.24 hectares of the CEEC occurs within the impact area which is subject to self-assessment under the EPBC Act. An assessment of the impacts of this vegetation in accordance with the *Matters of National Environmental Significance Significant impact guidelines* is provided below.

Table A.30 SIC assessment for Shale Sandstone Transition Forest

SIC assessment for Shale Sandstone Transition Forest
Reduce the extent of an ecological community.
The proposed works require the removal of 1.24 hectares of Shale Sandstone Transition Forest which exists as a small strip along the edge of larger patches native vegetation. The northern and southern alignment of the impact area contains moderate amounts of contiguous Shale Sandstone Transition Forest, totalling greater than 50 ha. The vegetation to be impacted, either directly or indirectly, as a result of the proposed works, equates to 2% of the CEEC recorded within the study area and broader local area, and will therefore reduce the extent of the ecological community within the locality. However, during the planning stages of the proposal, efforts were made to ensure that potential impacts to Shale Sandstone Transition Forest are avoided and minimised where practical. Sydney Water has taken a precautionary approach of including a 15 metre wide corridor within the impact area, which is an overestimate of the actual area of impact required for the proposal. Further, an additional 0.50 ha of indirect impact to Shale Sandstone Transition Forest within the study area relevant to the current proposal will occur in the form of canopy trimming, which will not constitute the complete removal of vegetation. Given this, it is unlikely that a relatively localised impact along the edge of the extent of occurrence of the CEEC will result in a significant reduction of the extent of Shale Sandstone Transition Forest in the locality.

SIC assessment for Shale Sandstone Transition Forest
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.
The proposed works requires vegetation clearance from within a 15 metre wide corridor, and the removal of 1.24 hectares of Shale Sandstone Transition Forest is expected. The occurrences of Shale Sandstone Transition Forest in the study area are predominantly along roadside reserves, where permanent physical barriers, including roads and buildings, contribute to existing fragmentation of the CEEC. Although the impact area dissects the CEEC at several points across the landscape, associated impacts are not considered substantial and will not result in substantial decreases in connectivity of canopy vegetation. Any resulting fragmentation will not significantly reduce connectivity as the impacts occur within already fragmented patches of the CEEC. Edge effects may increase as a result of the proposal, but these are again not expected to be significant.
Adversely affect habitat critical to the survival of an ecological community.
The Matters of National Environmental Significance Significant impact guideline (Commonwealth of Australia 2013) state the 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary: • For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators), • To maintain genetic diversity and long term evolutionary development, or • For the reintroduction of populations or recovery of the species or ecological community. There is no adopted or made Recovery Plan for Shale Sandstone Transition Forest, and as such no such habitat critical to the survival of the community has been identified. The proposal will directly impact upon 1.24 hectares of Shale Sandstone Transition Forest, which occurs largely in an edge-affected state. Given there is no identified critical habitat within the study area, and that the proposed works will impact on only the fringes of larger patches of the CEEC, and contiguous patches will remain in the broader landscape, it is unlikely that the proposal will have an adverse effect on any habitat that is critical to the community's survival.
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.
Construction will result in localised disturbance to soil, hydrology and topography. However, the proposal is not expected to result in substantial alteration to surface water patterns as the impact area will be rehabilitated following completion of construction works. The final rehabilitated form of the areas of open trenching will ensure ground levels are re-profiled to a stable landform consistent with original contours. Alterations to hydrological patterns may also occur, but the area of Shale Sandstone Transition Forest impacted in this is not expected to be substantial due to its occurrence further back from the riverbank and on higher parts of the floodplain. Mitigation measures would ensure that downstream indirect impacts (such as sediment and nutrient transportation) would be controlled and would not impact remaining areas of Shale Sandstone Transition Forest in the locality. As such, the proposal is not expected to result in impacts that modify or destroy abiotic factors necessary for the survival of the CEEC.
Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.
The occurrence of Shale Sandstone Transition Forest is defined as the patch of the community that occurs within the study area and extends into an adjacent area in a contiguous manner without major breaks in connectivity. The community occurs in a landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. Land use impacts from drainage works, clearing, cropping and grazing have reduced the community integrity and functionality (e.g. loss of hydrological functioning, reduced flora species richness, reduced genetic exchange across the community due to fragmentation). Clearing required for the proposal is unlikely to further reduce species

SIC assessment for Shale Sandstone Transition Forest
diversity and simplify community structure. The adjacent areas of the community within the broader area will remain intact and are unlikely to suffer substantial changes in species composition.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: - ***Assisting invasive species establishment*** ***- 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.***
All Shale Sandstone Transition Forest within the study area are subject to existing weed invasion, pest animals, erosion and chemical inputs as a result of surrounding land uses. Nonetheless, the proposed works are not considered to increase weed or pest invasion, or cause mobilisation of fertilisers, herbicides or other chemical within the CEEC. Construction activities can be managed through standard practices to avoid further sedimentation and pollution. Therefore, the proposed works are unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the CEEC.
Interfere with the recovery of an ecological community.
Shale Sandstone Transition Forest does not currently have an adopted or made recovery plan. However, recovery and threat abatement actions to support the recovery of Shale Sandstone Transition Forest has been described in the conservation advice (DoE 2014). Some of the high priority conservation actions significant to the proposed works are: • Avoid further clearance and fragmentation of patches of the ecological community and surrounding native vegetation, including derived grasslands/shrublands. • Minimise impacts from any developments and activities adjacent to patches that might result in further degradation (for example by applying buffer zones). • Retain other native vegetation remnants, derived grasslands or shrublands and paddock trees near patches of the ecological community and create or restore wildlife corridors and linkages. • Manage any changes to hydrology or disruptions to water flows that may result in changes to water table levels and/or increased run-off, salinity, sedimentation or pollution. Interference with the objectives of the Commonwealth conservation advice can be minimised by implementing management strategies and ensuring any potential impacts are avoided if possible. However, as the proposed works will cause clearing of the community and changes to the hydrology, interference with the objectives of the Commonwealth conservation advice is likely.
Conclusion
Based on the assessment provided above, it is concluded that Shale Sandstone Transition Forest is unlikely to be significantly impacted by the proposal. This conclusion was made on the basis that the proposed action is unlikely to contribute to substantial fragmentation of the community, unlikely to contribute to local scale reduction in the extent and functionality of the community and is unlikely to adversely affect habitat critical to the community's survival.

River-flat Eucalypt Forest on Coastal Floodplains of Southern New South Wales and Eastern Victoria – Critically Endangered Ecological Community EPBC Act

River-flat Eucalypt Forest on coastal floodplains of southern New South Wales and eastern Victoria occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans. Floodplains may be occasionally or more often saturated, water-logged or inundated

River-flat Eucalypt Forest occurs on coastal floodplains of southern New South Wales and eastern Victoria occurs on productive agricultural land, or in close proximity to coastal areas, where continuing population growth and urban development is expected. Historically, clearing was primarily for timber and agriculture, and actions such as culling of native fauna were undertaken largely to support agricultural productivity, while in recent times it is more likely to occur for residential and industrial development. The nature of some areas of the ecological community has changed structurally due to clearing, followed by regrowth that is likely to be subject to altered fire and water regimes and livestock grazing.

River-flat Eucalypt Forest within the study area

River-flat Eucalypt Forest aligns with PCT 835, which is primarily in poor condition within the study area. A total of 1.57 hectares of River-flat Eucalypt Forest occurs within the impact area which is subject to self-assessment under the EPBC Act. An assessment of the impacts of this vegetation in accordance with the *Matters of National Environmental Significance Significant impact guidelines* is provided below.

Table A.31 SIC assessment for River-flat Eucalypt Forest

SIC assessment for River-flat Eucalypt Forest
Reduce the extent of an ecological community.
The extent of the River-flat Eucalypt Forest includes approximately 7.7 hectares within the study area, of which 1.57 hectares will be removed under the current proposal. Areas classified as River-flat Eucalypt Forest within the study area consists of edge-affected vegetation found along drainage lines across the local area. The vegetation to be impacted, either directly or indirectly, as a result of the proposed works equates to less than 2% of the River-flat Eucalypt Forest recorded within the broader local area. In addition, during the planning stages of the proposal, efforts were made to ensure that potential impacts to River-flat Eucalypt Forest are avoided and minimised. Sydney Water has taken a precautionary approach of including a 15 metre wide corridor within the impact area, which is an overestimate of the actual area of impact required for the proposal. Further, an additional 0.60 ha of indirect impact to River-flat Eucalypt Forest within the study area relevant to the current proposal will occur in the form of canopy trimming, and areas of under-boring, which will not constitute the complete removal of vegetation. Given this, it is unlikely that a relatively localised impact along the edge of the extent of occurrence of River-flat Eucalypt Forest will result in a significant reduction of the extent of the CEEC.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.
The proposed works is confined to the disturbed edge of the River-flat Eucalypt Forest. In addition, the contiguous stands of the River-flat Eucalypt Forest will be retained. Hence, whilst the works may result in minor fragmentation to the patch of the ecological community, is not determined to cause a substantial decrease to the community within the local extent. The removal of the vegetation is not likely to decrease condition or increase fragmentation to adjoining bushland.
Adversely affect habitat critical to the survival of an ecological community.
All EPBC listed vegetation is considered critical habitat to the survival of River-flat Eucalypt Forest. Given this, a total of 1.57 hectares of River-flat Eucalypt Forest was found to meet the listing criteria and will be removed or disturbed within the study area. As the proposal will result in a reduction in the community's area as a result of vegetation removal, the proposal would be considered likely to have an adverse effect on habitat that is critical to the community's survival. However, the works are limited to edge-affected areas of the River-flat Eucalypt Forest community and will be limited to trimming of canopy vegetation where possible. Thus, although removal of River-flat Eucalypt Forest within the study area will occur, it is unlikely to adversely affect the ecological community as a whole.

SIC assessment for River-flat Eucalypt Forest
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.
Construction will result in localised disturbance to soil, hydrology and topography. However, the proposal is not expected to result in substantial alteration to surface water patterns as the impact area will be rehabilitated following completion of construction works. The final rehabilitated form of the areas of open trenching will ensure ground levels are re-profiled to a stable landform consistent with original contours. Alterations to hydrological patterns may also occur, which may cause some impact to River-flat Eucalypt Forest due to its occurrence on the riverbanks of drainage lines across the study area. Mitigation measures would ensure that downstream indirect impacts (such as sediment and nutrient transportation) would be controlled and would not impact remaining areas of River-flat Eucalypt Forest in the locality. As such, the proposal is not expected to result in impacts that modify or destroy abiotic factors necessary for the survival of the CEEC.
Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.
The occurrence of River-flat Eucalypt Forest is defined as the patch of the community that occurs within the study area and extends into an adjacent area in a contiguous manner without major breaks in connectivity. The community occurs in a landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. Land use impacts from drainage works, clearing, cropping and grazing have reduced the community integrity and functionality (e.g. loss of hydrological functioning, reduced flora species richness, reduced genetic exchange across the community due to fragmentation). Clearing required for the proposal is unlikely to further reduce species diversity and simplify community structure. The adjacent areas of the community within the broader area will remain intact and are unlikely to suffer substantial changes in species composition.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: - ***Assisting invasive species establishment*** ***- 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.***
All River-flat Eucalypt Forest within the study area is subject to existing weed invasion, pest animals, erosion and chemical inputs as a result of surrounding land uses. Nonetheless, the proposed works are not considered to increase weed or pest invasion, or cause mobilisation of fertilisers, herbicides or other chemical within the CEEC. Construction activities can be managed through standard practices to avoid further sedimentation and pollution. Therefore, the proposed works are unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the CEEC.
Interfere with the recovery of an ecological community.
River-flat Eucalypt Forest does not currently have an adopted or made recovery plan. However, within the Commonwealth Conservation Advice (DAWE 2020) recovery strategies have been listed to support the recovery of River-flat Eucalypt Forest. Some of the priority conservation actions significant to the proposed works are: • Protect and conserve remaining areas of the ecological community. • Avoid further clearance and destruction of the ecological community. • Retain other native vegetation near patches of the ecological community, where they are important for connectivity, diversity of habitat, and/or act as buffer zones between the ecological community and threats or development zones. • Protect patches identified as wildlife refuges, or of regional importance in formal conservation reserves. • Protect mature and over-mature trees and stags, particularly with hollows. Interference with the objectives of the Commonwealth conservation advice can be minimised by implementing

SIC assessment for River-flat Eucalypt Forest
management strategies and ensuring any potential impacts are avoided if possible. Impacts to River-flat Eucalypt Forest have been avoided and minimised through the initial proposal design phase, retaining large, intact patches of the community and mature canopy trees where possible. However, as the proposed works will cause clearing of the community, it is determined the proposed actions are considered likely to interfere with recovery actions.
Conclusion
Based on the assessment provided above, it is concluded that River-flat Eucalypt Forest is unlikely to be significantly impacted by the proposal. This conclusion was made on the basis that the proposed action is unlikely to contribute to substantial fragmentation of the community, unlikely to contribute to local scale reduction in the extent and functionality of the community, unlikely to result in impacts that modify or destroy abiotic factors necessary for the survival of the CEEC and is unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the CEEC.

Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community–Endangered Ecological Community EPBC Act

The ecological community occurs in sub-tropical, sub-humid and temperate climatic zones from Curtis Island, north of Gladstone, in Queensland to Bermagui in southern New South Wales. The community occurs in coastal catchments, mostly at elevations of less than 20 metres above sea-level that are typically found within 30 kilometres of the coast. However, this distance varies by catchment; for example, low elevations can occur as far as 40 kilometres inland on the Hawkesbury River, or more than 100 kilometres on the Clarence River.

The ecological community is typically found where groundwater is saline or brackish, but can occur in areas where groundwater is relatively fresh. It is typically found on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated. These are typically associated with low-lying coastal (Eby & Lunney 2002) floodplains and alluvial flats. Minor occurrences can be found on coastal dune swales or flats, particularly deflated dunes and dune soaks.

Extensive land clearing and landscape modification over the past 200 years has permanently altered the state of Coastal Swamp Oak Forest. Much of what remains consists of regrowth, and the integrity of the remaining patches is severely compromised, particularly by weed invasion and changes to hydrological processes. As the ecological community has been heavily cleared, fragmented and degraded, many remnants are smaller than they once were, or more isolated and/or modified.

Coastal Swamp Oak Forest within the study area

Coastal Swamp Oak Forest aligns with PCT 1800 in moderate condition within the study area. A total of 0.11 hectares of Coastal Swamp Oak Forest occurs within the impact area which is subject to self-assessment under the EPBC Act. An assessment of the impacts of this vegetation in accordance with the *Matters of National Environmental Significance Significant impact guidelines* is provided below.

Table A.32 SIC assessment for Coastal Swamp Oak Forest

SIC assessment for Coastal Swamp Oak Forest
Reduce the extent of an ecological community.
The proposed works requires the removal of 0.11 hectares of Coastal Swamp Oak Forest EEC which occurs along streams and drainage lines across the study area. The vegetation to be impacted, either directly or indirectly, as a result of the proposed works equates to less than 1% of the Coastal Swamp Oak Forest community recorded within the study area and

SIC assessment for Coastal Swamp Oak Forest
broader local area. In addition, during the planning stages of the proposal, efforts were made to ensure that potential impacts to Coastal Swamp Oak Forest are avoided and minimised as much as practicable. Sydney Water has taken a precautionary approach of including a 15 metre wide corridor within the impact area, which is an overestimate of the actual area of impact required for the proposal. Further, a portion of the impacts to Coastal Swamp Oak Forest within the study area relevant to the current proposal are in the form of canopy trimming and under boring, which will not constitute the complete removal of vegetation. Given this, it is unlikely that a relatively localised impact along the edge of the extent of occurrence for Coastal Swamp Oak Forest will result in a significant reduction of the extent of the EEC.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.
The proposed works is confined to the disturbed edge of the Coastal Swamp Oak Forest. In addition, the contiguous regions of the Coastal Swamp Oak Forest will remain. Hence, whilst the works may result in minor fragmentation to Coastal Swamp Oak Forest across the study area, it is unlikely to cause a substantial decrease to the community within the local extent. Any resulting fragmentation will not significantly reduce connectivity as the impacts occur within or adjacent to already fragmented patches of the EEC. Edge effects may increase as a result of the proposal, but these are again not expected to be substantial.
Adversely affect habitat critical to the survival of an ecological community.
The Approved Conservation advice for Coastal Swamp Oak Forest states: "The habitat most critical to the survival of the ecological community are those patches that are of a reasonable size and in the best condition (i.e. Categories A and B in Table 1 of the Conservation Advice). They are patches that retain the highest diversity and most intact structure and ecological function. Given this, a total of 0.11 hectares of Coastal Swamp Oak Forest was found to meet the listing criteria and will be impacted by the current proposal. As the proposal will result in a reduction in the community's area as a result of vegetation removal, the proposal would be considered likely to have an adverse effect on habitat that is critical to the community's survival. However, the works are limited to edge-affected areas of the Coastal Swamp Oak Forest community and will be limited to trimming of canopy vegetation where possible. Thus, although removal of Coastal Swamp Oak Forest within the study area will occur, it is unlikely to adversely affect the ecological community as a whole.
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.
Construction will result in localised disturbance to soil, hydrology and topography. However, the proposal is not expected to result in substantial alteration to surface water patterns as the impact area will be rehabilitated following completion of construction works. The final rehabilitated form of the areas of open trenching will ensure ground levels are re-profiled to a stable landform consistent with original contours. Alterations to hydrological patterns may also occur, which may cause some impact to Coastal Swamp Oak Forest due to its occurrence on the riverbanks of drainage lines across the study area. Mitigation measures would ensure that downstream indirect impacts (such as sediment and nutrient transportation) would be controlled and would not impact remaining areas of Coastal Swamp Oak Forest in the locality. As such, the proposal is not expected to result in impacts that modify or destroy abiotic factors necessary for the survival of the EEC.
Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.
The occurrence of Coastal Swamp Oak Forest is defined as the patch of the community that occurs within the study area and extends into an adjacent area in a contiguous manner without major breaks in connectivity. The community occurs in a landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. Land use impacts from drainage works, clearing, cropping and grazing have reduced the community integrity and

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SIC assessment for Coastal Swamp Oak Forest
functionality (e.g. loss of hydrological functioning, reduced flora species richness, reduced genetic exchange across the community due to fragmentation). Clearing required for the proposal is unlikely to further reduce species diversity and simplify community structure. The adjacent areas of the community within the broader area will remain intact and are unlikely to suffer substantial changes in species composition.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: - ***Assisting invasive species establishment*** ***- 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.***
All Coastal Swamp Oak Forest within the study area are subject to existing weed invasion, pest animals, erosion and chemical inputs as a result of surrounding land uses. Nonetheless, the proposed works are not considered to increase weed or pest invasion, or cause mobilisation of fertilisers, herbicides or other chemical within the EEC. Construction activities can be managed through standard practices to avoid further sedimentation and pollution. Therefore, the proposed works are unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the EEC.
Interfere with the recovery of an ecological community.
A National Recovery Plan for Coastal Swamp Oak Forest has not been produced, however the Approved Conservation Advice (DEE 2018) sufficiently outlines the priority actions needed for this ecological community. Some of the high priority conservation actions significant to the proposed works are: • Protect and conserve remaining areas of the ecological community, including protecting potential areas of natural or managed retreat (e.g. upslope and upstream of current occurrences). • Avoid further clearance and destruction of the ecological community. • Retain other native vegetation remnants, near patches of the ecological community, where they are important for connectivity, diversity of habitat and act as buffer zones between the ecological community and threats or development zones. Interference with the objectives of the Commonwealth conservation advice can be minimised by implementing management strategies and ensuring any potential impacts are avoided if possible. However, as the proposed works will cause clearing of the community and changes to the hydrology, interference with the objectives of the Commonwealth conservation advice is likely.
Conclusion
Based on the assessment provided above, it is concluded that Coastal Swamp Oak Forest is unlikely to be significantly impacted by the proposal. This conclusion was made on the basis that the proposed action is unlikely to contribute to substantial fragmentation of the community, unlikely to contribute to local scale reduction in the extent and functionality of the community, unlikely to result in impacts that modify or destroy abiotic factors necessary for the survival of the EEC and is unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the EEC.

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Threatened flora species

Eucalyptus sp. Cattai– Critically Endangered species EPBC Act

Eucalyptus sp. Cattai is listed as Critically Endangered under the Commonwealth EPBC Act. It is a small, often mallee-form tree to 4.5 metres tall with thick, somewhat fibrous, furrowed bark which is loose on the lower trunk. The species occurs in The Hills Local Government Area, with known populations occurring within the area bounded by Kellyville - Maraylya - Glenorie. Occurs as a rare emergent tree in scrub, heath and low woodland on sandy soils, usually as isolated individuals or occasionally in small clustered groups. The sites at which it occurs are generally flat and on ridge tops.

Eucalyptus sp. Cattai within the study area

Previous records of *Eucalyptus* sp. Cattai exist in the surrounding locality (482 records within 5 kilometres of the study area, with the most recent collected in 2020 and the closest record was approximately 3.5 kilometres from the study area). *Eucalyptus* sp. Cattai is associated with three vegetation communities within the study area, PCT 1081, PCT 1083 and PCT 1181.

Given the associated vegetation communities identified within the study area, the species has potential to occur in habitat within the study area. The proposed works will result in the removal of up to 4.24 hectares of potential habitat for the species. A self-assessment of whether the proposal is likely to lead to a significant impact on *Eucalyptus sp.* Cattai is provided below.

Table A.33 SIC assessment for *Eucalyptus sp.* Cattai

SIC assessment for *Eucalyptus sp. Cattai*
Lead to a long-term decrease in the size of a population.
Eucalyptus sp. Cattai was not recorded within the study area during field surveys, however, due to the large size of the study area, all areas of potential habitat for this species were not able to be surveyed and isolated occurrences of the species may remain undetected. Given there is a presence of associated vegetation communities within the study area, the study area may provide potential habitat for the species. Potential impacts to the local population of the species, associated with a 15 metre wide corridor for the proposed works, are considered localised in nature and relatively short-term (operational phase will maintain a native groundcover and significant areas of canopy vegetation). Although there is potential for the species to occur in 4.24 hectares of habitat within the study area, this potential habitat has been subject to previous edge effects and is considered unlikely to be of a high enough quality to provide habitat for the species. With this in consideration, it is considered unlikely that there will be a long-term decrease in the size of a population of a species able to re-colonise the area after disturbance, if present within or adjacent to the study area.
Reduce the area of occupancy of the species.
The removal of up to 4.24 hectares of potential habitat for *Eucalyptus* sp. Cattai will reduce the area of habitat available for the local population of the species. However, over 50 hectares of potential habitat has been mapped within the locality. Hence, the worst case scenario would be the proposed works impacting on less than 10 % of potential habitat within the locality. This is not considered a significant reduction. As such the removal of habitat as a result of the current proposal are not considered substantial enough to result in a reduction to the area of occupancy of the species.
Fragment an existing population into two or more populations.
Eucalyptus sp. Cattai was not recorded within the study area during field surveys, however, due to the large size of the study area, all areas of potential habitat for this species were not able to be surveyed and isolated occurrences of the species may remain undetected. The proposed works requires vegetation clearance from within a 15 metre wide corridor, and the

SIC assessment for *Eucalyptus sp. Cattai*
removal of 4.24 hectares of potential habitat for *Eucalyptus* sp. Cattai within the study area is expected. The occurrences of potential habitat for the species in the study area are predominantly along roadside reserves, where permanent man-made structures, including roads and buildings, contribute to existing fragmentation of the habitat. Although the impact area dissects potential habitat at several points across the landscape, associated impacts are not considered substantial and will not result in substantial decreases in connectivity of habitat. Any resulting fragmentation will not significantly reduce connectivity as the impacts occur within an already fragmented landscape, and it is unlikely that the local population, and/or any undetected individuals of *Eucalyptus* sp. Cattai, will be exposed to any substantial fragmentation.
Adversely affect habitat critical to the survival of a species.
Critical habitat has not been declared for *Eucalyptus* sp. Cattai.
Disrupt the breeding cycle of a population.
Little is known of the reproductive biology and ecology of *Eucalyptus* sp. Cattai. Observations have shown that some trees don't flower or produce seed, and it is speculated that this is due to in-breeding depression Given some areas include temporary vegetation clearing and limited canopy trimming as part of the works, there is the possibility to allow regeneration of shrub and canopy vegetation. If populations of *Eucalyptus* sp. Cattai remain undetected, there could be potential natural re-colonisation post-disturbance. Therefore, the proposed action is unlikely to disrupt the breeding cycle of the population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
The species was not recorded in the study area. The proposed works will remove up to 2 % of potential habitat for *Eucalyptus* sp. Cattai within the locality. This local scale loss of habitat within the study area is not considered to cause *Eucalyptus* sp. Cattai to decline considering there are higher quality patches of habitat available in the region.
Result in invasive species that are harmful to critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat.
All potential habitat associated with the species (PCT 1081, PCT 1083 and PCT 118) within the study area are subject to existing weed invasion and pest animals. The proposed action will not 'open up' habitat that was previously inaccessible to invasive species and as such is unlikely to exacerbate the current level of invasive species threat operating within the study area to the point that they become harmful to *Eucalyptus* sp. Cattai.
Introduce disease that may cause the species to decline.
It is unlikely that the proposal will result in the introduction of a disease that is harmful to *Eucalyptus* sp. Cattai.
Interfere substantially with the recovery of the species.
A Recovery Plan has not been prepared for *Eucalyptus* sp. Cattai. However, the NSW Conservation Advice identifies several priority actions for the recovery of the species: • Prevent further clearing or disturbance of known and suitable habitat. • Ensure infrastructure construction and maintenance (e.g. for roads and tracks) does not damage plants or remaining habitats. • Instigate appropriate fire management that is not detrimental to the species. • Reduce impact of weeds on known populations. Interference with the objectives of the Commonwealth conservation advice can be minimised by implementing management strategies and ensuring any potential impacts are avoided if possible. However, as the proposed works will cause clearing of suitable habitat for the species, interference with the Commonwealth conservation advice objectives are likely.

SIC assessment for *Eucalyptus sp. Cattai*
Conclusion
Eucalyptus sp. Cattai was not recorded in the study area during field investigations, however there are a number of records within 5 km of the study area. Based on the factors above, it is concluded that the proposed works are unlikely to lead to a significant impact on *Eucalyptus* sp. Cattai.

Darwinia biflora – Vulnerable species EPBC Act

Darwinia biflora is listed as Vulnerable under the Commonwealth EPBC Act. It is an erect to spreading shrub which occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Flowering occurs throughout the year but is concentrated in autumn, with mature fruits being produced from May to August. Fire is an important factor in the life cycle of this species, producing a flush of germination from seed stored in the soil. The number of individuals at a site then declines with time since fire, as the surrounding vegetation develops.

Darwinia biflora within the study area

Previous records of *Darwinia biflora* exist in the surrounding locality 340 records within 5 kilometres of the study area, with the most recent collected in 2019 and the closest record was approximately 3 kilometres from the study area. *Darwinia biflora* is associated with three vegetation communities within the study area, PCT 1081, PCT 1083 and PCT 1181.

Given the associated vegetation communities identified within the study area, the species has potential to utilise habitat within the study area. The proposed works will result in the removal of up to 4.24 hectares of potential habitat for the species. A self-assessment of whether the proposal is likely to lead to a significant impact on *Darwinia biflora* is provided below.

Table A.34 SIC assessment for *Darwinia biflora*

SIC assessment for *Darwinia biflora*
Lead to a long-term decrease in the size of an important population of a species.
Upon completing field surveys, the presence of *Darwinia biflora* was not recorded. However, due to nearby previous records and the presence of associated vegetation communities within the study area, the study area may provide potential habitat for the species. Within the impact area, approximately 4.24 hectares of vegetation is considered to contain potential habitat for *Darwinia biflora.* However, the vegetation to be removed within the study area has been subject to previous edge effects and is considered unlikely to be of a high enough quality to provide habitat for the species. With this in consideration, the potential impacts to the population of the species can be considered small and localised in nature and as such, it is considered unlikely that there will be a long-term decrease in the size of a population of a species able to re-colonise the area after disturbance, if present within or adjacent to the study area.
Reduce the area of occupancy of an important population.
The removal of up to 4.24 hectares of potential habitat for *Darwinia biflora* will reduce the area of habitat available for the local population of the species. However, over 50 ha of potential habitat has been mapped within the locality. Therefore, whilst it is possible the proposed works will impact upon on a very small proportion of potential habitat within the locality, it is not considered a significant reduction. Hence, the removal of habitat as a result of the current proposal are not considered substantial enough to result in a reduction to the area of occupancy of the species.

SIC assessment for *Darwinia biflora*
Fragment an existing important population into two or more populations.
Given there are nearby previous records and the presence of potential habitat within the study area, the study area may provide potential habitat for the species. However, it should be noted that no *Darwinia biflora* plants were recorded during field surveys. The proposed works requires vegetation clearance from within a 15 metre wide corridor, and the removal of 4.24 hectares of potential habitat for *Darwinia biflora* within the study area is expected. The occurrences of potential habitat for the species in the study area are predominantly along roadside reserves, where permanent man-made structures, including roads and buildings, contribute to existing fragmentation of the habitat. Although the impact area dissects potential habitat at several points across the landscape, associated impacts are not considered substantial and will not result in substantial decreases in connectivity of habitat. Any resulting fragmentation will not significantly reduce connectivity as the impacts occur within an already fragmented landscape, and it is unlikely that the local population, and/or any undetected individuals of *Darwinia biflora*, will be exposed to any substantial fragmentation.
Adversely affect habitat critical to the survival of the species.
Critical habitat has not been declared for *Darwinia biflora*.
Disrupt the breeding cycle of an important population.
Darwinia biflora is mostly dependent on fire for seed germination. Moreover, it has been shown that a dense canopy cover can limit seed production, having dramatic effects on the post fire recovery if the seed bank is not replenished (DAWE 2021). If anything, the proposed works in the form of canopy trimming may benefit the breeding life cycle of *Darwinia biflora* by reducing the density of the surrounding vegetation and will therefore not disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
The species was not recorded in the study area. The proposed works will remove a small proportion of edge-affected native vegetation that may provide potential habitat for *Darwinia biflora*. This local scale loss of habitat is not considered likely to cause *Darwinia biflora* to decline considering there are higher quality patches of habitat available across the study area, and the proposed works are mostly limited to the removal of vegetation along the edges of large patches of vegetation.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
The proposed action will not 'open up' habitat that was previously inaccessible to invasive species and as such is unlikely to exacerbate the current level of invasive species threat operating within the study area to the point that they become harmful to *Darwinia biflora*.
Introduce disease that may cause the species to decline.
It is unlikely that the proposal will result in the introduction of a disease that is harmful to *Darwinia biflora*.
Interfere substantially with the recovery of a species.
A Recovery Plan has not been prepared for *Darwinia biflora.* However, the NSW Conservation Advice identifies several priority actions for the recovery of the species: • Monitor known populations to identify key threats. • Develop and implement a management plan for the control of weeds across the species' distribution. • Develop and implement a suitable fire management strategy for the habitat of *Darwinia biflora*. • Raise awareness of *Darwinia biflora* within the local community.

SIC assessment for *Darwinia biflora*
Considering the above factors, the proposal will not interfere substantially with the recovery of *Darwinia biflora.*
Conclusion
Darwinia biflora was not recorded in the study area during field investigations, however there are a number of records within 5 km of the study area. Based on the factors above, it is concluded that the proposed works are unlikely to lead to a significant impact on *Darwinia biflora.*

Threatened fauna species

Dural Land Snail *Pommerhelix duralensis* –Endangered species EPBC Act

Dural Woodland Snail, is a medium sized snail with a dark brown to black semi-translucent, subglobose (almost spherical shaped) shell. The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. There is currently a degree of uncertainty about the distribution and identity of the snails in this and related species. The species is found in an area of north-western Sydney between Rouse Hill - Cattai and Wiseman's Ferry, west from Berowra Creek. The species is definitely found within the Local Government Areas of The Hills Shire, Hawkesbury Shire and Hornsby Shire.

The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also 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.

Dural Land Snail within the study area

Previous records of Dural Land Snail exist in the surrounding locality 71 records within 5 kilometres of the study area, with the most recent collected in 2020 within the boundaries of the Rouse Hill WRP within the study area.

The Dural Land Snail is associated with six vegetation communities within the study area, PCT 724, PCT 849, PCT 1081, PCT 1181, and PCT 1395. Higher quality habitat with a good native ground cover and an abundance of woody debris is preferred habitat for the species. A total of 3.85 hectares of vegetation within the study area is considered potential habitat for the Dural Land Snail. Due the presence of potential habitat, an assessment of the impacts of the species in accordance with the *Matters of National Environmental Significance Significant impact guidelines* is provided below.

Table A.35 SIC assessment for Dural Land Snail

SIC assessment for Dural Land Snail
Lead to a long-term decrease in the size of an important population of a species.
The proposed works include the removal of 3.85 hectares of native vegetation that is associated with the Dural Land Snail (TSSC 2014). Based upon existing information for the species, the maximum total number of snails that would be supported by the area of impact is 12 individuals (based upon 3 snails per hectare and an impact area of 3.85 ha) (Ridgeway et al. 2014). The vegetation to be removed is part of larger patches of shale-influenced vegetation that will remain undeveloped

SIC assessment for Dural Land Snail
under the current proposal. The remaining shale-influenced vegetation is likely capable of supporting Dural Land Snail to the same extent or better than the vegetation to be removed, given the remaining patches are contiguous and do not occur in an edge-affected state. Given the availability of connected resources and area of impacted vegetation occurring on the edges of larger patches of intact vegetation, the proposed works are unlikely to lead to the long term decrease in the size of a population.
Reduce the area of occupancy of an important population.
The vegetation being removed represents potential habitat for Dural Land Snail. As such its removal will reduce the area of available habitat for the species. The impacts are to vegetation which occurs on the edges of larger patches, generally within roadside reserves. Given the low abundance typically displayed by the species (Ridgeway et al. 2014, Clark 2009), the vegetation to be removed is expected to result in impacts to a very limited number of individuals (12 snails, based upon a maximum recorded density of 3 snails per hectare and an impact area of 3.85 ha). Therefore the reduction in area of occupancy is not likely to be significant.
Fragment an existing important population into two or more populations.
The proposed works requires vegetation clearance from within a 15 metre wide corridor, and the removal of 3.85 hectares of associated native vegetation, which represents potential Dural Land Snail habitat. The occurrences of Dural Land Snail habitat in the study area are predominantly along roadside reserves, where permanent man-made structures, including roads and buildings, contribute to existing fragmentation of the species' habitat. Thus the proposed works are unlikely to further contribute to fragmentation, given the already fragmented nature of Dural Land Snail habitat across the study area. Given the impacts are unlikely to result in fragmentation, the proposed works are unlikely to fragment an existing population of Dural Land Snail into two or more populations.
Adversely affect habitat critical to the survival of a species.
Dural Land Snail exhibits a strong preference for shale-influenced transitional landscapes and ecological communities, including the PCTs located within the study area (Ridgeway et al. 2014, NSW Scientific Committee 2015, TSSC 2014). Shale-influenced habitats within the geographic range of the species (i.e. the northwest fringes of the Cumberland Plain) are therefore considered to be of importance to the survival of the species. However, based on the available information for maximum snail densities, the area of impact is capable of supporting 12 snails, based upon 3 snails per hectare and an impact area of 3.85 ha (Ridgeway et al. 2014). Given the potential species habitat to be removed exists on the fringes of larger patches of shale-influenced vegetation, it is unlikely that the proposed works will significantly affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.
The mating behaviour of Dural Land Snail is poorly documented with studies on the species failing to observe mating behaviours despite hundreds of hours in the field (Ridgeway et al. 2014). Similarly there is no literature available on the longevity of the species (Ridgeway et al. 2014). However it is likely that the Dural Land Snail has similar longevity and reproductive traits to other related species of land snails, likely living for approximately five years and laying approximately 20 to 30 eggs after rain (Ridgeway et al. 2014, TSSC 2014). Based upon existing information for the species, the maximum total number of snails that would be supported by the area of impact is 12 individuals (based upon 3 snails per hectares and an impact area of 3.85 ha) (Ridgeway et al. 2014). Impacts to a limited number of individuals are unlikely to significantly disrupt the breeding cycle of a population of Dural Land Snails in the area.

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SIC assessment for Dural Land Snail
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
The study area and adjoining areas include shale-influenced vegetation that represent potential habitat for Dural Land Snail (OEH 2011). The proposed works include the removal of 3.85 ha of associated native vegetation, which will result in a decrease of the availability of habitat for the species. However, based on the documented maximum number of snails per hectare (Ridgeway et al. 2014), the removal of 3.85 ha of associated native vegetation is expected to impact on a number of individual snails (12). As a low level of impact is expected on the Dural Land Snail as a result of the proposed works, it is therefore unlikely that the removal of the potential species habitat will result in a significant decline in the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
All habitat within the study area are subject to existing weed invasion and pest animals as a result of surrounding land uses. Nonetheless, the proposed works are unlikely to exacerbate the current level of invasive species threat operating within the study area.
Introduce disease that may cause the species to decline.
There is a lack of information available in the current scientific literature on land snail diseases and neither the Preliminary Determination release by the NSW Scientific Committee (2015), or the Conservation Advice released by the Commonwealth Threatened Species Scientific Committee (2014) make any reference to disease risks for this species. Due to the lack of available information it is not possible to comment on the likelihood of the introduction of diseases that may cause a decline in Dural Land Snail.
Interfere substantially with the recovery of the species.
No recovery plan for Dural Land Snail currently exists and the Conservation Advice for the species does not recommend one (TSSC 2014). The proposed works include the removal of 3.85 ha of associated habitat for the species which may result in impacts to a very limited number of individuals (12). Given the small area of vegetation to be removed and the expected minimal impact to the species, the proposed works are unlikely to substantially interfere with the recovery of the species.
Conclusion
Based on the available information in the scientific literature and the minimal impacts to potential habitat within the study area, it is concluded that the proposal impacts are unlikely to lead to a significant impact on Dural Land Snail.

Large-eared Pied Bat *Chalinolobus dwyeri*– Vulnerable species EPBC Act

The Large-eared Pied Bat is a small to medium-sized bat with long, prominent ears and glossy black fur. It 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.

The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging (TSSC 2012). The species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin *Petrochelidon ariel*, frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and

overhangs. They remain loyal to the same cave over many years. The species is also found in well-timbered areas containing gullies.

Large-eared Pied Bat within the study area

Previous records of Large-eared Pied Bat exist in the surrounding locality (4 records within 5 kilometres of the study area, with the most recent collected in 2019 and the closest record was approximately 320 metres from the study area).

The study area includes several rocky overhangs, which may be indirectly impacted by the works, represents marginal roosting habitat for cave-dependant microchiropteran species such as the Large-eared Pied Bat. Although rocky overhangs in the study area will not be directly impacted by the proposal some indirect impacts are expected to occur, such as increased noise, dust and vibration. Due the presence of potential roosting habitat, a self-assessment of the impacts of the species in accordance with the *Matters of National Environmental Significance Significant impact guidelines* is provided below.

Table A.36 SIC assessment for Large-eared Pied Bat

SIC assessment for Large-eared Pied Bat
Lead to a long-term decrease in the size of an important population of a species.
Information about the size, distribution and interactions of Large-eared Pied Bat populations is largely unknown. No populations have been defined as 'important populations' for the species. The largest concentration of records for this species appears to be in the sandstone escarpments of the Sydney basin, and north-west slopes of NSW. Important populations are likely to occur at the edge of the species range, for example in the sandstone escarpments of the Morton National Park at the southern end of its range, and in Shoalwater Bay, QLD where only one individual has been recorded. For the purpose of this assessment, all records of Large-eared Pied Bat within 5 km of the study area are considered to make up the local population. Thus, the local population does not occur at the edge of the species' range, and it is unlikely that the population would constitute an 'important population'. Thus a decrease in the size of an important population of this species is considered unlikely.
Reduce the area of occupancy of an important population.
As above, it is unlikely that the local population of Large-eared Pied Bat potentially utilising the study area would be considered an 'important population', and thus a reduction in occupancy of an important population is unlikely.
Fragment an existing important population into two or more populations.
As above, it is unlikely that the local population of Large-eared Pied Bats potentially utilising the subject land would be considered an 'important population', and thus fragmentation of an important population is unlikely.
Adversely affect habitat critical to the survival of the species.
Habitat critical to the survival of the species is defined as (DERM 2011): • Maternity roosts. • Sandstone cliffs and fertile wooded valley habitat within close proximity of each other. It is very unlikely that study area supports a maternity roost for this species, given maternity roost sites require highly specific conditions and only four sites have ever been recorded in NSW. There are no identified sandstone cliffs within close proximity to the study area, and the vegetation to be removed within the study area is edge-affected and previously disturbed. Given the type of vegetation that will be removed, the availability of similar habitat adjacent to the impact area and the fact that the study area is highly unlikely to contain a maternity roost, the habitat to be affected is unlikely to constitute habitat critical to the survival of the species.

SIC assessment for Large-eared Pied Bat
Disrupt the breeding cycle of an important population.
As above, it is unlikely that the local population of Large-eared Pied Bat potentially utilising the study area would be considered an 'important population'. Additionally, it is very unlikely that study area supports a maternity roost for this species, given maternity roost sites require highly specific conditions and only four sites have ever been recorded in NSW, none of which are within the study area. Thus, it is unlikely that the proposed works would disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
The proposed works will likely result in the loss of 9.56 ha, and indirect impact to a further 3.71 ha, of potential forage habitat within the study area. If Large-eared Pied Bats are found to be utilising rocky overhangs within the study area as general roosting habitat, it is likely that there are appropriate roosting locations available at other suitable rocky overhangs adjacent to the study area. It is considered unlikely that disturbance to some potential roosting structures will result in the decline of the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
All habitat within the study area are subject to existing weed invasion and pest animals as a result of surrounding land uses. The proposed action will not 'open up' habitat that was previously inaccessible to invasive species and as such is unlikely to exacerbate the current level of invasive species threat operating within the study area to the point that they become harmful to the Large-eared Pied Bat.
Introduce disease that may cause the species to decline.
The IUCN Species Survival Commission released a statement on 19 June 2020 stating that there is a credible risk of human-to-bat transmission of SARS-Cov-2, a virus currently circulating the globe and causing a pandemic of the illness Covid-19 (IUCN SSC 2020). However, introduction of this disease to Large-eared Pied Bats within the study area as a result of the proposed works is unlikely for the following reasons: • The species has not been opportunistically recorded within the study area during field investigations. • No contact or sharing of closed areas between humans and bats is expected as a result of the proposed works. • When pre-clearance inspections are undertaken by a suitably qualified ecologist within potential roosting habitat for the Large-eared Pied Bat, the recommendations provided by the IUCN will be followed, including the wearing of a face mask by the ecologist, and avoidance of handling of any microbats. The transmission of SARS-Cov-2 is considered unlikely as a result of the proposed works.
Interfere substantially with the recovery of a species.
The following recovery objectives have been specified within the National recovery plan for the Large-eared Pied Bat: • 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. One of the recovery actions stated under these objectives is the protection of known roosts and associated foraging habitats and management of threats. If Large-eared Pied Bats were found to be utilising the study area as either roosting or breeding habitat (within identified rocky overhangs), disturbance to these structures may interfere with this recovery action. However, it is highly unlikely that these structures are being utilised as a maternity roost for this species. Additionally, more general roosting habitat is likely available adjacent to the study area if the rocky overhangs recorded are considered suitable habitat and are being used for general roosting by the species. If Large-eared Pied Bat were to be

SIC assessment for Large-eared Pied Bat
utilising structures within the subject land as roosting habitat and these were to be disturbed by the proposed works, this would likely not interfere substantially with the recovery of the species.
Conclusion
Based on the factors above, it is concluded that the proposed works are unlikely to lead to a significant impact on the Large-eared Pied Bat.

Grey-headed Flying-fox *Pteropus poliocephalus* – Vulnerable species EPBC Act

The Grey-headed Flying-fox is listed as Vulnerable under the EPBC Act. The Grey-headed Flying-fox trends with the distribution of plants with similar flowering and fruiting times, support regular annual cycles of migration It can be associated with flowering eucalyptus dependant on seasonality. Key threats to the Grey-headed Flying-fox include habitat fragmentation and habitat degradation, low levels of mortality, exploitation and competition. The species is largely impacted by urban growth displacing individuals.

Grey-headed Flying-fox within the study area

Previous records of the Grey-headed Flying-fox exist in the surrounding locality (164 records within 5 kilometres of the study area, with the most recent recorded in 2020 and the closest record was recorded within the study area.

The study area contains several known feed tree species for the Grey-heading Flying-fox. Due the presence of potential foraging habitat, a self-assessment of the impacts of the species in accordance with the *Matters of National Environmental Significance Significant impact guidelines* is provided below.

Table A.37 SIC assessment for Grey-headed Flying-fox

SIC assessment for Grey-headed Flying-fox
Lead to a long-term decrease in the size of an important population of a species.
All Grey-headed Flying-fox in Australia are regarded as one single population that moves freely within their entire national range (DoE 2015). Grey-headed Flying-fox can move up to 100 km in a single night and are known to occupy and freely disperse through urban environments, as such Grey-headed Flying-fox could be expected to occur anywhere within the study area. It is unlikely that the removal of potential foraging habitat, consisting of 9.56 hectares of direct removal and indirect loss of an additional 3.71 hectares of native vegetation, would lead to a long term decrease in the size of an important population. Given the vegetation removal will occur outside of known camps and habitat on site is physically connected to similar habitat nearby, Grey-headed Flying-fox could be reasonably expected to occupy or utilise the similar habitat adjacent to the impact area and as such the habitat removal would be unlikely to lead to a decline in an important population as this population would have ample habitat remaining for critical activities (i.e. foraging, breeding, dispersal etc.).
Reduce the area of occupancy of an important population.
The proposed works would reduce the area of available native vegetation within the study area. However, the overall area of occupancy will remain unchanged as the broader study area will remain suitable for this species post construction. Habitat on site is not used for roosting and a camp is not present within the study area.
Fragment an existing important population into two or more populations.
All Grey-headed Flying-fox in Australia are regarded as one single population that moves freely within their entire national range (Webb & Tidemann 1996; DoE 2015). Given Grey-headed Flying-fox can move up to 100 km in a single night

SIC assessment for Grey-headed Flying-fox
(McConkey et al 2012) and are known to occupy and freely disperse through urban environments, any disturbance associated with the proposal is not considered a barrier to dispersal for this species and as such will not fragment an existing important population.
Adversely affect habitat critical to the survival of the species.
Given the type of vegetation that will be removed, the availability of similar habitat adjacent to the impact area and the fact that no camp is located in or adjacent to the study area, the habitat to be affected is unlikely to constitute habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population.
For the reasons outlined above, it is unlikely that construction activities would disrupt the breeding cycle of an important population as no breeding camp sites have been observed within or adjacent to the study area. Secondary impacts such as noise and light disturbance during construction are not expected to be significant given this species' tolerance for highly noise polluted urban environments.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
It is unlikely that modification of habitat within the impact area would lead to a broader species decline, given the type of vegetation to be removed (non–roosting habitat) and the availability of similar adjacent habitat.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
The proposed action will not 'open up' habitat that was previously inaccessible to invasive species and as such is unlikely to exacerbate the current level of invasive species threat operating within the study area to the point that they become harmful to the Grey-headed Flying-fox.
Introduce disease that may cause the species to decline.
No diseases are currently known to be transferable to Grey-headed Flying-fox as a result of human activities.
Interfere substantially with the recovery of a species.
A national recovery plan for the Grey-headed Flying-fox has not been produced. The proposal is unlikely to directly interfere with the recovery of the species on a national or local scale due to the restricted nature of the impact and the dispersal ability of this species.
Conclusion
The Grey-headed Flying-fox was not recorded in study area during field investigations, however there are a number of previous sightings recorded within the study area. The dispersal ability of this species and its use of both native and non-native vegetation for foraging and roosting activities indicates that the proposal will not act as a barrier to dispersal for this species. Furthermore, the vegetation within the study area is unlikely to constitute critical habitat for this species and no known breeding camps were observed within the study area. On this basis, it is considered unlikely that a significant impact on Grey-headed Flying-fox would result from the current proposal.

Appendix 4 Tests of Significance

The following section provides for Tests of Significance as outlined in Section 7.3 of the BC Act for all species listed as a medium likelihood or greater.

Threatened Ecological Communities

Cumberland Plain Woodland in the Sydney Basin Bioregion– Critically Endangered Ecological Community BC Act

The Cumberland Plain Woodland is listed as a CEEC under the BC Act. This community occurs on soils derived from Wianamatta Shale, throughout the driest part of the Sydney Basin. It is well adapted to drought and fire and is typically found on heavy clay soils (OEH 2016b). This community has undergone significant declines since European settlement with the expansion of Sydney and the outlying regional centres, now only 9 % of the original extent of this community now remains in-tact (OEH 2016b) with around 12 % occurring as scattered remnants (DECCW 2010).

Cumberland Plain Woodland within the study area

Cumberland Plain Woodland aligns with PCT 849, and generally occurs in high quality or well-connected remnant within the study area. A total of 0.01 hectares of Cumberland Plain Woodland occurs within the impact area which is subject to assessment under the BC Act.

For this assessment, the local occurrence of Cumberland Plain Woodland comprises all PCT 849 mapped within the study area and any patches that occur in the vicinity up to 100 – 200 metres across the largely fragmented landscape that could be subject to indirect impacts associated with loss of connectivity. An assessment of the impacts of this vegetation in accordance with the *Threatened species test of significance* is provided below.

Table B.38 Test of Significance for Cumberland Plain Woodland

Test of Significance for Cumberland Plain Woodland
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.
Not applicable, not a threatened species.
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.***
The local occurrence of Cumberland Plain Woodland is considered to comprise the areas directly impacted by the proposal, and the areas potentially indirectly impacted through increased fragmentation and isolation. These areas include all contiguous areas of the CEEC extending from the linear study area and any patches that occur in the vicinity up to 100 – 200 metres that are considered to be connected via lack of barriers to movement of genetic material. The local occurrence of the CEEC is generally present in moderate condition, and occurs in a fragmented landscape where

Test of Significance for Cumberland Plain Woodland

introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. Land use impacts from clearing and grazing have reduced community integrity and functionality in southern NSW (e.g. loss of small native mammals, reduced flora species richness, reduced genetic exchange across the community due to fragmentation). Clearing for the proposal is unlikely to further reduce species diversity and simplify community structure more broadly. The CEEC already occurs in a patchy and edge effected state, and the proposal will not result in a substantial increase to these negative pressures. The adjacent areas of the community within the broader area will remain intact and are unlikely to suffer substantial changes in species composition. The vegetation to be directly removed does not comprise any ecological components critical to the survival of the CEEC in the locality.

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.

The habitat supporting the local occurrence of the CEEC comprises long linear strips along road verges where canopy trees have been retained and small fragmented areas where patches of the community have been able to persist. These areas of habitat occur with a patchy distribution across the study area.
The proposal will result in the removal of 0.01 ha of habitat for the CEEC, however areas contiguous to that being removed will be retained, and areas considered subject to some level of connectivity within 100 – 200 metres will also remain present. These areas are already subject to edge effects resulting from the fragmented and patchy landscape within which they occur, however the proposal is not considered likely to increase the level to which these negative pressures occur. The area of habitat to be directly and indirectly impacted by the proposal is not considered important to the long term survival of the community in the locality.

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).

Under the BC Act, the Minister for the Environment has the power to declare Areas of Outstanding Biodiversity Value (AOBVs). To date no AOBVs have been declared within the proposal's impact area.

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.

The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act, and to which are considered relevant to Cumberland Plain Woodland:

- Clearing of native vegetation.

The proposed works requires clearing of land where this community occurs, resulting in the removal 0.01 ha of the CEEC. Given some areas of the CEEC to be impacted by the proposal will be in the form of partial clearing and under boring, and that large areas of contiguous vegetation will be retained adjacent to the study area, the proposal is unlikely to increase the impact of any key threatening processes.

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Test of Significance for Cumberland Plain Woodland
Conclusion.
The proposed works are unlikely to significantly affect Cumberland Plain Woodland for the following reasons: • The proposed works are localised and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works. • The proposed works is unlikely to significantly alter floristic or structural diversity of the CEEC within the study area, particularly given a portion of the impacts are limited to partial clearance and some under boring. • The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes. Application of the BOS or preparation of a SIS is therefore not required.

Shale Sandstone Transition Forest in the Sydney Basin Bioregion– Critically Endangered Ecological Community BC Act

Shale Sandstone Transition Forest is listed as Critically Endangered under the BC Act.

A description of Shale Sandstone Transition Forest is found in the Commonwealth listings above.

Shale Sandstone Transition Forest within the study area

Shale Sandstone Transition Forest within the study area aligns with PCT 1395, and generally occurs in high quality or well-connected remnant within the study area. A total of 0.28 hectares of Shale Sandstone Transition Forest will be directly impacted, with an further 0.19 hectares of vegetation indirectly impacted via trimming, within the impact area and subject to assessment under the BC Act. PCT 1081 does not form part of the BC Act listing for the TEC.

For this assessment, the local occurrence of Shale Sandstone Transition Forest comprises all PCT 1395 mapped within the study area and any patches that occur in the vicinity up to 100 – 200 metres across the largely fragmented landscape that could be subject to indirect impacts associated with loss of connectivity. An assessment of the impacts of this vegetation in accordance with the *Threatened species test of significance* is provided below.

Table B.39 Test of Significance for Shale Sandstone Transition Forest

Test of Significance for Shale Sandstone Transition Forest
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.
Not applicable, not a threatened species.
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.***
The local occurrence of Shale Sandstone Transition Forest is considered to comprise the areas directly impacted by the proposal, and the areas potentially indirectly impacted through increased fragmentation and isolation. These areas include all contiguous areas of the CEEC extending from the linear study area and any patches that occur in the vicinity up to 100 – 200 metres that are considered to be connected via lack of barriers to movement of genetic material.

Test of Significance for Shale Sandstone Transition Forest

Thus the local occurrence of Shale Sandstone Transition Forest is considered to be at least 2.37 ha across the broader study area, and the expected impacts are likely to directly remove approximately 0.28 ha, with indirect impacts to a further 0.19 ha of the community. This level of impact will not lead to the local occurrence of Shale Sandstone Transition Forest being placed at risk of extinction.

The local occurrence of the CEEC is generally present in moderate condition, and occurs in a fragmented landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. Land use impacts from clearing and grazing have reduced community integrity and functionality in southern NSW (e.g. loss of small native mammals, reduced flora species richness, reduced genetic exchange across the community due to fragmentation). Clearing for the proposal is unlikely to further reduce species diversity and simplify community structure more broadly, and species impacted by the proposed works are common components of the CEEC vegetation. As such, the vegetation to be directly removed does not comprise any ecological components critical to the survival of the CEEC in the locality, and this level of impact will not lead to the local occurrence of Shale Sandstone Transition Forest being placed at risk of extinction.

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.

The habitat supporting the local occurrence of the Shale Sandstone Transition Forest comprises linear strips along Cattai Creek, adjacent to residential development in Kellyville where canopy trees have been retained and small fragmented areas of the community have been able to persist. These areas of habitat occur with a patchy distribution across the study area.

The proposal will result in the removal of 0.28 ha of habitat for the CEEC, and are already subject to edge effects resulting from the fragmented landscape within which they occur. Areas of contiguous vegetation to that being removed will be retained, and the nature of this impact will not substantially reduce the habitat available to the CEEC in the locality, nor will it result in isolation or fragmentation of habitats. The area of habitat to be impacted by the proposed works is not considered important to the long term survival of the community in the locality.

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).

To date no AOBVs have been declared within the proposal's impact area.

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.

The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act, and to which are considered relevant to Shale Sandstone Transition Forest:

- Clearing of native vegetation.

The proposed works requires clearing of land where this community occurs, resulting in the removal 0.28 ha and additional trimming on 0.19 ha of the CEEC. Given some areas of the CEEC to be impacted by the proposal will be in the form of partial clearing and under boring, and that large areas of contiguous vegetation will be retained adjacent to the study area, the proposal is unlikely to increase the impact of any key threatening processes.

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Test of Significance for Shale Sandstone Transition Forest
Conclusion.
The proposed works are unlikely to significantly effect Shale Sandstone Transition Forest for the following reasons: • The proposed works are localised and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works. • The proposed works is unlikely to significantly alter floristic or structural diversity of the CEEC within the study area, particularly given a portion of the impacts are limited to partial clearance and some under boring. • The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes. Application of the BOS or preparation of a SIS is therefore not required.

River-flat Eucalypt Forest on Coastal Floodplains of Southern New South Wales and Eastern Victoria – Endangered Ecological Community BC Act

River-flat Eucalypt Forest is listed as Endangered under the BC Act. The community is found on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, which may exceed 40 metres in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. Major examples once occurred on the floodplains of the Hunter, Hawkesbury, Moruya, Bega and Towamba Rivers, although many smaller floodplains and river flats also contain examples of the community. The remaining area is likely to represent much less than 30% of its original range. Given its habitat, the community has an important role in maintaining river ecosystems and riverbank stability. Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains

River-flat Eucalypt Forest within the study area

River-flat Eucalypt Forest aligns with PCT 835 in poor condition within the study area. A total of 1.57 hectares of River-flat Eucalypt Forest will be directly impacted, with an further 0.60 hectares of vegetation indirectly impacted via trimming, within the impact area and subject to assessment under the BC Act.

For this assessment, the local occurrence of River-flat Eucalypt Forest comprises all PCT 835 mapped within the study area and any patches that occur in the vicinity up to 100 – 200 metres across the largely cleared agricultural landscape that could be subject to indirect impacts associated with loss of connectivity. An assessment of the impacts of this vegetation in accordance with the *Threatened species test of significance* is provided below.

Table B.40 Test of Significance for River-flat Eucalypt Forest

Test of Significance for River-flat Eucalypt Forest
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.
Not applicable, not a threatened species.
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.***

Test of Significance for River-flat Eucalypt Forest

The local occurrence of River-flat Eucalypt Forest is considered to comprise the areas directly impacted by the proposal, and the areas potentially indirectly impacted through increased fragmentation and isolation. This can be broadly defined as the patch of the community that occurs within the study area and extends into adjacent vegetation in a contiguous manner, including patches that occur in the vicinity up to 100 – 200 metres that are considered to be connected via lack of barriers for movement of genetic material.

The local occurrence of River-flat Eucalypt Forest is over 30 ha in size and the proposed works require the direct removal of 1.57 ha of River-flat Eucalypt Forest, and direct impact to a further 0.60 ha of the TEC within the study area. River-flat Eucalypt Forest is generally present in moderate condition, and occurs in a fragmented landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. Land use impacts from clearing and grazing have reduced community integrity and functionality in southern NSW (e.g. loss of small native mammals, reduced flora species richness, reduced genetic exchange across the community due to fragmentation). Clearing for the proposal is unlikely to further reduce species diversity and simplify community structure more broadly, as the community already occurs in a patchy and edge effected state. The adjacent areas of the community within the broader area will remain intact and are unlikely to suffer substantial changes in species composition. The vegetation to be directly removed does not comprise any ecological components critical to the survival of the EEC in the locality.

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.

The habitat supporting the local occurrence of River-flat Eucalypt Forest comprises long linear strips along drainage lines (such as Cattai Creek, Killarney Chain of Ponds and Second Ponds Creek) where canopy trees have been retained and small degraded patches of the community have been able to persist. These areas of habitat occur with a patchy distribution across the study area.

The proposal will result in the removal of 1.57 ha of habitat for River-flat Eucalypt Forest, and are already subject to edge effects resulting from the fragmented landscape within which they occur. Areas of contiguous vegetation to that being removed will be retained, and the nature of this impact will not substantially reduce the habitat available to the EEC in the locality, nor will it result in isolation or fragmentation of habitats. The area of habitat to be impacted by the proposed works is not considered important to the long term survival of River-flat Eucalypt Forest in the locality.

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).

To date no AOBVs have been declared within the proposal's impact area.

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.

The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act, and to which are considered relevant to River-flat Eucalypt Forest:

- Clearing of native vegetation.

The proposed works requires clearing of land where this community occurs, resulting in the removal 1.57 ha and additional trimming of 0.60 ha of the EEC. Given some areas of River-flat Eucalypt Forest to be impacted by the proposal

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Test of Significance for River-flat Eucalypt Forest
will be in the form of partial clearing and under boring, and that large areas of contiguous vegetation will be retained adjacent to the study area, the proposal is unlikely to increase the impact of any key threatening processes.
Conclusion.
The proposed works are unlikely to significantly affect River-flat Eucalypt Forest for the following reasons: • The proposed works are localised and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works. • The proposed works is unlikely to significantly alter floristic or structural diversity of the EEC within the study area, particularly given a portion of the impacts are limited to partial clearance and some under boring. • The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes. Application of the BOS or preparation of a SIS is therefore not required.

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions –Endangered Ecological Community BC Act

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is listed as an EEC under the BC Act. This community comprises of plants that are generally dominated by the Swamp Oak *Casuarina glauca*. The community is found in close proximity to rivers and estuaries and is generally found on soils with a saline influence. The soils of the community may be quite wet and as such the composition of species present will vary markedly from site to site. In the past, areas of Swamp Oak Floodplain Forest were cleared for grazing and have been converted to grass paddocks with no over-storey.

Swamp Oak Floodplain Forest within the study area

Swamp Oak Floodplain Forest aligns with PCT 1800 in moderate condition within the study area. A total of 0.11 hectares of Swamp Oak Floodplain Forest occurs within the impact area which is subject to assessment under the BC Act.

For this assessment, the local occurrence of Swamp Oak Floodplain Forest comprises all PCT 1800 mapped within the study area and any patches that occur in the vicinity up to 100 – 200 metres across the largely cleared agricultural landscape that could be subject to indirect impacts associated with loss of connectivity. An assessment of the impacts of this vegetation in accordance with the *Threatened species test of significance* is provided below.

Table B.41 Test of Significance for Swamp Oak Floodplain Forest

Test of Significance for Swamp Oak Floodplain Forest
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.
Not applicable, not a threatened species.

Test of Significance for Swamp Oak Floodplain Forest
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.***
The local occurrence of Swamp Oak Floodplain Forest is considered to comprise the areas directly impacted by the proposal, and the areas potentially indirectly impacted through increased fragmentation and isolation. This can be broadly defined as the patch of the community that occurs within the study area and extends into adjacent vegetation in a contiguous manner, including patches that occur in the vicinity up to 100 – 200 metres that are considered to be connected via lack of barriers for movement of genetic material. The local occurrence of Swamp Oak Floodplain Forest is over 30 ha in size and the proposed works require the removal of 0.11 ha of Swamp Oak Floodplain Forest from the study area, in the form of complete clearance, partial clearing and under boring. Swamp Oak Floodplain Forest is generally present in low to moderate condition, and occurs in a fragmented landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. Clearing for the proposal is unlikely to further reduce species diversity and simplify community structure more broadly, as the community already occurs in a patchy and edge effected state. The adjacent areas of the community within the broader area will remain intact and are unlikely to suffer substantial changes in species composition. The vegetation to be directly removed does not comprise any ecological components critical to the survival of the EEC in the locality.
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.***
The habitat supporting the local occurrence of Swamp Oak Floodplain Forest comprises long linear strips along drainage lines (such as Killarney Chain of Ponds) where canopy trees have been retained and small fragmented areas where patches of the community have been able to persist. These areas of habitat occur with a patchy distribution across the study area. The proposal will result in the removal of 0.11 ha of habitat for Swamp Oak Floodplain Forest, and are already subject to edge effects resulting from the fragmented landscape within which they occur. Areas of contiguous vegetation to that being removed will be retained, and the nature of this impact will not substantially reduce the habitat available to the EEC in the locality, nor will it result in isolation or fragmentation of habitats. The area of habitat to be impacted by the proposed works is not considered important to the long term survival of Swamp Oak Floodplain Forest in the locality.
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).
To date no AOBVs have been declared within the proposal's impact area.

Test of Significance for Swamp Oak Floodplain Forest
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.
The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act, and to which are considered relevant to Swamp Oak Floodplain Forest: • Clearing of native vegetation. The proposed works requires clearing of land where this community occurs, resulting in the removal 0.11 ha of the EEC. Given some areas of Swamp Oak Floodplain Forest to be impacted by the proposal will be in the form of partial clearing and under boring, and that large areas of contiguous vegetation will be retained adjacent to the study area, the proposal is unlikely to increase the impact of any key threatening processes.
Conclusion.
The proposed works are unlikely to significantly affect Swamp Oak Floodplain Forest for the following reasons: • The proposed works are localised and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works. • The proposed works is unlikely to significantly alter floristic or structural diversity of the EEC within the study area, particularly given a portion of the impacts are limited to partial clearance and some under boring. • The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes. Application of the BOS or preparation of a SIS is therefore not required.

Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions

Freshwater Wetlands are associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes but may also occur in backbarrier landforms where floodplains adjoin coastal sandplains. Generally occur below 20 meters elevation on level areas. They are dominated by herbaceous plants and have very few woody species. The structure and composition of the community varies both spatially and temporally depending on the water regime. Those that lack standing water most of the time are usually dominated by dense grassland or sedgeland vegetation, often forming a turf less than 0.5 metre tall and dominated by amphibious plants. Where they are subject to regular inundation and drying the vegetation may include large emergent sedges over 1 metre tall (DPIE 2021).

Freshwater Wetlands within the study area

Freshwater Wetlands align with PCT 781 and PCT 1071 and occurs in low condition within the southern and western portions of the alignment from Riverstone WWTP to Rouse Hill WRP, and comprises a total area of 0.27 hectares within the study area. A total of 0.03 hectares of Freshwater Wetlands will be impacted as a result of the proposal.

For this assessment, the local occurrence of Freshwater Wetlands comprises all PCT 781 and PCT 1071 mapped within the study area and any further contiguous patches of the TEC patches of the TEC in the surrounding landscape, this equates to at least 0.51 hectares of the TEC. An assessment of the impacts of this vegetation in accordance with the *Threatened species test of significance* is provided below.

Table B.42 Test of Significance for Freshwater Wetlands

Test of Significance for Freshwater Wetlandst
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.
Not applicable, not a threatened species.
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.***
The local occurrence of Freshwater Wetlands comprises all PCT 781 and PCT 1071 mapped within the study area and any further contiguous patches of the TEC patches of the TEC in the surrounding landscape. The local occurrence of Freshwater Wetlands includes a minimum of 0.51 ha of low condition vegetation, with the proposed works likely to impact upon 0.03 ha of the TEC, in the form of direct impacts. Freshwater Wetlands is generally present in low condition, and occurs in a fragmented landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. Clearing for the proposal is unlikely to further reduce species diversity and simplify community structure more broadly, as the community already occurs in a patchy and edge effected state. The adjacent areas of the community within the broader area will remain relatively undisturbed and are unlikely to suffer substantial changes in species composition, due to their already poor condition. The vegetation to be directly removed does not comprise any ecological components critical to the survival of the EEC in the locality.
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.***
The habitat supporting the local occurrence of Freshwater Wetlands comprises linear strips in drainage lines and wider soaks surrounding those areas comprising small fragmented patches of the community have been able to persist. These areas of habitat occur with a patchy distribution across the study area. The proposal will result in the removal of 0.03 ha of habitat for Freshwater Wetlands, and are already subject to edge effects resulting from the fragmented landscape within which they occur. The nature of this impact will not substantially reduce the habitat available to the EEC in the locality, nor will it result in isolation or fragmentation of habitats. The area of habitat to be impacted by the proposed works is not considered important to the long term survival of Freshwater Wetlands in the locality.
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).
To date no AOBVs have been declared within the proposal's impact area.

Test of Significance for Freshwater Wetlandst
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.
The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act, and to which are considered relevant to Freshwater Wetlands: • Clearing of native vegetation. The proposed works requires clearing of land where this community occurs, resulting in the removal 0.03 ha of the EEC. This level of impact in not considered a substantial exacerbation of this KTP.
Conclusion.
The proposed works are unlikely to significantly affect Freshwater Wetlands for the following reasons: • The proposed works are localised and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works. • The proposed works is unlikely to significantly alter floristic or structural diversity of the EEC within the study area, particularly given a portion of the impacts are limited to partial clearance and some under boring. • The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes. Application of the BOS or preparation of a SIS is therefore not required.

Threatened flora species

Epacris purpurascens var. *purpurascens* – Vulnerable species BC Act

Epacris purpurascens var. *purpurascens* is a shrub endemic to the Sydney Basin Bioregion in NSW and currently listed as Vulnerable under the BC Act. *E. purpurascens* var. *purpurascens* has been recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the south. It is described as an erect shrub, 50 – 180 centimetres tall, with leaves spreading and recurved above, ovate to heart-shaped, 7 – 21 millimetres long, 4.4 – 9 millimetres wide, with sharply pointed tips. Flowers are showy, 7 – 10 millimetres in diameter and appear between July – September, crowded along the branchlets, often white or pink (NSW Scientific Committee 1999). In some past surveys *Epacris purpurascens* var. *purpurascens* has been confused with *Woollsia pungens* and Pink Swamp Heath *Sprengelia incarnata* when not in flower. In *Woolsia pungens,* the corolla lobes are contorted in bud, whereas in *Epacris purpurascens* var. *purpurascens,* the corolla lobes are imbricate in bud (National Parks and Wildlife Services NSW 2002). Pink Swamp Heath has large sheathing leaves relative to the small non-sheathing leaves of *Epacris* spp. (National Parks and Wildlife Services NSW 2002). *Epacris purpurascens* var. *purpurascens* occurs in sclerophyll forest, scrubs and swamps, favouring open woodlands with a strong shale soil influence (NSW Scientific Committee 1999). Additionally, this species has been observed to exhibit a preference for disturbed habitat which can include drainage lines or depressions, areas of skeletal soils and areas of indurated laterite gravels or rock fragments (NSW Scientific Committee 1999).

Epacris purpurascens var. *purpurascens* within the study area

Previous records of *Epacris purpurascens* var. *purpurascens* exist in the surrounding locality 340 records within 5 kilometres of the study area, with the most recent collected in 2021 and the closest record was approximately 5 metres from the study area.

Twelve individuals were observed during a site investigation using transect surveys. The proposal has the potential to result in clearing of or damage to these individuals which are situated directly within trenched

areas of the site. Further surveys identified a large connected population associated with the individuals that totalled over 200 individuals.

Epacris purpurascens var. *purpurascens* the proposed works will result in the removal of up to 12 individuals and 4.24 hectares of potential habitat for the species. An assessment of whether the proposal is likely to lead to a significant impact *Epacris purpurascens* subsp. *purpurascens* is provided below.

Table B.43 Test of Significance for *Epacris purpurascens* var. *purpurascens*

Test of Significance for *Darwinia biflora*
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.
As the pollinators for *Epacris purpurascens* var. *purpurascens* are unknown, the distance between groups of plants which creates isolation is unknown (National Parks and Wildlife Services NSW 2002). The National Parks and Wildlife Service NSW suggest that all populations should be considered viable unless proven otherwise (ref). It is therefore assumed that the population in the study area is viable. Additional individuals have been recorded within the same patch of bushland within recent targeted surveys showing that the individuals located during this site investigation are unlikely to be the sole representatives of the local community. NSW Scientific Committee (1999) state that the lifespan is between 5 – 20 years, requiring 2 – 4 years before seed is produced in the wild. The proposed works include removal of native vegetation, the native vegetation to be removed was assessed as conforming to Sydney Hinterland Sandstone Woodland, a non-threatened ecological community which is common in the locality. Given the non-threatened status of the ecological community which is providing habitat for *Epacris purupurascens* var. *purpurascens* within the locality, and the continuity of the vegetation community outside of the impact area, it is unlikely that the proposed works will substantially reduce the habitat available to this species. The impacted vegetation is part of a larger patch of Sydney Hinterland Sandstone Woodland in the locality, which covers an area of over 20 hectares. Up to 0.48 ha of this native vegetation is likely to be removed with an additional 3.76 potential habitat to be removed within the impact area. Furthermore, the individuals to be impacted form part of a larger population group than contains at least 200 individuals. Given the small area of impact and surrounding connectivity, the proposed works are unlikely 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.
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.***
Not applicable, not an ecological community.
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***

Test of Significance for *Darwinia biflora*
(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.
Twelve (12) individuals of *Epacris purpurascens* var. *purpurascens* were recorded from within the impact area. The proposed works requires vegetation clearance from within a 15 metre corridor, and the removal of 4.24 ha of potential habitat for *Epacris purpurascens* var. *purpurascens*. The individuals to be impacted occur on the eastern most extent as part of a larger population of *Epacris purpurascens* var. *purpurascens* that contains at least 200 individuals. The habitat to be impacted forms part of a large contiguous area of intact native vegetation associated with Cattai Creek. Given the extent of habitat available and larger population of *Epacris purpurascens* var. *purpurascens* present in the surrounding environment, it is unlikely that the impact is of high importance for the long term survival of the species. Therefore, the impact is unlikely to put the population at risk of decline or extinction.
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).
To date no AOBVs have been declared within the proposal's impact area.
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.
The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act, and to which are considered relevant to *Epacris purpurascens* var. *purpurascens*: • Clearing of native vegetation. The proposed works requires clearing of vegetation, resulting in the removal of 0.47 ha of potential habitat for *Epacris purpurascens* var. *purpurascens*. Given some areas of potential habitat to be impacted by the proposal will be in the form of partial clearing and under boring, and that large areas of contiguous vegetation similar to that in the study area will be retained, the proposal is unlikely to increase the impact of any key threatening processes.
Conclusion.
In consideration of the above, the proposed activity is not likely to significantly affect *Darwinia biflora* within the study area or wider locality, as: • 12 individuals that form part of a larger population are likely to be impacted by the proposal. • The proposed works are localised, and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works. • The proposed works is unlikely to significantly alter the extent of the populations to the point where they become locally extinct. • The removal of potential habitat will not result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long term survival in the locality. • The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes. Application of the BOS or preparation of a SIS is therefore not required.

Eucalyptus sp. Cattai– Critically Endangered species BC Act

Eucalyptus sp. Cattai is listed as Critically Endangered under the BC Act.

A description of *Eucalyptus* sp. Cattai is found in the Commonwealth listings above.

Eucalyptus sp. Cattai within the study area

Previous records of *Eucalyptus* sp. Cattai exist in the surrounding locality (482 records within 5 kilometres of the study area, with the most recent collected in 2020 and the closest record was approximately 3.5 kilometres from the study area).

Eucalyptus sp. Cattai is associated with three vegetation communities within the study area, PCT 1081, PCT 1083 and PCT 1181. The proposed works will result in the removal of up to 4.24 hectares of potential habitat for the species. An assessment of whether the proposal is likely to lead to a significant impact *Eucalyptus sp.* Cattai is provided below.

Table B.44 Test of Significance for *Eucalyptus* sp. Cattai

Test of Significance for *Eucalyptus* sp. Cattai
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.
Eucalyptus sp. Cattai was not recorded within the study area during field surveys, the extents of the known population were survey with additional effort to discount presence of any individuals in the study area. Given there is a presence of associated vegetation communities within the study area, the study area may provide potential habitat for the species. Potential impacts to the species are associated with a 15 metre wide corridor for the proposed works, and include 4.24 ha of potential habitat. Although there is potential for the species to occur within the study area, this potential habitat has been subject to previous edge effects and is considered unlikely to be of a high enough quality to provide habitat for the species. In additional, the impacts are considered localised in scale and are limited to the edges of larger patches of potential habitat for the species adjacent to the study area. With this in consideration, it is considered unlikely that the current proposal will have an adverse effect on the life cycle of the species such that the species is likely placed at risk of extinction.
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.***
Not applicable, not an ecological community.
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.***
Eucalyptus sp. Cattai was not recorded within the study area during field surveys, however, the study area may provide potential habitat for the species given associated vegetation communities are present. The proposed works requires vegetation clearance from within a 15 metre wide corridor, and the removal of 4.24 hectares of potential habitat for

Test of Significance for *Eucalyptus* sp. Cattai
Eucalyptus sp. Cattai within the study area is expected. The occurrences of potential habitat for the species in the study area are predominantly bounded between Cattai Creek and residential development in Kellyville, where permanent physical barriers, including roads and buildings, contribute to existing fragmentation of the habitat. Although the impact area dissects potential habitat at several points across the landscape, associated impacts are not considered substantial and will not result in substantial decreases in connectivity of habitat. Any resulting fragmentation will not significantly reduce connectivity as the impacts occur within an already fragmented landscape, and it is unlikely that the local population, and/or any undetected individuals of *Eucalyptus* sp. Cattai, will be exposed to any substantial fragmentation. In light of the above, the proposed works are not considered likely to impact upon *Eucalyptus* sp. Cattai habitat at a level likely to impact the long-term survival of the species, particularly given no individuals were detected..
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).
To date no AOBVs have been declared within the proposal's impact area.
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.
The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act, and to which are considered relevant to *Eucalyptus* sp. Cattai: • Clearing of native vegetation. The proposed works requires clearing of vegetation, resulting in the removal 4.24 ha of potential habitat for *Eucalyptus* sp. Cattai. Given some areas of potential habitat to be impacted by the proposal will be in the form of partial clearing and under boring, and that large areas of contiguous vegetation similar to that in the study area will be retained, the proposal is unlikely to increase the impact of any key threatening processes.
Conclusion.
In consideration of the above, the proposed activity is not likely to significantly affect *Eucalyptus* sp. Cattai within the study area or wider locality, as: • No individuals were detected within the study area. • The proposed works are localised, and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works. • The proposed works is unlikely to significantly alter the extent of the populations to the point where they become locally extinct. • The removal of potential habitat will not result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long term survival in the locality. • The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes. Application of the BOS or preparation of a SIS is therefore not required.

Hibbertia superans –Endangered species BC Act

Hibbertia superans is listed as endangered under the BC Act. A low spreading shrub which occurs in both open woodland and heathland, and open disturbed areas, such as tracksides. Flowering occurs from July to December and produces dehiscent fruit with a fleshy aril that attracts ants and encourages them to disperse the seed. The general distribution of this species is from Baulkham Hills to South Maroota in the northern outskirts of Sydney, where there are currently 16 known sites, and at one locality at Mount Boss, inland from Kempsey.

Hibbertia superans within the study area

Previous records of *Hibbertia superans* exist in the surrounding locality (512 records within 5 kilometres of the study area, with the most recent collected in 2019 and the closest record was approximately 3.5 kilometres from the study area).

The species is associated with four vegetation communities within the study area, PCT 1081, PCT 1083, PCT 1181 and PCT 1395. Given the associated vegetation communities identified within the study area, the species have potential to utilise habitat within the study area. The proposed works will result in the removal of up to 4.53 hectares of potential habitat for the species. An assessment of whether the proposal is likely to lead to a significant impact on the species is provided below.

Table B.45 Test of Significance for *Hibbertia superans*

Test of Significance for *Hibbertia superans*,
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.
Hibbertia superans was not recorded within the study area during field surveys. However, due to the large size of the study area and previous recordings of the species in the surrounding landscape of the study area, isolated occurrences of the species may remain undetected. Given there is a presence of associated vegetation communities within the study area, the study area may provide potential habitat for the species. Potential impacts to the species are associated with a 15 metre wide corridor for the proposed works, and include 4.53 ha of potential habitat. Although there is potential for the species to occur within the study area, this potential habitat has been subject to previous edge effects and is considered unlikely to be of a high enough quality to provide habitat for the species. Nonetheless, the species are known to exist in degraded and disturbed areas and it is therefore possible that the proposed works will impact upon unrecorded individuals. In additional, the impacts are considered localised in scale and are limited to the edges of larger patches of potential habitat for the species adjacent to the study area. Given the localised impact of the proposed works and the fact that surrounding landscape contains equally habitable vegetation, it is unlikely that the proposed works will lead to the extinction of the viable local population.
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.***
Not applicable, not an ecological community.
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.***

Test of Significance for *Hibbertia superans*,

Hibbertia superans was not recorded within the study area during field surveys, however, the study area may provide potential habitat for the species given associated vegetation communities are present. The proposed works requires vegetation clearance from within a 15 metre wide corridor, and the removal of 4.53 hectares of potential habitat for the species within the study area is expected. The occurrences of potential habitat for the species in the study area are predominantly bounded between Cattai Creek and residential development in Kellyville, where permanent man-made structures, including roads and buildings, contribute to existing fragmentation of the habitat. Although the impact area dissects potential habitat at several points across the landscape, associated impacts are not considered substantial and will not result in substantial decreases in connectivity of habitat. Any resulting fragmentation will not significantly reduce connectivity as the impacts occur within an already fragmented landscape, and it is unlikely that the local population, and/or any undetected individuals of *Hibbertia superans* will be exposed to any substantial fragmentation.
In light of the above, the proposed works are not considered likely to impact upon *Hibbertia superans* habitat at a level likely to impact the long-term survival of the species, particularly given no individuals were detected.

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).

To date no AOBVs have been declared within the proposal's impact area.

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.

The proposed works have the potential to result in the following key threatening processes which are considered relevant to *Hibbertia superans*:

- Clearing of native vegetation.

Approximately 4.53 hectares of native vegetation that may provide potential habitat for *Hibbertia superans* will be impacted by the proposed works. Given the surrounding landscape contains equally habitable vegetation, the small-scale removal of vegetation as a result of the proposed works is unlikely to significantly contribute to the key threatening process of clearing of native vegetation.

Conclusion.

In consideration of the above, the proposed activity is not likely to significantly affect *Hibbertia superans* within the study area or wider locality, as:

- No individuals were detected within the study area.
- The proposed works are localised, and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works.
- The proposed works is unlikely to significantly alter the extent of the populations to the point where they become locally extinct.
- The removal of potential habitat will not result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long term survival in the locality.
- The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes.

Application of the BOS or preparation of a SIS is therefore not required.

Darwinia biflora – Vulnerable species BC Act

Darwinia biflora is listed as Vulnerable under the BC Act. It is an erect to spreading shrub which occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Flowering occurs throughout the year but is concentrated in autumn, with mature fruits being produced from May to August. Fire is an important factor in the life cycle of this species, producing a flush of germination from seed

stored in the soil. The number of individuals at a site then declines with time since fire, as the surrounding vegetation develops.

Darwinia biflora within the study area

Previous records of *Darwinia biflora* exist in the surrounding locality 340 records within 5 kilometres of the study area, with the most recent collected in 2019 and the closest record was approximately 3 kilometres from the study area).

Darwinia biflora is associated with three vegetation communities within the study area, PCT 1081, PCT 1083 and PCT 1181. The proposed works will result in the removal of up to 4.24 hectares of potential habitat for the species. An assessment of whether the proposal is likely to lead to a significant impact *Darwinia biflora* is provided below.

Table B.46 Test of Significance for *Darwinia biflora*

Test of Significance for *Darwinia biflora*
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.
Darwinia biflora was not recorded within the study area during field surveys, however, due to the large size of the study area isolated occurrences of the species may remain undetected. The proposed works requires the removal of 4.24 ha of vegetation which is potentially habitat for *Darwinia biflora.* Whilst no individuals were recorded during field surveys, there have been previously mapped individuals in the surrounding area and therefore there is a potential direct risk to unmapped individuals, and indirect risk towards soil stored seed, both of which would affect the lifecycle of the affected individuals, or clusters of plants, within the local population. Although there is potential for the species to occur within the study area, this potential habitat has been subject to previous edge effects and is considered unlikely to be of a high enough quality to provide habitat for the species In additional, the impacts are considered localised in scale and are limited to the edges of larger patches of potential habitat for the species adjacent to the study area. Given the localised impact of the proposed works and the fact that surrounding landscape contains equally habitable vegetation, it is unlikely that the proposed works will lead to the extinction of the viable local population.
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.***
Not applicable, not an ecological community.
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***

Test of Significance for *Darwinia biflora*

(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.

Darwinia biflora was not recorded within the study area during field surveys, however, due to the large size of the study area isolated occurrences of the species may remain undetected. The proposed works requires vegetation clearance from within a 15 metre wide corrridor, and the removal of 4.24 hectares of potential habitat for *Darwinia biflora* through clearing of native vegetation within the study area is expected. The occurrences of potential habitat for the species in the study area are predominantly bounded between Cattai Creek and residential development in Kellyville, where permanent physical barriers, including roads and buildings, contribute to existing fragmentation of the habitat. Although the impact area dissects potential habitat at several points across the landscape, associated impacts are not considered substantial and will not result in substantial decreases in connectivity of habitat. Any resulting fragmentation will not significantly reduce connectivity as the impacts occur within an already fragmented landscape, and it is unlikely that the local population, and/or any undetected individuals of *Darwinia biflora*, will be exposed to any substantial fragmentation.

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).

To date no AOBVs have been declared within the proposal's impact area.

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.

The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act, and to which are considered relevant to *Darwinia biflora*:

- Clearing of native vegetation.

The proposed works requires clearing of vegetation, resulting in the removal of 4.24 ha of potential habitat for *Darwinia biflora*. Given some areas of potential habitat to be impacted by the proposal will be in the form of partial clearing and under boring, and that large areas of contiguous vegetation similar to that in the study area will be retained, the proposal is unlikely to increase the impact of any key threatening processes.

Conclusion.

In consideration of the above, the proposed activity is not likely to significantly affect *Darwinia biflora* within the study area or wider locality, as:

- No individuals were detected within the study area.
- The proposed works are localised, and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works.
- The proposed works is unlikely to significantly alter the extent of the populations to the point where they become locally extinct.
- The removal of potential habitat will not result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long term survival in the locality.
- The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes.

Application of the BOS or preparation of a SIS is therefore not required.

Dillwynia tenuifolia– Vulnerable species BC Act

Dillwynia tenuifolia is listed as Vulnerable under the BC Act. It is a low spreading pea-flower shrub to 1 metre high. The core distribution is the Cumberland Plain from Windsor and Penrith east to Dean Park near Colebee. Other populations in western Sydney are recorded from Voyager Point and Kemps Creek in the Liverpool LGA, Luddenham in the Penrith LGA and South Maroota in the Baulkham Hills Shire. In western Sydney, 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.

Dillwynia tenuifolia within the study area

Previous records of *Dillwynia tenuifolia* exist in the surrounding locality (48 records within 5 kilometres of the study area, with the most recent collected in 2019 and the closest record was approximately 150 metres from the study area).

Dillwynia tenuifolia is associated with five vegetation communities within the study area, PCT 724, PCT 849, PCT 1081, PCT 1083 and PCT 1395. The proposed works will result in the removal of up to 1.94 hectares of potential habitat for the species. An assessment of whether the proposal is likely to lead to a significant impact *Dillwynia tenuifolia* is provided below.

Table B.47 Test of Significance for *Dillwynia tenuifolia*

Test of Significance for *Dillwynia tenuifolia*
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.
Dillwynia tenuifolia was not recorded within the study area during field surveys. The proposed works requires the removal of 1.94 ha of vegetation which is potentially habitat for *Dillwynia tenuifolia.* Whilst no individuals were recorded during field surveys, there have been previously mapped individuals in the surrounding area and therefore the proposal has the potential to impact upon unrecorded individuals of the species directly, and soil stored seed, both of which would affect the lifecycle of the affected individuals, or clusters of plants, within the populations. Although there is potential for the species to occur within the study area, this potential habitat has been subject to previous edge effects and is considered unlikely to be of a high enough quality to provide habitat for the species. Considering the proposed works include partial clearance in the form of canopy trimming in some areas of potential habitat for *Darwinia biflora*, the breeding life cycle of *Darwinia biflora* may benefit from some partial clearance. With this in consideration, it is considered unlikely that the current proposal will have an adverse effect on the life cycle of the species such that the species is likely placed at risk of extinction.
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.***
Not applicable, not an ecological community.

Test of Significance for *Dillwynia tenuifolia*

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.

Dillwynia tenuifolia was not recorded within the study area during field surveys, however, due to the large size of the study area isolated occurrences of the species may remain undetected. The proposed works requires vegetation clearance from within a 15 metre wide corridor, and the removal of 1.94 hectares of potential habitat for *Dillwynia tenuifolia* through clearing of native vegetation within the study area is expected. The extent of habitat removal is not considered to be substantial when assessed in the context of the local population of the species, which occur throughout the Cumberland Plain. The occurrences of potential habitat for the species in the study area are predominantly bounded between Cattai Creek and residential development in Kellyville, and along roadside reserves within the northern extent of the study area, where permanent man-made structures, including roads and buildings, contribute to existing fragmentation of the habitat. Although the impact area dissects potential habitat at several points across the landscape, associated impacts are not considered substantial and will not result in substantial decreases in connectivity of habitat. Any resulting fragmentation will not significantly reduce connectivity as the impacts occur within an already fragmented landscape, and it is unlikely that the local population, and/or any undetected individuals of *Dillwynia tenuifolia*, will be exposed to any substantial fragmentation.

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).

To date no AOBVs have been declared within the proposal's impact area.

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.

The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act, and to which are considered relevant to *Dillwynia tenuifolia*:

- Clearing of native vegetation.

The proposed works requires clearing of vegetation, resulting in the removal of 1.94 ha of potential habitat for *Dillwynia tenuifolia*. Given some areas of potential habitat to be impacted by the proposal will be in the form of partial clearing and under boring, and that large areas of contiguous vegetation similar to that in the study area will be retained, the proposal is unlikely to increase the impact of any key threatening processes.

Conclusion.

In consideration of the above, the proposed activity is not likely to significantly affect *Dillwynia tenuifolia* within the study area or wider locality, as:

- No individuals were detected within the study area.
- The proposed works are localised, and the study area has already been exposed to a number of disturbances which are unlikely to be further exacerbated by the proposed works.
- The proposed works is unlikely to significantly alter the extent of the populations to the point where they become locally extinct.

Test of Significance for *Dillwynia tenuifolia*
• The removal of potential habitat will not result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long term survival in the locality. • The localised nature of the proposed works will not significantly trigger or exacerbate any key threatening processes. Application of the BOS or preparation of a SIS is therefore not required.

Threatened fauna species

Cumberland Plain Land Snail *Meridolum corneovirens*– Endangered species BC Act

The Cumberland Plain Land Snail is listed as Endangered under the BC Act. It lives in small areas on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. This species primarily inhabits Cumberland Plain Woodland, a grassy, open woodland with occasional dense patches of shrubs. It is also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest, which are also listed communities. It lives under litter of bark, leaves and logs, or shelters in loose soil around grass clumps often near waterways. Occasionally shelters under rubbish.

Cumberland Plain Land Snail within the study area

Previous records of Cumberland Plain Land Snail exist in the surrounding locality (54 records within 5 kilometres of the study area with the most recent collected in 2020 and the closest record was approximately 290 metres from the study area).

Cumberland Plain Land Snail is associated with four vegetation communities within the study area, PCT 724, PCT 835, PCT 849, and PCT 1395. The proposed works will result in the removal of up to 1.83 hectares of potential habitat for the species. An assessment of whether the proposal is likely to lead to a significant impact Cumberland Plain Land Snail is provided below.

Table B.48 Test of significance for Cumberland Plain Land Snail

Test of Significance for Cumberland Plain Land Snail
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.
The proposal will remove 1.83 ha of potential habitat for the Cumberland Plain Land Snail, including leaf litter and understorey vegetation that may provide foraging and breeding habitat for the species. The removal of this vegetation will reduce the available habitat for the Cumberland Plain Land Snail in the study area, however, most of the potential habitat along creek lines within the study area will be under bored under the current proposal, which will significantly reduce direct impacts to habitat for the species. Given the availability of similar habitat adjacent to the study area, as well as higher quality habitat within the local area, such small-scale removal of vegetation is considered unlikely 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.
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.***

Test of Significance for Cumberland Plain Land Snail
Not applicable, not an ecological community.
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.***
The proposed works will result in the removal of 1.83 ha of potential habitat for the Cumberland Plain Land Snail, including removal of leaf litter and understorey ground cover vegetation that represents potential foraging and breeding habitat for the species. The occurrences of Cumberland Plain Land Snail habitat in the study area are predominantly along roadside reserves, and is located on the outer extent of larger patches of native vegetation. Thus, roadways and buildings situated beside the potential habitat already contributes to edge effects and fragmentation of the species' habitat. Given the location of the study area, the removal of this vegetation is unlikely to result in further fragmentation of habitat for the species. As such, it is unlikely that the small-scale removal of vegetation required by this proposal will result in fragmentation or isolation of Cumberland Plain Land Snail. Vegetation within the study area is contiguous with larger patches of potential habitat, which includes native vegetation with less exposure to edge effects and fragmentation. The vegetation situated adjacent to the study area may provide better habitat potential than the area to be impacted by the proposed works. The best quality habitat for the species in the study area is located along several creek lines, in which most direct impacts are being avoided through under boring. Therefore the importance of the habitat to be removed is not consider significant for the long-term survival of the species within the locality.
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).
To date no AOBVs have been declared within the proposal's impact area.
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.
The proposed works have the potential to result in the following key threatening process which is listed under the Schedule 4 of the BC Act and which is considered relevant to Cumberland Plain Land Snail: • Clearing of native vegetation. Approximately 1.83 ha of native vegetation that may provide marginal breeding and foraging habitat for Cumberland Plain Land Snail will be impacted by the proposed works. Given the availability of more intact bushland that is contiguous with the study area, such localised removal of vegetation is considered unlikely to significantly contribute to the key threatening process of clearing of native vegetation.
Conclusion.

Test of Significance for Cumberland Plain Land Snail
In consideration of the above, the proposed activity is not likely to significantly affect the Cumberland Plain Land Snail within the study area or wider locality, as: • The best quality habitat for the species within the study area is located along creek lines, in which direct impacts are being avoided through under boring. • The proposal will remove 1.83 ha of potential habitat from within an area containing contiguous patches of similar or better habitat. • The extent of the vegetation removal in the context of the broader area will not significantly disrupt the lifecycle of the species as large areas of similar habitat will still be available adjacent to the study area. . Application of the BOS or preparation of a SIS is therefore not required.

Dural Land Snail *Pommerhelix duralensis* –Endangered species BC Act

The Dural Land Snail is listed as Vulnerable under the BC Act.

A description of Dural Land Snail is found in the Commonwealth listings above.

Dural Land Snail within the study area

Previous records of Dural Land Snail exist in the surrounding locality (71 records within 5 kilometres of the study area with the most recent collected in 2019 and the closest record was approximately 60 metres from the study area).

Dural Land Snail is associated with five vegetation communities within the study area, PCT 724, PCT 849, PCT 1081, PCT 1181, and PCT 1395. The proposed works will result in the removal of up to 3.85 hectares of potential habitat for the species. An assessment of whether the proposal is likely to lead to a significant impact Dural Land Snail is provided below.

Table B.49 Test of significance for the Dural Land Snail

Test of Significance for Dural Woodland Snail
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.
The mating behaviour of Dural Land Snail is poorly documented with studies on the species failing to observe mating behaviours despite hundreds of hours in the field (Ridgeway et al. 2014). Similarly there is no literature available on the longevity of the species (Ridgeway et al. 2014). However it is likely that the Dural Land Snail has similar longevity and reproductive traits to other related species of land snails, likely living for approximately five years and laying approximately 20 to 30 eggs after rain (TSSC 2014, Ridgeway et al. 2014). The species is never abundant (Clark 2009), with the maximum total number of recorded individuals (mature and otherwise) per hectare being three individuals (Ridgeway et al. 2014, TSSC 2014). However this information is based on a single study and it is possible densities may be higher in some populations (TSSC 2014). The proposed works include the removal of 3.85 ha of potential habitat for the species. Based upon existing information for the species, the maximum total number of snails that would be supported by the area of impact is 12 individuals (based upon three snails per hectare and an impact area of 3.85 ha) (Ridgeway et al. 2014). The vegetation to be removed is part of larger patches of shale-influenced vegetation that will remain undeveloped under the current proposal. The remaining shale-influenced vegetation is likely capable of supporting Dural Land Snail to the same extent or better than the vegetation to be removed, given the remaining patches are contiguous and do not occur in an edge-affected state. Given the availability of connected resources and area of impacted vegetation occurring on the edges of larger patches of

Test of Significance for Dural Woodland Snail
intact vegetation, the proposed works are unlikely 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.
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.***
Not applicable, not an ecological community.
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.***
The proposed works requires vegetation clearance from within a 15 metre wide corridor, and the removal of 3.85 ha of associated native vegetation, which represents potential Dural Land Snail habitat. Dural Land Snail exhibit a strong preference for shale-influenced transitional landscapes and ecological communities, thus shale-influenced habitats within the geographic range of the species (i.e. the northwest fringes of the Cumberland Plain) are considered to be of importance to the survival of the species. The occurrences of Dural Land Snail habitat in the study area are predominantly along roadside reserves, where permanent man-made structures, including roads and buildings, contribute to existing fragmentation of the species' habitat. In addition, based on the available information for maximum snail densities, the area of impact is considered to be capable of supporting 12 individuals (based upon three snails per hectare and an impact area of 3.85 ha) (Ridgeway et al. 2014). Given the state of edge-affected habitat to be removed within the study area, and the remaining contiguous shale-influenced vegetation adjacent to the study area, it is unlikely that the proposed works will significantly impact the long-term survival of the species.
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).
To date no AOBVs have been declared within the proposal's impact area.
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.
Key threatening processes relevant to the woodland bird species identified on the Schedule 4 of the BC Act that may be exacerbated by the proposed slope works include: • Clearing of native vegetation. The proposed works include the clearing potential habitat for the species, through the removal of 3.85 ha of shale-influenced vegetation. However, given potential habitat within the study area is contiguous with larger patches of shale-influenced vegetation that may provide similar or better habitat for the Dural Land Snail, the removal of this edge-

Test of Significance for Dural Woodland Snail
affected habitat is unlikely to significantly impact the species within the locality. The proposed works are unlikely to increase the impact of any of the other threats to the species highlighted under the Threatened Species Scientific Committee Conservation Advice (2014).
Conclusion.
In consideration of the five factors listed above (a - e) the proposed works are considered unlikely to result in a significant effect to Dural Land Snail due to: • The proposal will remove 3.85 ha of potential habitat from within an area containing contiguous patches of similar or better habitat. • The extent of the vegetation removal in the context of the broader area will not significantly disrupt the lifecycle of the species as large areas of similar habitat will still be available adjacent to the study area. Application of the BOS or preparation of a SIS is therefore not required.

Glossy Black Cockatoo *Calyptorhynchus lathami* – Vulnerable species BC Act

The Glossy Black Cockatoo is listed as Vulnerable under the BC Act. It is a medium-sized cockatoo with a diagnostic combination of black-brown head, neck and underbody, red or orange-red panel in tail, and otherwise black plumage. The species is closely associated with *Allocasuarina* spp. and *Casuarina* spp. dominated woodlands, or open sclerophyll forest where the middle stratum is *Allocasuarina* spp. They feed almost exclusively on the seed of *Allocasuarina* spp. but occasionally also take wood-boring insect larvae. The species is dependent on hollow-bearing trees for breeding habitat as they nest in the hollows formed in the trunk, stump, spout or limbs of eucalypt trees, living or dead (Higgins 1999, DPIE 2017). In coastal and tablelands areas preferred feed trees are Forest Oak *Allocasuarina torulosa* and Black She-oak *Allocasuarina littoralis*, with some foraging occurring on Horsetail She-oak *Casuarina equisetifolia* (DEC 2004).

Glossy Black Cockatoo within the study area

Previous records of Glossy Black Cockatoo exist in the surrounding locality (19 records within 5 kilometres of the study area with the most recent collected in 2020 and the closest record was approximately 90 metres from the study area).

Glossy Black Cockatoo is associated with five vegetation communities within the study area, PCT 724, PCT 1081, PCT 1083, PCT 1181, and PCT 1292. The proposed works will result in the removal of up to 4.45 hectares of potential habitat for the species. An assessment of whether the proposal is likely to lead to a significant impact Glossy Black Cockatoo is provided below.

Table B.50 Test of Significance for Glossy Black Cockatoo

Test of Significance for Glossy Black Cockatoo
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.
The direct impacts resulting from the proposed works that have the potential to impact upon the life cycle of Glossy Black Cockatoo include the reduction or degradation of suitable foraging habitat. The proposed works include the removal of 32 hollow-bearing trees that do not constitute potential breeding habitat, as well as the removal of several *Allocasuarina* and *Casuarina* trees which represent foraging habitat. The removal of these trees will reduce the availability of resources within the immediate area, however, the contiguous nature of the vegetation within the study area with good quality bushland adjacent to the study area reduces the importance of the vegetation to be removed. Recommendations have

Test of Significance for Glossy Black Cockatoo
been included for the protection of trees to be retained within the vicinity of the proposed works which will ensure potential impacts to Glossy Black Cockatoo habitat are minimised. Given the small scale of impact associated with the proposed works and the wide availability of suitable high-quality resources within the locality, it is unlikely that the proposed works will have an adverse effect on the life cycle of Glossy Black Cockatoo such that a viable local population of the species is likely to be placed at risk of extinction.
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.***
Not applicable, not an ecological community.
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.***
The proposed works will result in the removal of 4.45 ha of potential habitat for the Glossy Black Cockatoo, including removal of known feed trees for the species. In addition, the current proposal will impact 32 hollow-bearing trees, however these hollows are not suitable as nesting habitat for Glossy Black Cockatoo. Habitat connectivity within the study area is considered moderate as the study area is situated across several residential areas and agricultural land, but connectivity is retained through drainage lines and riparian vegetation. Given the linear nature of the vegetation clearing associated within the proposed works, and its location within an already fragmented landscape, the removal of 4.45 ha of potential habitat for the species is considered unlikely to significantly contribute to any fragmentation of habitat. In a broader sense, the potential habitat to be removed within the study area is important habitat for the species. However, the quantity of permanent vegetation removal/disturbance and the type of removal (linear) required for the development will not jeopardise the long term survival of the species in the locality given the quantity of similar contiguous habitat immediately adjacent to the development. Given the wide availability of higher quality resources within the adjacent riparian vegetation, the removal of vegetation from the study area is unlikely to significantly impact the species, such that the long-term survival of the species within the locality is placed at risk.
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).
To date no AOBVs have been declared within the proposal's impact area.
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.

Test of Significance for Glossy Black Cockatoo
Key threatening processes relevant to the woodland bird species identified on the Schedule 4 of the BC Act that may be exacerbated by the proposed slope works include: • Clearing of native vegetation. • Loss of hollow-bearing trees. The potential habitat being removed is located within a disturbed region and will not result in any further fragmentation of habitat for the species. The removal of 4.45 ha of potential foraging and roosting habitat will contribute to these KTPs, but is unlikely to significantly impact the species within the locality.
Conclusion.
In consideration of the above five factors (a-e), the proposed activity is not likely to significantly affect Glossy Black Cockatoo individuals within the study area or wider locality, as: • The proposal will remove 4.45 ha of potential habitat that may represent foraging and roosting resource from within an area containing contiguous patches of similar habitat. • The extent of the vegetation removal in the context of the broader area will not significantly disrupt the lifecycle of the Glossy Black Cockatoo as large areas of similar habitat will still be available for critical activities to occur adjacent to the study area. • While the habitat to be removed is considered important to these species, the type of the removal within the area is not considered important to the survival or recovery of the species. • The proposed works do not significantly contribute to a KTP for Glossy Black Cockatoo. Application of the BOS or preparation of a SIS is therefore not required.

Woodland bird species

The following woodland bird species have previously been recorded within a 5 kilometre radius of the study area:

- Dusky Woodswallow *Artamus cyanopterus cyanopterus* –Vulnerable species BC Act
- Varied Sittella *Daphoenositta chrysoptera* – Vulnerable species BC Act
- Little Lorikeet *Glossopsitta pusilla* – Vulnerable species BC Act
- Turquoise Parrot *Neophema pulchella* – Vulnerable species BC Act
- Scarlet Robin *Petroica boodang* – Vulnerable species BC Act
- Flame Robin *Petroica phoenicea* – Vulnerable species BC Act

Dusky Woodswallow are found over a broad range of habitats, primarily inhabiting dry open Eucalypt forests and woodland, yet can be found in moist forest or rainforest. The species can be resident or migratory birds depending on location. Populations in NSW migrate to south-eastern Queensland after breeding in Spring. Dusky Woodswallow nest in open cup shaped nests, generally occurring in shrubs or low trees. Dusky Woodswallow primarily eat insects whilst flying high but can also forage under canopy over leaf litter or dead timber (OEH 2017).

The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. The species usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts.The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.

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Little Lorikeet is distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 metres and 15 metres, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.

The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. The species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Nests in tree hollows, logs or posts, from August to December.

Scarlet Robin is found from south east Queensland to south-east South Australia and also in Tasmania and south-west Western Australia. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. The species lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation that usually contains abundant logs and fallen timber, which are important components of its habitat. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps.

Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. 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. The preferred habitat in summer includes moist eucalyptus forests and open woodlands, in winter prefers open woodlands and farmlands. It is considered migratory. Diet consists mainly of invertebrates.

Woodland bird species within the study area

A number of records of the above woodland bird species occur within 5 kilometres of the study area.

The proposed works will result in the removal of up to 9.56 hectares of potential habitat for the species. A combined assessment of whether the proposal is likely to lead to a significant effect on these threatened woodland bird species is provided below.

Table B.51 Test of Significance for Dusky Woodswallow, Varied Sittella, Little Lorikeet, Turquoise Parrot, Scarlet Robin and Flame Robin

Test of Significance for Dusky Woodswallow, Varied Sittella, Little Lorikeet, Turquoise Parrot, Scarlet Robin, Flame Robin
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.
Woodland birds move freely between the study area and adjacent woodland habitats adjacent to the study area and more broadly in the locality. Impacts from the current proposal that have potential to adversely affect the life cycle of threatened woodland birds (Dusky Woodswallow, Varied Sittella, Little Lorikeet, Turquoise Parrot, Scarlet Robin and Flame Robin) include direct mortality during construction, loss of nesting, perching and sheltering habitat, loss and fragmentation of foraging habitat particularly areas of continuous woodland and indirect impacts including clutch failure due to noise disturbance, mortality through vehicle strikes, increased edge effects and competition from Noisy Miners. The bird species considered here may use a range of PCTs therefore the total permanent habitat removal/disturbance area is considered to be the likely extent of long term impacts on woodland vegetation (i.e. up to 9.56 ha), although not all species would utilise all vegetation in the same manner. In addition to this total woodland birds are likely to utilise planted indigenous and non-indigenous vegetation throughout the study area that does not align with a PCT. The habitat to be permanently removed includes understorey vegetation that may be used as a foraging or nesting resource (shrubs for

Test of Significance for Dusky Woodswallow, Varied Sittella, Little Lorikeet, Turquoise Parrot, Scarlet Robin, Flame Robin
small passerine species) and canopy species including 32 hollow-bearing trees (which some species use). It is likely that if these species use the study area for foraging, nesting and breeding then the local populations would be reasonably expected to use the entire patches of contiguous habitat within the road reserves and adjacent native vegetation that is contiguous with vegetation within the study area. Removal of vegetation in the context of the available habitat adjacent to the development will not adversely affect the life cycle of threatened woodland bird species such that local populations would be placed at risk of extinction given the nature of the removal (linear strip), the quantity of suitable breeding and nesting habitat immediately adjacent to the development, the dispersal ability of these mobile avian species and the abundance of these species in the local area (some of which are locally common).
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.***
Not applicable, not an ecological community.
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.***
The current proposal will remove up to 9.56 ha of potential habitat for threatened woodland birds throughout the study area. The development also has the potential to modify adjoining native vegetation by increased edge effects, sedimentation and accidental modification by workers during construction. Recommendations contained within this report aim to minimise indirect impact from construction and operation of the proposal. The threatened woodland bird habitat in the area will be fragmented by the current proposal and although some woodland birds are more susceptible to fragmentation and are generally more sedentary, the development will not act as a barrier such that the habitat would become isolated or local population should become genetically isolated. In a broader sense, the potential habitat to be removed within the study area is important habitat for these species. However, the quantity of permanent vegetation removal/disturbance and the type of removal (linear) required for the development will not jeopardise the long term survival of these species in the locality given the quantity of similar contiguous habitat immediately adjacent to the development and the local abundance of some of these threatened species. The cumulative impacts of incremental habitat loss is a key concern for woodland bird species but given the type of impact in the context of the available habitat at the location, this is not seen as a significant issue in this case. Habitat removal of this type and extent will not adversely influence the long term survival of any threatened woodland birds given the quantity of similar habitat immediately adjacent to the development.
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).

Test of Significance for Dusky Woodswallow, Varied Sittella, Little Lorikeet, Turquoise Parrot, Scarlet Robin, Flame Robin
To date no AOBVs have been declared within the proposal's impact area.
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.
Key threatening processes relevant to the woodland bird species identified on the Schedule 4 of the BC Act that may be exacerbated by the proposed slope works include: • Clearing of native vegetation. • Loss of hollow-bearing trees. The removal of 9.56 ha of potential foraging and roosting habitat will contribute to these KTPs, but is unlikely to significantly impact any threatened woodland birds within the locality.
Conclusion.
In consideration of the above five factors (a-e), the proposed activity is not likely to significantly affect threatened woodland birds within the study area or broader locality, as: • The proposal will remove 9.56 ha of potential habitat that may represent a dispersal, nesting or foraging resource from within an area containing contiguous patches of similar habitat. • The extent of the vegetation removal in the context of the broader area will not significantly disrupt the lifecycle of threatened woodland birds as large areas of similar habitat will still be available for critical activities to occur in post construction adjacent to the study area. Some of the species considered here readily move through the landscape and undertake seasonal migration while others are sedentary but capable of short distance dispersal. • While the habitat to be removed is considered important to these species, the type of the removal within the area is not considered important to the survival or recovery of any of these species. • The proposal does not significantly contribute to a KTP for these species. Application of the BOS or preparation of a SIS is therefore not required.

Cave roosting microchiropteran bat species

The following cave-roosting microchiropteran bat species have previously been recorded within a 5 kilometre radius of the study area:

- Large-eared Pied Bat *Chalinolobus dwyeri*– Vulnerable species BC Act
- Little Bent-winged Bat *Miniopterus australis*– Vulnerable species BC Act
- Large Bent-winged Bat *Miniopterus orianae oceanensis* – Vulnerable species BC Act
- Eastern Cave Bat *Vespadelus troughtoni*– Vulnerable species BC Act

The Little Bent-winged Bat occurs on the east coast of Australia, ranging from Cape York in Queensland to Wollongong in NSW (DPIE 2019a). It is a cave dwelling bat, however it is known to roost in caves, abandoned mines, tunnels, stormwater drains, and occasionally buildings. It is insectivorous, feeding primarily on beetles, moths and flies, but is also known to frequently consume spiders.

Large Bent-winged Bat occurs along the eastern coast of Australia from Cape York in northern Queensland to Castlemaine in Victoria, including coastal areas of NSW (Churchill 2008). The species is cave dwelling but will also roost in man-made structures such as abandoned mines and road culverts. They are insectivorous feeding primarily on moths as well as flies, cockroaches and beetles. In forested areas they hunt just above the canopy level. They can forage long distances, with individuals recorded traveling up to 65 kilometres in one night, although this is not energetically efficient.

The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest.

A description of Large-eared Pied Bat is found in the Commonwealth listings above.

Cave roosting microbat species within the study area

A number of records of the above microbat species occur within 5 kilometres of the study area.

The proposed works will result in the removal of up to 9.56 hectares of potential habitat for the species. A combined assessment of whether the proposal is likely to lead to a significant effect on threatened microbat species is provided below.

Table B.52 Test of Significance for Large-eared Pied Bat, Little Bent-winged Bat, Large Bent-winged Bat and Eastern Cave Bat

Test of Significance for Large-eared Pied Bat, Little Bent-winged Bat, Large Bent-winged Bat and Eastern Cave Bat
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.
Impacts under the current proposal likely to have an adverse effect on the life cycle of cave-dependent threatened microbat species include direct mortality, disturbance of potential roosting sites, degradation or removal of breeding and foraging habitat and by vegetation encroachment (DPIE 2019a, 2019b). The proposed works include clearing of native forest and woodland vegetation, and indirect disturbance to rocky overhangs which may provide marginal breeding and roosting habitat for the cave-dependent microbat species. The proposed works will not involve removal of this habitat but under boring may result in some indirect impacts such as increased noise, dust and vibration. The vegetation being removed represents potential foraging resources for insectivorous microbat species that feed above or within the forest canopy, which includes the Little Bent-winged Bat and Large-winged Bat. However, despite the suitability of the rocky overhangs, due to the cracks and crevices formed by the sandstone blocks which allow for microbats to take hold when roosting, the overall quality of the habitat that it affords is considered low due to the small size of the overhangs which are subject to light spill and noise impacts from existing nearby traffic. The locality includes a variety of higher quality habitats for cave-dwelling microbat species due to the prevalence of rocky ridgelines and drainage lines adjacent to the study area. Given the small-scale removal of marginal habitat within an area with abundant resources the proposed works are unlikely 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 extinction
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.***
Not applicable, not an ecological community.

Test of Significance for Large-eared Pied Bat, Little Bent-winged Bat, Large Bent-winged Bat and Eastern Cave Bat
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.***
The proposed works will indirectly disturb marginal roosting habitat for cave-dwelling microbats within the study area, and will remove 9.56 ha of potential foraging habitat. The potential breeding and roosting habitat is considered of low quality due to the small size of the rocky overhangs which are subject to light spill and noise disturbances from nearby traffic. Habitat connectivity within the locality is high as the study area follows multiple drainage lines containing contiguous vegetation. There are several rocky escarpments within the locality which would provide good quality roosting habitat for cave-dwelling microbat species. Microbats are also highly mobile species and therefore indirect impacts to the rocky overhangs would not serve as barrier to the movement of individuals across the area. Due the quality of the potential breeding and roosting habitat afforded by the rocky overhangs, and its presence within an area of similar quality roosting resources, the proposed works are considered unlikely to result in significant fragmentation to cave-dependant microchiropteran roosting habitat, such that the long-term survival of any of the species within the locality are placed at risk.
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).
To date no AOBVs have been declared within the proposal's impact area.
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.
Key threatening processes that may be exacerbated by the proposed works include: • Clearing of native vegetation. The proposed works will remove 9.56 ha of potential foraging habitat for the microbat species, and indirect impacts may occur to the potential breeding and roosting habitat, which will reduce the quality of the potential habitat within the study area. Given the location of the study area within a disturbed and developed urban environment it is considered unlikely that the removal of this vegetation would exacerbate the impacts of these key threatening processes on the microbat species.
Conclusion.
In consideration of the above five factors (a-e), the proposed activity is not likely to significantly affect the cave-dependent microbat species within the study area or wider locality, as: • The proposed works will result in impacts to 9.56 ha of potential foraging habitat and indirect impacts to low-quality breeding and roosting habitat, and the removal of these habitats is considered unlikely to constitute a significant effect to these microbat species. • The proposed works are unlikely to significantly contribute to a KTP for microbats. Application of the BOS or preparation of a SIS is not required.

Tree-hollow roosting microchiropteran bat species

The following tree-hollow roosting microchiropteran bat species have previously been recorded within a 5 kilometre radius of the study area:

- Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* – Vulnerable species BC Act
- Southern Myotis *Myotis macropus* – Vulnerable species BC Act
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*– Vulnerable species BC Act
- Greater Broad-nosed Bat *Scoteanax rueppellii*– Vulnerable species BC Act

The Eastern Coastal Free-tailed Bat occurs along the coastal regions of eastern Australia. In NSW its range expands west out over the Great Diving Range. The habitat preference of this species is poorly known, however, it has been observed to occur in dry eucalypt forest, coastal woodland, riparian zones and wet sclerophyll forests. Hollow bearing trees are their preferred roosting sites.

Southern Myotis has a wide distribution within the coastal band (i.e. less than 100 kilometres inland), occurring from north-west Australia, across the top-end and south to western Victoria. The species generally roosts in groups of 10 – 15 individuals, preferably close to water in a number of different habitat structures including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, bridges and in dense foliage.

Yellow-bellied Sheathtail-bat is wide-ranging, present across northern and eastern Australia, including coastal and inland NSW (DPIE 2017c). It roosts in large tree hollows in mixed-sex groups of two to six and occasionally up to 30 individuals. They are insectivorous, feeding primarily on beetles but also grasshoppers, crickets, leafhoppers, shield bugs, wasps, and flying ants.

Greater Broad-nosed Bat occurs in gullies and river system that drain the Great Dividing Range and ranges from north-eastern Victoria up to the Gold Coast in Queensland. The species utilises a variety of habitats including woodland, moist and dry Eucalyptus forests and rainforest, however it is most commonly found in tall wet forests. It generally roosts in tree hollows however it is also known to utilised man-made structures.

Tree-hollow roosting microbat species within the study area

A number of records of the above microbat species occur within 5 kilometres of the study area.

The proposed works will result in the removal of up to 9.56 hectares of potential habitat for the species and 32 hollow-bearing trees. An assessment of whether the proposal is likely to lead to a significant effect on threatened tree hollow-dependent microbat species is provided below.

Table B.53 Test of Significance for Eastern Coastal Free-tailed Bat, Southern Myotis, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat

Test of Significance for Eastern Coastal Free-tailed Bat, Southern Myotis, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat
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.
Impacts from the current proposal which have potential to have an adverse effect on the life cycle of threatened microbats include disturbance to roosting and breeding sites, loss of roosting habitat (primarily hollow-bearing eucalypts), loss and fragmentation of foraging habitat particularly areas of continuous woodland and indirect impacts including noise disturbance and mortality through vehicle strikes. These tree-hollow dependent microbats may occupy woodland habitats, planted vegetation, farm houses, sheds and

Test of Significance for Eastern Coastal Free-tailed Bat, Southern Myotis, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat
culverts, bridges and underpasses within and adjacent to the alignment. The development will permanently remove or disturb up to 9.56 ha of suitable woodland habitat, including 32 hollow-bearing trees. The resultant disturbance will be a 15 metre wide corridor of potential habitat for the species. It is likely that if the species utilise the study area for foraging and roosting then the local population could continue to utilise the adjacent contiguous habitat. Hollow-bearing trees suitable for roosting will also be removed. This level of disturbance, whilst significant, is unlikely to affect foraging, dispersal or gene flow of threatened microbats given their dispersal ability and large home ranges to the extent that local population are put at risk of extinction. Recommendations for the staged removal of these habitat trees under ecological supervision will further ensure the impacts to any roosting microbats are minimised. The vegetation to be removed by the proposed works is also primarily located in an area of infrastructure, already subject to edge effects. It is likely that this vegetation does not afford the same foraging opportunities as those of the surrounding more intact vegetation. As such the development is unlikely to have a significant adverse effect on the life cycle of local populations of microbats to the point that the broader population should significantly decline.
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.***
Not applicable, not an ecological community.
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.***
The current proposal will remove or modify 9.56 ha of potential habitat and 32 hollow-bearing trees that may be used by threatened microbat species. The proposed works also have the potential to modify adjoining native vegetation by increased edge effects, sedimentation and accidental modification by workers during construction. Given the dispersal ability of these species, any fragmentation that may occur from the current proposal is unlikely to act as a barrier to dispersal such that two populations would become isolated. The vegetation to be removed for the proposed works includes potential habitat and 32 hollow-bearing trees that in the broader sense, is important habitat for these species. However, the extent of vegetation removal (9.56 ha) required for the development will not jeopardise the long term survival of these species in the locality given the quantity of similar quality habitat in the broader landscape.
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).
To date no AOBVs have been declared within the proposal's impact area.

Test of Significance for Eastern Coastal Free-tailed Bat, Southern Myotis, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat
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.
The proposed works have the potential to result in the following key threatening processes, which are listed under the Schedule 4 of the BC Act and which are considered relevant to these species: • Clearing of native vegetation. • Removal of hollow-bearing trees. The proposal will result in the removal of 9.56 ha of potential habitat and 32 hollow-bearing trees for the tree-hollow dependent microbats. Given the location of the study area within a disturbed and developed peri-urban environment it is considered unlikely that the removal of this vegetation would exacerbate the impacts of these key threatening processes on the microbat species.
Conclusion.
In consideration of the above five factors (a-e), the proposed activity is not likely to significantly affect threatened microbats within the study area or broader locality, as: • The proposal will permanently remove or disturb forest/woodland vegetation that may represent a foraging resource from within an area containing large contiguous patches of similar habitat. • The extent of the vegetation removal in the context of the broader landscape will not significantly disrupt the lifecycles of threatened microbats as large areas of similar habitat will still be available for critical activities to occur in post construction. Application of the BOS or preparation of a SIS is therefore not required.

Grey-headed Flying-fox *Pteropus poliocephalus* – Vulnerable species BC Act

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

A description of Grey-headed Flying-fox is found in the Commonwealth listings above.

Grey-headed Flying-fox within the study area

Previous records of Grey-headed Flying-fox exist in the surrounding locality (164 records within 5 kilometres of the study area, with the most recent collected in 2020 and the closest record taken within the study area).

Grey-headed Flying-fox is associated with all native vegetation within the study area. The proposed works will result in the removal of up to 9.56 hectares of potential habitat for the species. An assessment of whether the proposal is likely to lead to a significant impact Grey-headed Flying-fox is provided below.

Table B.54 Test of Significance for Grey-headed Flying-fox

Test of Significance for Grey-headed Flying-fox
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.
Grey-headed Flying-fox in Australia are regarded as one single population that moves freely within their entire national range (Webb & Tidemann 1996; DoE 2015). Given Grey-headed Flying-fox can move up to 100 km in a single night (McConkey et al 2012) and are known to occupy and freely disperse through urban environments, Grey-headed Flying-fox could be expected to occur anywhere within the study area on occasion. Given this high dispersal ability it is unlikely that the removal of potential foraging habitat, consisting of potential foraging habitat, would affect the life cycle of a local

Test of Significance for Grey-headed Flying-fox
population as the proposed development would not act as a barrier to gene flow within or between populations. Given the vegetation removal will occur outside of any known roosting camps, the habitat removal is unlikely to impact the life cycle of a population as the population would have ample habitat remaining for critical activities (i.e. foraging, breeding, dispersal etc.).
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.***
Not applicable, not an ecological community.
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.***
The proposed works will result in the removal of 9.56 ha of potential foraging habitat for the Grey-headed Flying-fox, which includes the removal and canopy trees of some Eucalypt trees that may represent potential nectar resources for the species (Eby & Law 2008). No camps or roosts were recorded within the study area and the nearest known camp is approximately 10 km south at Parramatta Park. Given the highly mobile nature of the species, the clearing potential habitat from the study area is not likely to lead to any further isolation of foraging habitat available to the Grey-headed Flying-fox. Whilst the removal of vegetation does include known feed tree resources for the species, these resources are not uncommon across the metropolitan area and the removal of 9.56 ha of potential habitat is unlikely to further exacerbate foraging pressure for the local population of Grey-headed Flying-fox. Whilst native woodland vegetation is considered important to this species' overall national recovery and survival, the habitat to be removed for the current proposal is not considered critical to roosting or breeding and as such is not considered critical to the species local survival.
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).
To date no AOBVs have been declared within the proposal's impact area.
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.
The proposed works have the potential to result in the following key threatening processes, which are listed under the Schedule 4 of the BC Act and which are considered relevant to Grey-headed Flying-fox: • Clearing of native vegetation.

Test of Significance for Grey-headed Flying-fox
The proposal will result in the removal of 9.56 ha of potential foraging habitat for the Grey-headed Flying-fox, including known feed trees. Given the location of the study area within a highly disturbed and developed urban environment it is considered unlikely that the removal of this vegetation would exacerbate this impacts of this key threatening process on Grey-headed Flying-fox.
Conclusion.
In consideration of the factors listed above, the proposed works are considered unlikely to result in a significant affect to Grey-headed Flying-fox due to: • The development will not impact the life cycle of Grey-headed Flying-fox such that a local population will be at risk of extinction. • This vegetation type is not considered to be important to the long term survival of Grey-headed Flying-fox within the broader LGA and habitat will not become fragmented to the point that Grey-headed Flying-fox are isolated as a result of the development. • Secondary impacts such as noise disturbance and vehicle strikes during construction and operation are not expected to be significant given this species' tolerance of urban environments. • While habitat removal could be considered part of a Key Threatening Process the proposal is considered unlikely to result in a significant impact on Grey-headed Flying-fox given the nature of the vegetation removal. Application of the BOS or preparation of a SIS is therefore not required.