

# Aquatic and Terrestrial Ecology Assessment

SSDA -9472 THE SIKH GRAMMAR SCHOOL, ROUSE HILL



JUNE 2019



## Document Verification



Project Title: SSDA -9472 The Sikh Grammar School, Rouse Hill

Project Number:		18-660		
Project File Name:		18-660 Sikh Grammar School Rouse Hill Aquatic Ecology Assessment draft 190208		
Revision	Date	Prepared by (name)	Reviewed by (name)	Approved by (name)
Final	28/03/19	Patrick McEvoy, Daniel Perkovic	Aleksei Atkin	Mitch Palmer
Final	06/06/19	Zeina Jokadar	Minor changes	Minor changes

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# CONTENTS

<b>1</b>	<b>INTRODUCTION AND BACKGROUND .....</b>	<b>1</b>
1.1	PROJECT DESCRIPTION .....	1
1.2	SCOPE OF THE REPORT .....	4
<b>2</b>	<b>STATUTORY CONSIDERATIONS.....</b>	<b>6</b>
2.1	NSW ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 (EP&A ACT) .....	6
2.2	NSW BIODIVERSITY CONSERVATION ACT 2016 .....	6
2.3	STATE ENVIRONMENTAL PLANNING POLICY (SYDNEY REGION GROWTH CENTRES) 2006 .....	7
2.4	NSW FISHERIES MANAGEMENT (FM) ACT 1994 .....	7
2.5	BIOSECURITY ACT 2015 .....	7
2.6	ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (CWTH).....	8
<b>3</b>	<b>METHODOLOGY .....</b>	<b>8</b>
3.1	DESKTOP ASSESSMENT .....	8
3.1.1	Threatened Flora and Fauna.....	9
3.2	BIODIVERSITY SURVEY.....	9
3.2.1	Flora .....	10
3.2.2	Fauna .....	10
3.3	LIMITATIONS .....	11
<b>4</b>	<b>RESULTS.....</b>	<b>0</b>
4.1	DATABASE SEARCHES.....	0
4.1.1	Threatened Aquatic Species .....	0
4.1.2	Threatened Fauna Species.....	0
4.1.3	Threatened Flora and Ecological Communities .....	0
4.2	EXISTING ENVIRONMENT.....	0
4.3	PLANT COMMUNITY TYPES .....	1
4.4	THREATENED ECOLOGICAL COMMUNITIES .....	5
4.5	THREATENED SPECIES AND POPULATIONS.....	6
4.5.1	Terrestrial Fauna.....	6
4.5.2	Green and Golden Bell Frog Population .....	7
4.6	NON-THREATENED SPECIES .....	7
4.6.1	Aquatic Fauna .....	7
4.6.2	Terrestrial Fauna .....	7
4.7	TERRESTRIAL HABITAT .....	7

4.8	AQUATIC HABITAT .....	8
4.8.1	Overview of proposal site and connected aquatic ecosystems.....	8
4.8.2	First Ponds Creek .....	8
4.8.3	Existing environment .....	9
<b>5</b>	<b>ASSESSMENT OF IMPACTS .....</b>	<b>15</b>
5.1	FLORA IMPACTS .....	15
5.2	FAUNA IMPACTS .....	16
5.3	AQUATIC IMPACTS .....	16
5.3.1	Construction Impacts.....	16
5.3.2	Operational Impacts .....	17
5.4	REGIONAL AND CUMULATIVE IMPACTS .....	17
5.5	SUMMARY OF IMPACTS .....	19
<b>6</b>	<b>MITIGATION MEASURES .....</b>	<b>20</b>
6.1	TERRESTRIAL SAFEGUARDS.....	20
6.1.1	Construction and Operation .....	20
6.2	AQUATIC SAFEGUARDS.....	20
6.2.1	Construction .....	20
6.2.2	Operation.....	21
<b>7</b>	<b>CONCLUSION .....</b>	<b>22</b>
<b>8</b>	<b>REFERENCES.....</b>	<b>23</b>
<b>APPENDIX A</b>	<b>FLORA AND FAUNA SITE LISTS.....</b>	<b>24</b>
<b>APPENDIX B</b>	<b>DATABASE SEARCH RESULTS .....</b>	<b>27</b>
<b>APPENDIX C</b>	<b>THREATENED SPECIES EVALUATIONS .....</b>	<b>28</b>
<b>APPENDIX D</b>	<b>TESTS OF SIGNIFICANCE .....</b>	<b>54</b>
<b>APPENDIX E</b>	<b>SITE PHOTOS.....</b>	<b>63</b>

## TABLES

Table 3-1	Searches summary .....	8
Table 3-2	Field survey dates and conditions.....	10
Table 4-1	PCTs within Proposal Site.....	2
Table 4-2	Condition thresholds for the federally listed Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest .....	6
Table 4-3	Water quality testing results.....	12



Table 5-1 Impacts on vegetation .....	15
Table 5-2 Priority Weeds Identified within Proposal Site .....	15
Table 5-3 Water quality and environmental flow targets (Blacktown City Council, 2016).....	18
Table 5-4 Summary of Flora and Fauna Impacts .....	19
Table 9-1 CPW CEEC Summary of Test of Significance .....	57
Table 9-2 Microbat Summary of Test of Significance .....	60

## FIGURES

Figure 1-1: Proposal site .....	2
Figure 1-2 Draft masterplan of the proposal .....	3
Figure 4-1 Proposal site environment.....	1
Figure 4-2– Ground-truthed vegetation survey.....	3
Figure 4-3 GDE Atlas search results within 5km of proposal site .....	8
Figure 4-5 Degraded culvert clogged with sediment .....	9
Figure 4-4 Drainage line through grassed area to dam .....	9
Figure 4-6 The dam and surrounds .....	10
Figure 4-7 Aquatic vegetation within the dam .....	11
Figure 4-8 Dark water with sulfurous odour and surface slick along the dam's edge .....	11
Figure 4-9 Aquatic vegetation within the ruined irrigation structure .....	13
Figure 4-10 Water seepage in ground disturbance below the dam wall.....	13
Figure 4-11 Drainage line running southwest from the proposal site to First Ponds Creek.....	14
Figure 8-1 The dam and surrounds.....	63
Figure 8-2 Sewerage installation works underway along the south-eastern side of the proposal site.....	64
Figure 8-3 Sewage cistern installed below dam on proposal site.....	65
Figure 8-4 <i>Gambusia holbrookia</i> collected during dipnetting .....	66

## ACRONYMS AND ABBREVIATIONS

ASL	Above Sea Level
AWS	Automatic Weather Station
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
Biosecurity Act	<i>Biosecurity Act 2015 (NSW)</i>
BOM	Australian Bureau of Meteorology
CEMP	Construction Environmental Management Plan
Cwth	Commonwealth
DECCW	Refer to OEH
DoEE	(Cwth) Department of the Environment and Energy
DP&I	(NSW) Department of Planning and Infrastructure
EEC	Endangered Ecological Community – as defined under relevant law applying to the proposal
EIA	Environmental impact assessment
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwth)</i>
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
ESD	Ecologically Sustainable Development
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
ha	Hectares
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007 (NSW)</i>
KFH	Key Fish Habitat
km	Kilometres
LEP	Local Environment Plan
Locality	A 10 km radius from the Proposal Site
m	Metres
NES	Matters of National environmental significance under the EPBC Act (c.f.)
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
SEPP	State Environmental Planning Policy (NSW)
SIS	Species Impact Statement
sp/spp	Species/multiple species

# 1 INTRODUCTION AND BACKGROUND

## 1.1 PROJECT DESCRIPTION

Sikh Grammar School Australia (SGSA) propose to construct an educational and residential complex at 151-161 Tallawong Road, Rouse Hill. It would include the following:

- Three stream Primary School
- Four stream Secondary School
- Early Learning Centre
- Residential facilities to accommodate 100 student boarders, and six teaching staff apartments
- A place of worship, comprising a Sikh Gurdwara & Langar

Figure 1-1 shows the proposal site and study area for this biodiversity assessment and Figure 1-2 shows the proposed development plan for the school. The 4Ha site was formerly used for small scale agricultural purposes, however the proposal would require the entire property to be cleared to allow for construction. This would include the dewatering of a large central dam, followed by cutting and filling earthworks to prepare the site for construction. Stormwater would be diverted at the eastern boundary of the property to flow through drainage along its northern edge. The potential impacts of the proposed development on the terrestrial and aquatic ecology of the proposal site and surrounding area are the subject of this biodiversity assessment.



Figure 1-1: Proposal site





## 1.2 SCOPE OF THE REPORT

This report presents the results of an assessment of impacts of the proposed development on the flora and fauna present at the proposal site, as well as aquatic ecosystems and downstream waterways. It includes water quality testing results, an assessment of the aquatic fauna habitat present at the site, and results of surveys for native flora and fauna including threatened amphibians. The report also includes an assessment of the impacts of the proposal on terrestrial biodiversity in the study area and recommends mitigation measures to avoid and minimise potential direct and indirect impacts.

This assessment will support the Environmental Impact Statement (EIS) submitted with the Development Application (DA). For the purposes of this report, the following definitions apply:

- *Proposal site*: the area directly impacted by the proposed works including ancillary facilities (indicative only).
- *Study area*: is the area surveyed for the purposes of this assessment and includes the proposed works area and immediate surrounds.
- The *study locality* is defined as the area within a 10 km radius of the proposed works area

The structure and content of this report addresses the Secretary's Environmental Assessment Requirements (SEARs), provided by NSW Department of Planning and Environment (DP&E) on 25 July 2018. in respect of the SSDA 2757 (Table 1 1).

Table 1-1 Secretary's Environmental Assessment Requirements

Issue summary	Addressed in this report
<p><b>Biodiversity</b></p> <p>OEH notes the site is identified as 'Existing Certified Land' in the North West Growth Centre – Biodiversity Conservation' map under s. 43 of the Biodiversity Conservation (Savings and Transition) Regulation 2017. The effect of biodiversity is that consideration of the likely impacts of the development on biodiversity values is not required (under s8.4 of the BC Act 2016)</p>	<p>Noted in Section 2.1 and 2.2</p> <p>Impacts to threatened species and communities are taken to be non-significant as discussed in Section 5.1, 5.4 and 7.</p>
<p><b>Dam dewatering / Removal</b></p> <p>The SEARs request report notes the site includes a farm dam and it indicates water from the dam is to be discharged. In relation to the proposed dam dewatering, OEH recommends the EIS:</p> <ul style="list-style-type: none"> <li>• assesses the potential impact of dewatering/removal of the farm dam on native fauna and provides adequate provisions to protect and manage native fauna'. and the downstream environment</li> <li>• provides details on the farm dam including its size, volume, depth and whether the dam is located online (i.e. on a watercourse) or offline (Sixviewer maps shows it is located on a 1st order watercourse)</li> <li>• provides details on any watercourse(s) effected by the works including stream order/whether the watercourses are ephemeral or perennial; the condition of the watercourses and riparian vegetation</li> <li>• describes background conditions for any water resource likely to be affected by the development including hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations</li> <li>• assesses the existing environmental assets provided by the farm dam/watercourse</li> </ul>	<p>Section 4.8 Aquatic Habitats</p> <p>Section 5.3.1 Aquatic Impacts</p> <p>Section 6.2 Aquatic Safeguards</p>

<ul style="list-style-type: none"> <li>assesses the environmental benefits and impacts of dewatering/removing the dam/watercourse on native fauna and flora species (including any water dependent species) and includes:             <ol style="list-style-type: none"> <li>details on native fauna and flora species known to occur or potentially inhabit or use the dam, the area surrounding the dam; and downstream environment</li> <li>mitigation measures to mitigate impacts on native fauna including details on the location and adequacy of the proposed relocation sites for any impacted fauna</li> </ol> </li> <li>assesses the impacts of the dam dewatering on water quality including:             <ol style="list-style-type: none"> <li>the nature and degree of impact on receiving waters including: assess impacts on water quality including the potential to release nutrient rich water; water with low oxygen levels; blue-green algae etc; aquatic weeds downstream the potential to disturb bottom sediments; increase turbidity and release sediment/ organic loads downstream etc assess the potential impact on the instream habitat below the dam</li> <li>identification of proposed monitoring of water quality and instream habitat.</li> </ol> </li> </ul>	
<p><b>Water and Soils</b></p> <p>The EIS must map the following features relevant to water and soils including:</p> <ol style="list-style-type: none"> <li>Acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map).</li> <li>Rivers, streams, wetlands, estuaries (as described in s4.2 of the Biodiversity Assessment Method).</li> <li>Wetlands as described in s4.2 of the Biodiversity Assessment Method.</li> <li>Groundwater</li> <li>Groundwater dependent ecosystems</li> <li>Proposed intake and discharge locations</li> </ol> <p><b>The EIS must describe background conditions for any water resource likely to be affected by the development, including:</b></p> <ol style="list-style-type: none"> <li>Existing surface and groundwater.</li> <li>Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations.</li> <li>Water Quality Objectives (as endorsed by the NSW Government <a href="http://www.environment.nsw.gov.au/ieo/index.htm">http://www.environment.nsw.gov.au/ieo/index.htm</a>) including groundwater as appropriate that represent the community's uses and values for the receiving waters.</li> <li>Indicators and trigger values/criteria for the environmental values identified at (c) in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government.</li> <li>Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions <a href="http://www.environment.nsw.gov.au/research-and-publications/publications-search/risk-based-framework-for-considering-waterway-health-outcomes-in-strategic-land-use-planning">http://www.environment.nsw.gov.au/research-and-publications/publications-search/risk-based-framework-for-considering-waterway-health-outcomes-in-strategic-land-use-planning</a></li> </ol> <p><b>The EIS must assess the impacts of the development on water quality, including:</b></p> <ol style="list-style-type: none"> <li>The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the development protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction.</li> <li>Identification of proposed monitoring of water quality.</li> <li>Consistency with any relevant certified Coastal Management Program (or Coastal Zone Management Plan)</li> </ol>	<p>Section 4 Results for database searches and existing environment conditions at the proposal site</p> <p>Section 5.3 Aquatic impacts</p> <p>Section 6.2 Aquatic Safeguards</p>

<p><b>The EIS must assess the impact of the development on hydrology, including:</b></p> <ul style="list-style-type: none"> <li>a) Water balance including quantity, quality and source.</li> <li>b) Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas.</li> <li>c) Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems.</li> <li>d) Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches).</li> <li>e) Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water.</li> <li>f) Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options.</li> <li>g) Identification of proposed monitoring of hydrological attributes.</li> </ul>	<p>Section 5.3 Aquatic Impacts</p>
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## 2 STATUTORY CONSIDERATIONS

### 2.1 NSW ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 (EP&A ACT)

As the proposal includes a new school, it is eligible to be considered under a State-Significant Development application (SSD) and as such, it is being assessed under Division 4.7 of the EP&A Act. As the proposal site is on land that has been Biodiversity Certified, the requirement for a biodiversity development assessment report under Section 7.9 of Division 2 of Part 7 of the BC Act does not apply.

### 2.2 NSW BIODIVERSITY CONSERVATION ACT 2016

The *Biodiversity Conservation Act 2016* outlines the framework for addressing impacts on biodiversity from development and clearing and sets out to:

- Conserve biological diversity and promote ecologically sustainable development;
- Prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- Protect the habitat of those species, populations and ecological communities that are endangered;
- Eliminate or manage certain threatening processes;
- Ensure proper assessment of activities impacting threatened species, populations and ecological communities, and
- Encourage the conservation of threatened species, populations and ecological communities through co-operative management.

Typically, threatened species issues are addressed during both the rezoning of land and when development applications are submitted and assessed by Council. However, the BC Act also provides for planning instruments to be “certified”, meaning that the assessment of threatened species is done at the rezoning stage and does not need to be further considered at the development application stage. This approach provides for more strategic assessment and management of threatened species issues and streamlines the development application process.



Biodiversity Certification was conferred upon the Growth Centres SEPP on 14 December 2007 via the gazettal of a Biodiversity Certification Order signed by the Minister for Climate Change and the Environment. The Order requires 2,000 ha of “existing native vegetation” (ENV) to be retained across the Growth Centres. Any clearance of ENV within Non-Certified Areas will be required to undertake a threatened species assessment and vegetation removal may need to be offset in accordance with the Biodiversity Certification Ministerial Order.

The proposal site is situated within an existing Certified Area and as such, no further offsets are required for the removal of native vegetation.

## **2.3 STATE ENVIRONMENTAL PLANNING POLICY (SYDNEY REGION GROWTH CENTRES) 2006**

*State Environmental Planning Policy (Sydney Region Growth Centres) 2006* (Growth Centres SEPP) contains policies that govern the development of land within the North-West and South-West Growth Centres and Wilton Growth Area. It includes provisions for infrastructure residential and other urban developments and controls for protecting waterways, native vegetation and cultural heritage. The Growth Centres SEPP Biodiversity Certification of the Growth Centres SEPP was conferred under Schedule 7, Part 7 of the TSC Act on 14 December 2007. It removed the need for threatened species assessment and species impact statements during development applications. All developments compliant with the Growth Centres SEPP are deemed not to have significant impacts on BC Act-listed threatened species, populations or threatened ecological communities.

## **2.4 NSW FISHERIES MANAGEMENT (FM) ACT 1994**

The objects of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The Act sets out to ensure that the impact of any action affecting threatened species, populations and ecological communities of fish and marine vegetation is properly assessed. Amongst other matters, the FM Act sets out to develop habitat protection plans and protect marine vegetation and other habitats. It also sets out criteria for the issue of licenses or ministerial orders for activities likely to harm protected or threatened species, populations or ecological communities or damage critical habitats. Section 7.3 of the BC Act lists a number of factors to be taken into account when deciding if there is the likelihood of a significant impact on threatened species, populations and their habitat or on ecological communities. If there is a chance of an impact, then a Test of Significance is required to determine the significance of the impact.

## **2.5 BIOSECURITY ACT 2015**

The Biosecurity Strategy 2013-2021 and *Biosecurity Act 2015* (Biosecurity Act) provide a streamlined, clear framework for safeguarding primary industries, natural environments and communities from a range of pests, diseases and weeds. The broad objectives of this Act and for biosecurity in NSW are to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants by;

- Preventing their entry into NSW;
- Quickly finding, containing and eradicating any new entries; and
- Effectively minimising the impacts of those pests, diseases, weeds and contaminants that cannot be eradicated through robust management arrangements.

The Biosecurity Act provides a flexible and responsive statutory framework to help achieve these objectives for the benefit of the NSW economy, environment and community. Priority weeds identified within the study area and associated impacts are assessed in Section 5 below.

## 2.6 ENVIRONMENTAL PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (CWTH)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance. Under the EPBC Act a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land.

Potential impacts on nationally listed threatened species, ecological communities and migratory species must be assessed as part of the approval process. To assist with this, assessments are required in accordance with the Matters of National Environmental Significance (MNES): Significant Impact Guidelines 1.1 (DoE 2013).

## 3 METHODOLOGY

### 3.1 DESKTOP ASSESSMENT

Background searches undertaken for the purposes of this Biodiversity Assessment included Commonwealth and State databases to determine whether any threatened flora and fauna species, populations, ecological communities, migratory species and critical habitats as detailed in State and Commonwealth legislation occur or are likely to occur within the proposed works area. In addition to this, searches of the groundwater dependent ecosystems database and DPI weed wise database were also undertaken. The results of the database searches are provided in Appendix B.

Table 3-1 Searches summary

Resource	Target	Search date	Search area
<b>OEH Wildlife Atlas Data (Bionet)</b>	Threatened flora and fauna species, populations and ecological communities listed under the BC Act	4/2/2019	Study locality
<b>EPBC Act Protected Matters Search</b>	Threatened flora and fauna, endangered populations and ecological communities and migratory species	4/2/2019	Study locality
<b>Bureau of Meteorology National Atlas of Groundwater Dependant Ecosystems</b>	Vegetation communities that are likely to rely on groundwater.	8/2/2019	5 km radius of the proposed works area.
<b>DPI WeedWise</b>	Declared weed species.	8/2/2019	Greater Sydney Local Lands Services region
<b>DPI Fisheries</b>	Freshwater fish community status	25/03/2019	Study Locality

Resource	Target	Search date	Search area
NSW Planning Portal	Acid Sulfate Soils (ASS), drinking water catchments, areas of groundwater vulnerability, riparian lands and watercourses, wetlands	8/2/2019	Study area

### 3.1.1 Threatened Flora and Fauna

Threatened terrestrial species identified by database searches were evaluated for their potential to occur in the study area based on habitat assessments undertaken in the field. Threatened species have been considered likely to occur where:

- the geographic distribution of the species is known or predicted to include the IBRA subregion in which the study area is located, and
- the study area contains habitat features or components associated with the species, or
- past surveys undertaken within the study area indicate that the species is present.

Refer to Appendix C for the habitat assessment table which assesses the likelihood of each threatened species, population or community identified with the potential to occur in the study area. The likely occurrence of threatened biodiversity is based on the presence, condition and type of habitat and previous records.

The habitat evaluation approach increases the integrity of the survey to determine presence or absence of threatened species, and reduces limitations relating to survey timing or cryptic species that are difficult to detect in surveys.

## 3.2 BIODIVERSITY SURVEY

Biodiversity survey was undertaken within the subject site on the 13<sup>th</sup> and 14<sup>th</sup> of February, 2019, and on the 6<sup>th</sup> of March, 2019. Fauna surveys included habitat assessment for threatened terrestrial and aquatic flora and fauna, opportunistic surveys of avifauna, active searches, and nocturnal spotlighting and call playback for threatened amphibians. Nocturnal searches were conducted for frogs around the dam in fringing and emergent vegetation. The search area included vegetation and other habitat features within 20m of the dam's edge. The dam water's and emergent vegetation were accessed by wading. Dip-netting was also conducted to give an indication the presence of aquatic invertebrates. Additionally, one Anabat Swift ultrasonic call detector was deployed over two nights, recording microchiropteran bat calls. The results of call detection were analysed in accordance with the methodology detailed within Bat Calls of NSW (Pennay, Law and Reinhold, 2004).

Botanical survey was undertaken by a botanist within the subject site on the 6<sup>th</sup> of March 2019. A detailed plot survey in accordance with the Biodiversity Assessment Method (BAM) was undertaken to assist with Plant Community Type (PCT) identification.

Water quality testing was undertaken using a YSI multi-function probe and locations upstream, downstream and within the dam. The testing regime conformed to AS/NZS 5667.1:1998, AS/NZS 5667.6:1998 and the Australian Guidelines for Water quality Monitoring and Reporting 2000. The parameters recorded at each testing site included pH, turbidity (NTU), conductivity (s/cm), Temperature (°C) and dissolved oxygen (% saturation and mg/L).

Weather conditions during the flora and fauna surveys as well as the targeted threatened nocturnal fauna surveys undertaken are shown in Table 3-2.

Table 3-2 Field survey dates and conditions

Date	Temperature (°C)	Humidity	Rain (mm)	Condition	Survey type
13/2/2019	25	62%	0	Slightly overcast	Spotlighting, active search, call playback for threatened frogs, aquatic vegetation and habitat assessment, opportunistic diurnal bird survey
14/2/2019	21	56%	0	Clear	Spotlighting, active search, call playback for threatened frogs
6/3/2019	35.4	40%	5	Passing storm	Flora survey as per Biodiversity Assessment Method (BAM) and opportunistic fauna sightings.

### 3.2.1 Flora

The objectives of the flora survey were to:

- Identify whether threatened species are present or have the potential to occur at the subject sites;
- Determine PCTs present within the subject site, their condition and extent;
- Identify potential TECs and determine their extent and condition;
- Assess the distribution and abundance of priority weeds in the subject site.

An assessment and description of the vegetation communities present within the subject site was undertaken with reference to the structure and condition of vegetation and previous vegetation mapping by Tozer *et. al.* (2010). Corresponding PCTs in accordance with the BioNet Vegetation Classification were then identified via analysis of floristic data collected using the PCT Identification Tool.

For those threatened flora species that background research suggested had potential to occur within the subject site, targeted searches were undertaken in areas of suitable habitat. These searches were incorporated into the random meander or plot survey as applicable.

Targeted searches were undertaken for the following threatened flora and EECs:

- Cumberland Plain Woodland in the Sydney Basin Bioregion BC Act – CE, EPBC Act – CE
- Juniper-leaved Grevillea *Grevillea juniperina subsp. Juniperina* BC Act - V

A full list of the flora species recorded within the BAM plots are presented in Appendix A.

### 3.2.2 Fauna

In areas where impacts to vegetation are expected the following was identified:

- Fauna habitat present (e.g. nests, hollow-bearing trees)

- Opportunistic sightings of fauna or fauna signs (e.g. scats, diggings etc.)
- Current habitat corridors
- The habitat value of any waterways (i.e. habitat sensitivity and classification of waterways for fish passage) were characterised in accordance with NSW DPI (Fisheries) document Policy and Guidelines for fish habitat conservation and management (2013 update).

Targeted searches were undertaken in areas of suitable habitat for those threatened fauna species where background research suggested there is potential for occurrence of the species within the subject site. These searches were incorporated into the random meander or plot survey as applicable. Targeted surveys were undertaken for the following threatened fauna species:

- Varied Sitella *Daphoenositta chrysoptera* BC Act - V
- Little Lorikeet *Glossopsitta pusilla* BC Act - V
- Eastern Freetail-bat *Mormopeterus norfolkensis* BC Act - V
- Southern Myotis *Myotis Macropus* BC Act - V
- Little Bentwing-bat *Miniopterus australis* BC Act – V
- Eastern False Pipistrelle *Falsistrellus tasmaniensis* BC Act – V
- Greater Broad-nosed Bat *Scoteanax ruepelli* BC Act – V
- Giant Burrowing Frog *Helioporus australiacus* BC Act – CE, EPBC Act – CE
- Green and Golden Bell Frog *Litoria aurea* BC Act – E, EPBC Act – V

### 3.3 LIMITATIONS

A thorough search of the area to be affected by the proposed works was undertaken. As the field surveys were undertaken in February and March, the flora species lists reflect plant species usually detectable in summer and early autumn months. Therefore, there is the potential for some flora species that were not in flower at the time of the survey to have gone undetected. However, the lists are considered sufficient to identify vegetation communities present within the subject site and therefore to evaluate the probability of threatened flora species to occur.

## 4 RESULTS

### 4.1 DATABASE SEARCHES

#### 4.1.1 Threatened Aquatic Species

The Protected Matters Search Tool undertaken within the study locality listed three threatened aquatic fauna species as potentially occurring. NSW BioNet Database searches did not identify any threatened aquatic species within the locality. Additionally, the nearest identified threatened fish habitat as mapped by DPI occurs approximately 15 km to the west of the site, within the Grose and Nepean Rivers, being Macquarie Perch habitat.

#### 4.1.2 Threatened Fauna Species

Database searches identified a number of threatened fauna species as being recorded in the study locality, detailed in Appendix C. The Protected Matters Search Tool undertaken within the study locality listed 21 threatened fauna species and 16 migratory species as potentially occurring. Based on the availability of suitable habitat and the number of records in proximity to the study area, the following fauna species were considered to have potential to occur:

- Varied Sitella *Daphoenositta chrysoptera* BC Act - V
- Little Lorikeet *Glossopsitta pusilla* BC Act - V
- Eastern Freetail-bat *Mormopeterus norfolkensis* BC Act - V
- Southern Myotis *Myotis Macropus* BC Act - V
- Little Bentwing-bat *Miniopterus australis* BC Act – V
- Eastern False Pipistrelle *Falsistrellus tasmaniensis* BC Act – V
- Greater Broad-nosed Bat *Scoteanax ruepelli* BC Act – V
- Giant Burrowing Frog *Heliophorus australiacus* BC Act – CE, EPBC Act – CE
- Green and Golden Bell Frog *Litoria aurea* BC Act – E, EPBC Act – V

#### 4.1.3 Threatened Flora and Ecological Communities

The Protected Matters Search Tool undertaken within the study locality listed seven (7) Threatened Ecological Communities (TECs) and 25 threatened flora species as potentially occurring within the site.

One threatened flora species and one threatened ecological community were identified within the background searches, and considered likely to occur within the subject site. They included:

- Cumberland Plain Woodland in the Sydney Basin Bioregion BC Act – CE, EPBC Act – CE
- Juniper-leaved Grevillea *Grevillea juniperina subsp. Juniperina* BC Act - V

### 4.2 EXISTING ENVIRONMENT

The study area is located with the Sydney Basin IBRA bioregion and the Cumberland IBRA subregion. The study area is within the Cumberland Plain Mitchell Landscape, situated on Triassic shales and lithic sandstones with Quaternary alluvium along streams.



The proposal site is highly modified and cleared of all native vegetation except for two remnant trees within the proposal site boundary and macrophytes around the edge of the dam. Exotic kikuyu grass (*Cenchrus clandestinus*) covers the vast majority of the proposal site, as shown in Figure 4-1. Remnant and regrowth vegetation occurs around the proposal site including immediately outside the existing fence line.

Terrestrial fauna habitat features recorded at the proposal site include one (1) large hollow bearing tree containing one large hollow and decorticated bark.



Figure 4-1 Proposal site environment

### 4.3 PLANT COMMUNITY TYPES

A review of existing vegetation mapping (OEH 2013) was ground-truthed using quantitative floristic data gathered within the proposal site as per the Biodiversity Assessment Method (BAM). A random meander search (Cropper 1993) was also undertaken throughout the proposal site. One (1) Plant Community Type (PCT) was considered to occur: PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (aka Cumberland Shale Plains Woodland). This PCT was considered to be present where native canopy is present including two (2) paddock trees within the proposal site and canopy overhanging from trees adjacent to the fence line. All other areas where vegetation consists of exotic or non-indigenous native species have been mapped as Exotic/Pasture. A significant portion of the southern end of the proposal site had been recently cleared and grubbed with no vegetation remaining. Vegetation mapping is presented in Figure 4-2 below.

PCT 849 within the proposal site conforms to the Final Determination for the BC Act listed Critically Endangered Ecological Community (CEEC) Cumberland Plain Woodland within the Sydney Basin Bioregion (CPW), discussed further in Section 4.3.

A description of the vegetation types mapped within the proposal site are included in Table 4-1. A total of twelve (12) flora species were recorded within the proposal site. No threatened flora species were identified. All species recorded are included in Appendix A.

Table 4-1 PCTs within Proposal Site

Plant Community Type (PCT)	Condition class	Threatened ecological community?	Area (m <sup>2</sup> )
<b>PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion</b>	Poor	Yes – BC Act Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC	674*
			1407†
<b>Exotic/Pasture</b>	-	No	23991
<b>Total</b>			26072

\* 2 trees within proposal site

† native canopy overhanging from adjacent properties





Figure 4-2– Ground-truthed vegetation survey

## Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849)

**Vegetation formation:** Grassy Woodlands

**Vegetation class:** Coastal Valley Grassy Woodlands

**PCT:** 849

**Conservation status:** Critically Endangered (NSW and Cth)

**Estimate of percent cleared:** 93%

**Condition:** Poor

**Extent in the Proposal Site:** 0.21 ha

Structure	Average height and height range (m)	Average cover and cover range	Typical species within site
Trees	20	5%	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> ) Forest Red Gum ( <i>E. tereticornis</i> ) Rough-barked Apple ( <i>Angophora floribunda</i> ) Grey Box ( <i>E. moluccana</i> )
Small trees	Absent	-	-
Shrubs	Absent	-	-
Ground covers	< 0.5	95%	Kikuyu ( <i>Cenchrus clandestinus</i> *) Paspalum ( <i>Paspalum dilatatum</i> *) Kidney Weed ( <i>Dichondra repens</i> )
Vines & climbers	Absent	-	-

The gentle topography associated with the shale plains of Western Sydney carries an open grassy woodland dominated by Grey Box *Eucalyptus moluccana*, Forest Red Gum *Eucalyptus tereticornis* and Ironbark *Eucalyptus crebra*/*Eucalyptus fibrosa*. Localised patches of Spotted Gum *Corymbia maculata* may occur in the Fairfield LGA. Cumberland Shale Plains Woodland is the second of the grassy woodlands that comprise the Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC listed under the NSW BC Act. Like the related community Cumberland Shale Hills Woodland it is typified by a sparse to moderate cover of shrubs and a high cover of grasses and forbs.

Tozer et al. (2010) define the primary habitat for the community as occurring at elevations less than 150 meters above sea level with some sites occurring at higher elevations where the landscape remains gently inclined. Rainfall is restricted to a narrow band between 750 and 950 millimetres per annum. The community occupies the north-west and west zones of the study area but is widespread elsewhere across the Cumberland Plain.

Small patches of this community occur where there is remnant canopy cover within the proposal site (i.e. 2 paddock trees and overhanging canopy from adjacent properties). Vegetation was mapped along the boundary of the canopy drip line. The community within the study area is dominated by exotic grasses and is regularly mown.

This PCT was found to conform to the BC Act definition of the Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC. The PCT does not conform to the EPBC Act listed form of the community.

## Exotic/Pasture

**Vegetation formation:** -

**Vegetation class:** -

**PCT:** -

**Conservation status:** -

**Estimate of percent cleared:** -

**Extent in the study area:** 2.40 ha

Structure	Average height and height range (m)	Average cover and cover range	Typical species
Trees	Absent	-	-
Small trees	Absent	-	-
Shrubs	Absent	-	-
Ground covers	< 0.5	95%	Kikuyu ( <i>Cenchrus clandestinus</i> *) Paspalum ( <i>Paspalum dilatatum</i> *) Clover ( <i>Trifolium spp.</i> *)
Vines & climbers	Absent	-	-

### Description:

This community describes areas of vegetation dominated by planted exotic species or areas containing a high proportion of exotic species. This plant community has been mapped throughout the majority of the study area with exotic grasses and groundcovers dominating. It was found not to conform to any threatened ecological communities listed under the BC or EPBC Acts.

## 4.4 THREATENED ECOLOGICAL COMMUNITIES

One PCT associated with CPW CEEC was identified within the proposal site: PCT 849 Cumberland Shale Plains Woodland.

Identification of CPW as listed under the BC Act and EPBC Act was undertaken using the final determination from the NSW Scientific Committee (NSW Scientific Committee 2014) and the approved conservation advice from the Commonwealth Threatened Species Scientific Committee (Threatened Species Scientific Committee 2014). Although condition thresholds are not provided for the state-listed community, it is considered that the BC Act form of the community occurs wherever native canopy cover is present.

For the federally listed community, none of the vegetation within the study area meets the condition thresholds to be considered part of the CEEC (see Table 4-2 below).

Table 4-2 Condition thresholds for the federally listed Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest

Category and rationale	Thresholds
A. Core thresholds that apply under most circumstances: patches with an understorey dominated by natives and a minimum size that is functional and consistent with the minimum mapping unit size applied in NSW	Minimum patch size is $\geq 0.5$ ha AND $\geq 50$ percent of the perennial understorey vegetation cover is made up of native species
OR:	
B. larger patches which are inherently valuable due to their rarity	The patch size is $\geq 5$ ha AND $\geq 30$ percent of the perennial understorey vegetation cover is made up of native species
OR:	
C. Patches with connectivity to other large native vegetation remnants in the landscape	The patch size is $\geq 0.5$ ha; AND $\geq 30$ percent of the perennial understorey vegetation cover is made up of native species; AND The patch is contiguous with a native vegetation remnant (any native vegetation where cover in each layer present is dominated by native species) that is $\geq 5$ ha in area
OR:	
D. Patches that have large mature trees or trees with hollows (habitat) that are very scarce on the Cumberland Plain	The patch size is $\geq 0.5$ ha in size; AND $\geq 30$ percent of the perennial understorey vegetation cover is made up of native species; AND The patch has at least one tree with hollows per hectare or at least one large tree ( $\geq 80$ cm dbh) per hectare from the upper tree layer outlined from the community description.

## 4.5 THREATENED SPECIES AND POPULATIONS

Potential habitat for threatened fauna and flora is highly limited due to the general lack of native vegetation within the proposal site, regular mowing, and ongoing disturbance from nearby clearing and construction works.

As fauna would likely only utilise the habitat on occasion as part of a broader foraging range, the likelihood of occurrence is generally considered low. Similarly, no targeted threatened flora surveys were undertaken as limited suitable habitat was present (with the majority being mown exotic grasses). Habitat assessment and surveys results for threatened species are detailed in Appendix C.

### 4.5.1 Terrestrial Fauna

Targeted threatened fauna surveys identified the following species on site:

- Latham's Snipe *Gallinago hardwickii* – EPBC Marine/Migratory
- Eastern Great Egret *Ardea alba* – EPBC Marine
- Eastern Bentwing-Bat - *Miniopterus schreibersii oceanensis* – BC Act V - Possible
- Southern Myotis *Myotis Macropus* – BC Act V - Probable
- Greater Broad-nosed Bat *Scoteanax ruepellii* – BC Act V - Definite
- Eastern False Pipistrelle *Falsistrellus tasmaniensis* – BC Act V - Probable

Ultrasonic call analysis identified a number of threatened microchiropteran bat species. These calls have been ranked as Possible, Probable and Definite, based on the quality of the call. Where a possible threatened species has been detected, a precautionary approach has been taken and the species is assumed present. Each species was detected on one night only, indicating that they are likely utilising the proposal site as part of a broader foraging range rather than as permanent roosting habitat.

#### **4.5.2 Green and Golden Bell Frog Population**

An investigation conducted by EcoLogical Australia (2009) confirmed the presence of a Green and Golden Bell Frog population in the study locality. Field surveys investigated sites 1.6 to 1.8km from the proposal site along First Ponds Creek and within ponds on properties along Regent Street and Clarke Street, Riverstone. This population was assumed to be supported by a successful breeding site established in the backyard of a resident, from which individuals dispersed regularly into the wider area.

Targeted surveys for the species did not identify the Green and Golden Bell Frog within the proposal site.

### **4.6 NON-THREATENED SPECIES**

#### **4.6.1 Aquatic Fauna**

Dipnetting in shallow vegetated water yielded Eastern Mosquitofish *Gambusia holbrooki* along with dragonfly larvae, water beetles and spiders. Given that the dam is isolated from permanent or intermittently flowing 'chain of ponds' watercourses providing habitat for fish, it is unlikely to be accessible to most fish species. The very low levels of dissolved oxygen within the dam water is likely to limit its habitability for fish. No turtles were observed surfacing or within the area surrounding the dam. No eels were observed during dipnetting or water sampling.

#### **4.6.2 Terrestrial Fauna**

One Red-bellied Black Snake *Pseudechis porphyriacus* was observed. This species feeds predominantly on frogs, but will also eat small mammals, reptiles, fish and other snakes captured in or out of aquatic environments. Five aquatic bird species were observed using the dam, including Pacific Black Duck *Anas superciliosa*, Great Egret *Ardea alba*, Australian Wood Duck *Chenonetta jubata*, Eurasian Coot *Fulica atra* and Tachybaptus *novaehollandiae* Australasian Grebe.

Two amphibian species, Eastern Dwarf Tree Frog *Litoria fallax* and Common Eastern Froglet *Crinia signifera* were common. Groups of both species were detected calling throughout the dam's aquatic vegetation and adjacent pasture.

A total of four non-threatened microchiropteran bat species were recorded using ultrasonic call detection, including Gould's Wattled Bat *Chalinolobus gouldii*, a Long-eared Bat *Nyctophilus sp.*, Eastern Freetail Bat *Mormopterus ridei* and White Striped Freetail Bat *Austronomus australis*.

### **4.7 TERRESTRIAL HABITAT**

Given the proposal site's history of disturbance, habitat value is largely limited to trace amounts of forage and refuge within the remnant vegetation occurring along the edges of the proposal site and within the two remnant trees. These habitats would likely be utilised by transient birds and mammals. Of the two trees proposed to be removed by the proposal, one is a large hollow-bearing *Angophora floribunda* (DBH



80cm+) with decorticating bark. This may provide roosting habitat for threatened microchiropteran bat (microbat) species and constitute occasional foraging habitat for nomadic and migratory threatened fauna. The areas of exotic grassland and disturbed soil are not considered to constitute important faunal habitat.

## 4.8 AQUATIC HABITAT

### 4.8.1 Overview of proposal site and connected aquatic ecosystems

The proposal site is connected to First Ponds Creek via an ephemeral first order drainage line running from north of Tallawong Road through to the southwest of the site. At the time of the February site visit, construction-related earthworks had cleared and altered the topology of the drainage line north and south of the proposal site. The remnant native woodland on the site is considered a groundwater-dependent ecosystem (GDE) (Figure 4-3). No Acid Sulfate Soils are mapped on the proposal site or within the First Ponds Creek catchment.

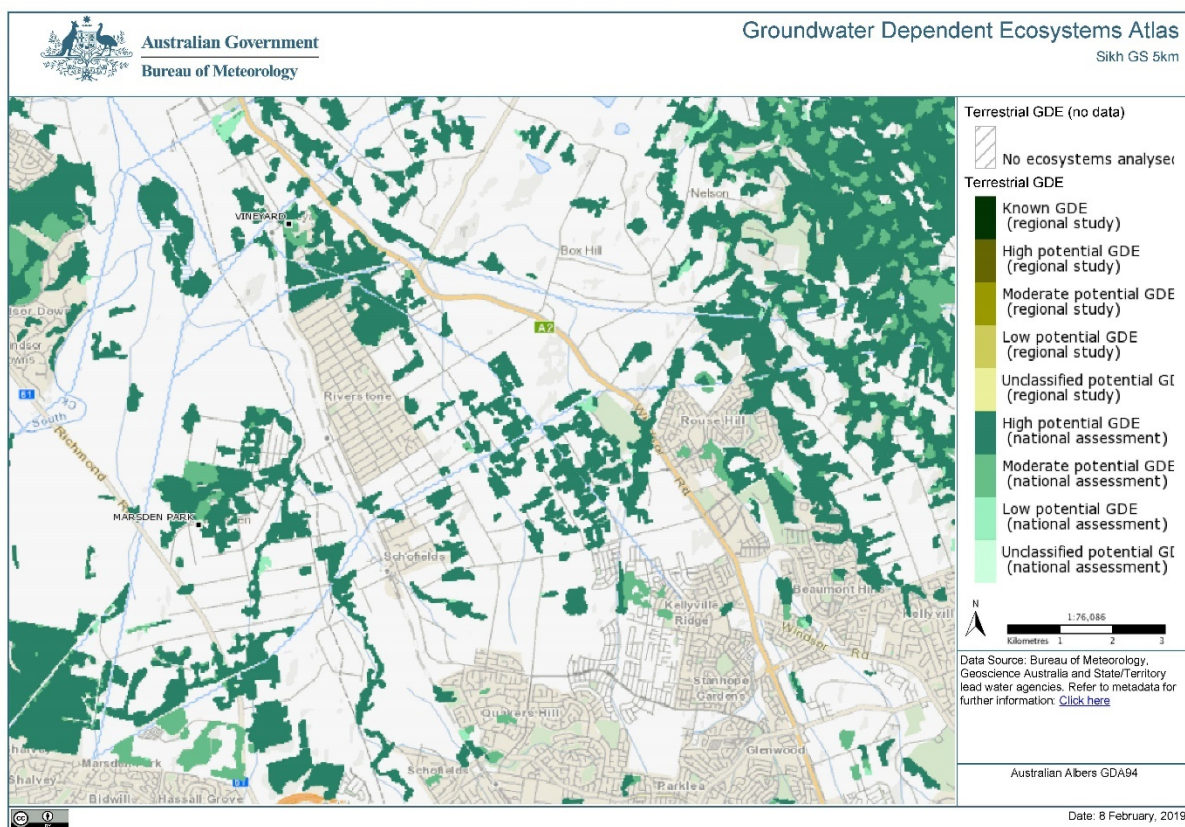


Figure 4-3 GDE Atlas search results within 5km of proposal site

### 4.8.2 First Ponds Creek

First Ponds Creek is an ephemeral watercourse in the Hawkesbury River catchment. The dam within the proposal site lies on a first order ephemeral drainage line which runs 415 m west into First Ponds Creek. First Ponds Creek is a third order stream draining into the Killarney Chain of Ponds, a fourth order stream. Surface water flows through the Killarney Chain of Ponds into Mckenzie's Creek and South Creek, joining the Hawkesbury River 11 km north west of the proposal site. First Ponds Creek is not considered to be key fish habitat by the NSW Department of Primary Industries (DPI, 2019).

Land uses in the First Ponds Creek catchment include small-scale agriculture and residential and light commercial developments. Urban and agricultural runoff likely contains significant levels of fertilisers and pesticides, hydrocarbons and sediments contributing to reducing water quality. Surface water flows in its catchment are heavily mediated by numerous small dams and urban stormwater systems.

The amount of riparian vegetation left intact varies along First Ponds Creek, with approximately 2.5km of its 6.8 km extent retaining mature tree cover. First Ponds Creek was determined to be of high conservation significance during investigations conducted for Biodiversity Certification Order for the Riverstone Precinct (Planning NSW, 2010).

#### **4.8.3 Existing environment**

Surface water flows entered the site from the northwest through a degraded culvert beneath Tallawong Road (Figure 4-5). The lot opposite the site had been recently cleared and earthworks were in progress. Water quality entering the site was likely to be heavily affected by this activity. The drainage line continued through an open grass area to the dam (Figure 4-4).



Figure 4-5 Drainage line through grassed area to dam



Figure 4-4 Degraded culvert clogged with sediment



In the centre of the site was a large dam constructed to capture water flowing down the drainage line. It appeared to be constructed by scraping and pushing soil into a wide berm. Little evidence of excavation was observed, limiting the potential depth of the dam. The dam was relatively full at the time of the site visit and was estimated to be at about 80% of its maximum capacity (Figure 4-6). The volume of water in the dam was estimated using the method suggested by the NSW Office of Water (2010) for triangular dams. Because of the hazard presented by soft sediments in the bed of the dam, it was not possible to walk into the middle of the dam and measure depth. Based on the depth at the water quality sampling points, the depth at the deepest point of the dam was estimated to be approximately 1.8 m. The volume of the dam at the time of the site survey was estimated to be 1,023 m<sup>3</sup> (1.023 ML).



Figure 4-6 The dam and surrounds

The dam banks featured grassy cover dominated by the exotic grasses Caterpillar Grass *Paspalum dilatatum* and Kikuyu *Pennisetum clandestinum*, with some scattered patches of Kangaroo Grass *Themeda triandra*. Three native aquatic plant species, Knotgrass *Paspalum distichum*, Slender Knotweed *Persicaria decipiens* and Water Primrose *Ludwigia peploides* subsp. *montevidensis* spread through shallower parts of the dam (Figure 4-7). While investigating aquatic vegetation, a sulphurous odour and slicks on the surface of the water were observed (Figure 4-8).





Figure 4-7 Aquatic vegetation within the dam



Figure 4-8 Dark water with sulfurous odour and surface slick along the dam's edge

## Water Quality

Water quality parameter measurements were consistent across the four sampling sites. Very low dissolved oxygen readings were taken at the sampling sites. To rule out an instrument error, measurements were taken in oxygen-rich surface water. These confirmed that the instrument was working correctly. The pH and temperature of sampled water was acceptable when compared to the ANZECC guidelines ('the guidelines'). Conductivity and dissolved oxygen were very low in comparison to the guidelines. Turbidity exceeded guideline levels at all sampling sites.

Table 4-3 Water quality testing results

Parameter	Guideline*	Sampling sites			
		1A	1B	2A	2B
pH	6.5-8	7.87	7.48	7.36	7.2
Conductivity (µS/cm)	20-30	0.222	0.213	0.199	0.199
Temperature (°C)	24	24.1	24	23.6	23.7
Dissolved oxygen (mg/L)	5	1.1 <sup>1</sup>	0.13 <sup>1</sup>	0.054 <sup>1</sup>	0.2 <sup>1</sup>
		8 <sup>2</sup>		6.31 <sup>2</sup>	
Turbidity (NTU)	1-20	>20	>20	>20	>20

\*Guideline figures taken from ANZECC (2000)

<sup>1</sup>Values taken approximately 40cm below surface level

<sup>2</sup>Values taken at surface level

## Downstream Environment

Southwest and immediately downslope from the dam was a derelict irrigation reservoir. Some water remained within the sections of the reservoir, allowing *Typha orientalis* (Cumbungi) and *Lemna minor* (Duckweed) to grow (Figure 4-9). The water depth was approximately 10cm.





Figure 4-9 Aquatic vegetation within the ruined irrigation structure

Groundwater seepage was evident throughout much of the western part of the site downslope from the dam. Tracks from construction plant allowed water to pool, and elsewhere saturation of the ground was evident (Figure 4-9).



Figure 4-10 Water seepage in ground disturbance below the dam wall

At the southwest boundary of the property, sewage installation works were already underway. The drainage line running southwest from the proposal site had been subject to extensive earthworks and several ponds had been constructed along it (Figure 4-10).





Figure 4-11 Drainage line running southwest from the proposal site to First Ponds Creek

## 5 ASSESSMENT OF IMPACTS

### 5.1 FLORA IMPACTS

The proposal will involve the removal of groundcover vegetation and two remnant native trees. The amount of vegetation to be potentially impacted is approximately 2.47 ha. Of this, 0.07 ha constitutes remnant native vegetation, the remaining 2.4 ha consisting of exotic vegetation/pasture.

The local occurrence of PCT 849 within the study area is 11.87 ha. The proposed works would impact a total of 0.07 ha to the community, or the removal of approximately 0.6% of its local occurrence. The small area of reduction given the extent of habitat in the locality is not considered likely to impact the abundance or diversity of flora and fauna in the region in the long-term.

The proposal site occurs within lands Biocertified under the Growth Centres SEPP (2007). As such, impacts to threatened species are taken to not be significant, thus a Species Impact Statement or Biodiversity Development Assessment Report is not considered necessary.

Table 5-1 Impacts on vegetation

Plant Community Type (PCT)	Status		Proposal area <sup>1</sup> (hectares)	Percent cleared in CMA <sup>2</sup>
	BC Act	EPBC Act		
<b>PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion</b>	CEEC	Does not meet criteria	0.07	93%
<b>Exotic/Pasture</b>	-	-	2.4	-
<b>Total</b>			2.47	

- 1- Area to be cleared based on ground-truthed vegetation mapping within the study area.  
2- Catchment Management Authority. Based on the VIS classification database.

One (1) priority weed for Greater Sydney was identified within the proposal site: Blackberry *Rubus fruticosus*. The proposed works have the potential to introduce new weeds into the site and spread weeds to other sites in the form of soil-stored seed. A project Construction Environment Management Plan (CEMP) should provide protocols for the management of weed spread and be implemented during all works.

Table 5-2 Priority Weeds Identified within Proposal Site

Weed	Duty
Blackberry <b><i>Rubus fruticosus</i> species aggregate</b>	Prohibition on dealings <i>Must not be imported into the State or sold</i> All species in the <i>Rubus fruticosus</i> species aggregate have this requirement, except for the varieties Black Satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem, and Thornfree

## 5.2 FAUNA IMPACTS

Fauna habitat exists within the proposal site in the form of two individual trees, one of which is a large hollow-bearing *Angophora floribunda* (DBH 80cm+) with decorticating bark. This may provide roosting habitat for threatened microchiropteran bat (microbat) species and constitute occasional foraging habitat for nomadic and migratory threatened fauna. Hollow dependent microbats detected included the Greater Broad-nosed Bat *Scoteanax ruepellii* and Eastern False Pipistrelle *Falsistrellus tasmaniensis*. These species were recorded on one night only, indicating that they likely use the proposal site as part of a wider foraging habitat. Nonetheless, the presence of suitable hollows indicates that these species could utilise the proposal site as roosting habitat. The removal of this vegetation will marginally reduce the availability of current and future foraging habitat for woodland birds and small mammals. However, it is considered unlikely that the threatened fauna utilising the vegetation would be solely reliant on it and thus are unlikely to be significantly impacted. A Test of Significance (ToS) under section 7.3 of the BC Act has been prepared to assess whether the proposed works are considered likely to constitute a significant impact to microbat species (see Appendix D).

As the proposal sites contain limited fauna habitat value, connectivity is not considered to be reduced as a result of the proposal. The site occurs within a fragmented semi-rural landscape and it is not considered likely that the proposal will increase the degree of this fragmentation such that it would significantly reduce the connectivity of habitat for threatened or common flora and fauna. The majority of works will occur within previously cleared grassland, and as such connectivity will not be fragmented significantly.

Increased noise, light, dust and vibration impacts are expected to occur during the proposed construction works. These impacts will be temporary in nature and will not significantly impact fauna within the study area.

## 5.3 AQUATIC IMPACTS

### 5.3.1 Construction Impacts

During construction, the hydrology of the site would be completely altered. The site would be cleared and levelled with earthmoving equipment, creating a permanent major impact within the site. Natural drainage through the site would be redirected through stormwater pipes to be installed. During this process erosion and transport of sediment could occur between the period of clearing and completion of the onsite stormwater system. This would be a short term and minor impact.

#### Dam Dewatering

The construction process would include dewatering of the dam by pumping approximately 1 ML of water out onto the ground downslope. As the water would not be released directly into another waterbody, the low levels of oxygen would not have an impact. The water would be significantly oxygenated through the pumping and discharging process. No exotic flora or water weeds were present in the dam and the dewatering process would not threaten aquatic biodiversity downstream by dispersing potentially invasive species. Given that the drainage line between the dam and First Ponds Creek consists of a number of small ponds and stretches of dry channel, the dam waters would infiltrate the soil and would not flow directly into any receiving waters.

This would be a minor short-term impact given the volume of water and the area available to absorb it. The highly disturbed nature of the drainage line downstream and widespread disturbance in the catchment renders any water quality impacts from release of the dam waters insignificant.

### Other Construction Impacts

During construction activities, spills of hydrocarbons or other mechanical fluids could occur. This short-term minor impact would be mitigated by the use of spill kits. The potential for spills to occur would be reduced by storing chemicals and fuels within bunded storage areas, and refuelling vehicles within bunded refuelling sites.

The aquatic habitat within the proposal site is highly disturbed and is not connected to permanent surface water flows within the catchment. It is only refilled during rainfall events and has poor water quality as a result. Water quality is also affected by the recent clearing and earthworks along the drainage lines upstream and downstream of the proposal site. Under the proposal, impacts to water quality within the site would be major, however given the extensive construction and disturbance already in progress adjacent to the proposal site, the impacts of construction on water quality downstream and within the wider First Ponds Creek catchment would be insignificant.

#### 5.3.2 Operational Impacts

During operation, the pre-construction hydrological system of the site would not be restored. All stormwater runoff on the sites would be channelled through a drainage system to be constructed along the northwest boundary of the site. This would be connected to the wider council-operated stormwater system. This system would include grating and oil-water separators to address contamination in runoff from the site.

Much of the site would be hardscaped and would allow very little groundwater infiltration during rain events. Infiltration would only occur within landscaped areas. Contamination of groundwater and the soil would be unlikely given the limited pathways available. This impact would be moderate and long term.

The additional operational impacts of the proposal would include contamination of stormwater from fertilisers, herbicides and hydrocarbons. These would occur intermittently depending on rainfall events and the quantity of chemicals used in landscape maintenance. The landscape design for the proposal would seek to minimise maintenance, watering and application of chemical additives by selecting native species from the vegetation communities currently present in the area. These impacts would be minor to moderate and intermittent.

## 5.4 REGIONAL AND CUMULATIVE IMPACTS

The proposal site lies within the Riverstone East Precinct of the North West Growth Centre, which has been rezoned and biodiversity certified under SEPP (Sydney Growth Centres). Development within the precinct is subject to the North West Growth Centre Development Control Plan (NWGCDCP) administered by Blacktown City Council (2016). The purpose of the NWGCDCP is to:

- a. Communicate the planning, design and environmental objectives and controls against which the Consent Authority will assess Development Applications (DAs);
- b. Consolidate and simplify the planning controls for the Blacktown City Council's Growth Centre Precincts;
- c. Ensure the orderly, efficient and environmentally sensitive development of the Precincts as envisaged by the North West Growth Centre Structure Plan and State Environmental Planning Policy (Sydney Region Growth Centres) 2006 (the Growth Centres SEPP);
- d. Promote high quality urban design outcomes within the context of environmental, social and economic sustainability.

## Stormwater Management

The NWGCDP specifies a number of controls that must be implemented by new developments. Objectives and controls are specified for flooding and water cycle management within section 2.3.1. Measures relevant to the aquatic impacts of the proposal include:

- Where practical, development shall attenuate up to 50% AEP peak flow for discharges into the local tributaries, particularly Category 1 and 2 creeks. This will be achieved using detention storage within water quality features and detention basins.
- The developed 1% AEP peak flow is to be reduced to pre-development flows through the incorporation of stormwater detention and management devices.
- The trunk stormwater system is to be constructed and maintained by Council in accordance with Riparian and Water Cycle Management Strategy at Appendix B (Appendix B of Blacktown City Council, 2016), and to achieve the water quality targets set by the Department of Environment, Climate Change and Water (see Table 5-3).

Table 5-3 Water quality and environmental flow targets (Blacktown City Council, 2016)

	Water Quality				Environmental Flows
	% reduction in pollutant loads				Stream erosion control ratio
	Gross pollutants (>5mm)	Total suspended solids	Total phosphorus	Total nitrogen	
Stormwater management Objective	90	85	65	45	3.5-5.0:1
'Ideal' stormwater outcome	100	95	95	85	1:1

Wide-ranging changes to the terrestrial ecology and hydrology of land within the North West Growth Centre are under way. Surface water flows and storage across large areas of the First Ponds Creek catchment are being dramatically altered as a result of extensive development. With adherence to these controls, the proposal's contribution to total stormwater management and water quality within the Riverstone East Precinct would be in line with that of other developments. The volume of flows managed by the proposal would be insignificant in comparison to the total volume managed within the precinct. The cumulative impact of the proposal on the aquatic ecology of First Ponds Creek catchment would be minor.



## 5.5 SUMMARY OF IMPACTS

Table 5-4 Summary of Flora and Fauna Impacts

Category of Impact	Significance of Impacts		
	Extent and Duration	Nature	Impact on Sensitive Features
<b>Flora impacts</b>			
	Removal of 2.47 ha of vegetation and 2 trees during construction	Permanent	Removal of 1 hollow bearing tree
<b>Threatened communities</b>			
	Removal of up to 0.07 ha of PCT 849 during construction	Permanent	Removal of 0.07 ha of CPW CEEC (BC Act)
<b>Fauna impacts</b>			
- Construction	Increased noise, dust, light, vibration	Temporary	
- Operation	Loss of 1 hollow bearing tree	Permanent	Potential impact on threatened microbat species
<b>Aquatic impacts</b>			
- Construction	Dewatering of dam, potential for spills	Temporary	Potential for impacts downstream
- Operation	Removal of dam, increased impermeable surface area	Permanent	Potential impacts to surrounding vegetation Loss of foraging habitat for migratory birds
<b>Regional and cumulative impacts</b>			
	Loss of 0.06% of PCT 849 within study area	Permanent	Reduction of local occurrence of CPW CEEC (BC Act)

## 6 MITIGATION MEASURES

### 6.1 TERRESTRIAL SAFEGUARDS

#### 6.1.1 Construction and Operation

Impact	Safeguards and mitigation measures
<b>Removal of native vegetation</b>	<ul style="list-style-type: none"> <li>Native vegetation removal to be minimised through detailed design;</li> <li>Arboricultural assessment of canopy trees prior to removal to determine if trees can be retained.</li> </ul>
<b>Removal of threatened species habitat</b>	<ul style="list-style-type: none"> <li>Habitat removal will be minimised through detailed design;</li> <li>Replace or re-install any habitat features removed in nearby bushland.</li> </ul>
<b>Injury and mortality of fauna</b>	<ul style="list-style-type: none"> <li>Habitat tree clearing to be supervised by ecologist</li> <li>If unexpected threatened fauna or flora species are discovered, stop works immediately and consult project ecologist</li> </ul>
<b>Invasion and spread of weeds/edge effects</b>	<ul style="list-style-type: none"> <li>Exclusion zones to be set up at clearing limits to prevent spread of weeds into adjacent native vegetation;</li> <li>Hygiene protocols preventing spread of weed seed and propagules to be detailed in CEMP and followed during construction.</li> </ul>
<b>Invasion and spread of pathogens and disease</b>	<ul style="list-style-type: none"> <li>Hygiene protocols managing introduction and spread of soil born pathogens such as <i>Phytophthora cinnamomi</i> to be detailed in CEMP and followed during construction.</li> </ul>
<b>Noise, light and vibration</b>	<ul style="list-style-type: none"> <li>Temporary impacts as a result of construction works to be managed as per CEMP requirements.</li> </ul>

### 6.2 AQUATIC SAFEGUARDS

#### 6.2.1 Construction

Impact	Safeguards and mitigation measures
<b>Flooding</b>	<ul style="list-style-type: none"> <li>As part of the construction environmental management plan (CEMP), a procedure will be prepared to identify potential flood threats and an evacuation procedure for dispersible materials, hazardous materials and equipment containing such materials. The procedure will include: <ul style="list-style-type: none"> <li>Regular consultation of the Bureau of Meteorology website for weather forecasts and flood warnings</li> <li>Where possible, schedule activities on land subject to flooding to avoid high flow periods</li> <li>A process for removing equipment and materials off site and out of flood risk areas quickly</li> </ul> </li> <li>Storing and use of fuels, chemicals and extracted materials away from the water's edge, in bunded areas.</li> </ul>

Impact	Safeguards and mitigation measures
<b>Water contamination</b>	<ul style="list-style-type: none"> <li>Protection (e.g. sedimentation fencing) shall be provided for the works to minimise runoff from the construction site into waterways and waterbodies.</li> </ul>
<b>Soil management, erosion and sediment control</b>	<ul style="list-style-type: none"> <li>An Erosion and Sediment Control Plan (ESCP) is to be prepared. The plan will be site-specific, taking into account the specific nature of the works and surrounding environment at each alignment section. The plan will be prepared in accordance with the Blue Book (Landcom, 2004).</li> <li>Sediment and erosion controls will be maintained during the construction works and adapted if required to ensure the objectives of the Blue Book (Landcom, 2004) are met.</li> <li>Construction works should not be carried out in periods of forecast heavy rains or strong/gale wind warnings.</li> <li>Where possible, topsoils and subsoils will be removed and stockpiled without mixing the two, in a location or manner that will facilitate the return of soils to a location as close as possible to their original sources. Disturbed areas will be dressed with top soil to assist rapid revegetation of the disturbed surfaces.</li> <li>Stockpiles will be covered within 10 days in accordance with the Blue Book (Landcom, 2004).</li> <li>Vehicle and machinery movements will be restricted to access tracks as far as possible.</li> <li>Vehicles and machinery must not be parked on native vegetated areas. Staff shall park at designated parking areas, existing cleared areas or exotic vegetated areas.</li> </ul>

### 6.2.2 Operation

Impact	Safeguards and mitigation measures
<b>Flooding</b>	<ul style="list-style-type: none"> <li>Stormwater retention and management devices will be installed to reduce the 1% AEP peak flow to pre-development flows.</li> </ul>
<b>Stormwater management and contamination</b>	<ul style="list-style-type: none"> <li>Stormwater systems will be designed and managed in accordance with the control measures and guidelines specified in section 2.3.1 of the NWGCDP.</li> <li>Stormwater systems will be fitted with grating and oil-water separators to capture contaminants.</li> <li>All filtration systems fitted to stormwater will be maintained in accordance with design guidelines to ensure their effectiveness is maintained.</li> </ul>
<b>Water use</b>	<ul style="list-style-type: none"> <li>Landscaped areas will be designed and managed in accordance with section 4.2.6 of the NWGCDP, which includes measures to reduce water use, water runoff and maintenance requirements, including fertiliser and herbicide application rates</li> </ul>

## 7 CONCLUSION

### Terrestrial Impacts

Clearing of exotic groundcover vegetation and two remnant native trees will occur at 151-161 Tallawong Road, Rouse Hill for a proposed educational and residential complex, the Sikh Grammar School Australia. This Biodiversity Assessment has assessed impacts to terrestrial and aquatic flora and fauna associated with the proposal.

The proposal is considered unlikely to have a significant impact on the extent of Cumberland Plain Woodland CEEC such that the local occurrence of the communities is likely to be placed at further risk of extinction. Additionally, four species of threatened microchiropteran bat species were identified during the survey, and two species of migratory birds. The removal of foraging habitat and the removal of a hollow-bearing tree will generate a long-term reduction in habitat for these species, however the impacts are not considered significant such that populations of the species would no longer remain viable within the locality. The proposal site occurs within lands Biocertified under the Growth Centres SEPP (2007). As such, impacts to threatened species are taken to not be significant, thus a Species Impact Statement or Biodiversity Development Assessment Report is not considered necessary.

### Aquatic Impacts

The dam on site lies on an ephemeral first order tributary of First Ponds Creek. Surface water flows upstream and downstream of the proposal site have been heavily altered by land clearing and earthworks. The water quality of the dam was poor. The dam and surrounds supported five native aquatic flora species, two amphibian species and seven aquatic bird species, including Latham's Snipe and Eastern Great Egret, migratory species listed under the EPBC Act. The proposal would not have a significant impact on any threatened aquatic species.

The proposal would completely alter the hydrology and aquatic ecosystems of the site. The dam would be drained and the site cut, filled and levelled. Existing aquatic habitat provided by the dam and irrigation structure would be removed and surface water flows redirected through constructed stormwater drainage into the council-operated stormwater system. Groundwater infiltration would be greatly reduced due to the large area of impermeable surfaces required under the proposal. This major local impact would be minor when the consequences of precinct-wide development and hydrological change are considered.

Environmental protection safeguards will be implemented during construction including (but not limited to) establishment of exclusion zones, erosion and sediment control, and weed management.

## 8 REFERENCES

- ELA, 2009, Riverstone Precinct Green and Golden Bell Frog Survey, prepared for Growth Centres Commission, 2009.
- NSW Department of Primary Industries (DPI), 2019, Key Fish Habitat Baulkham Hills LGA, viewed 22 February 2019, <[https://www.dpi.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0010/634267/BaulkhamHills.pdf](https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0010/634267/BaulkhamHills.pdf)>
- NSW Office of Water, 2010, Dams in NSW: What size are your existing dams?, viewed 27 February 2019, <[http://www.water.nsw.gov.au/\\_\\_data/assets/pdf\\_file/0010/547237/licensing\\_rights\\_harvest\\_dams\\_what\\_size\\_are\\_your\\_existing\\_dams.pdf](http://www.water.nsw.gov.au/__data/assets/pdf_file/0010/547237/licensing_rights_harvest_dams_what_size_are_your_existing_dams.pdf)>
- NSW Threatened Species Scientific Committee 2010 *Cumberland Plain Woodland in the Sydney Basin Bioregion - critically endangered ecological community listing NSW Scientific Committee - final determination*  
<<http://www.environment.nsw.gov.au/determinations/cumberlandwoodlandsFD.htm>>
- Office of Environment and Heritage 2018, *BioNet the Atlas of NSW Wildlife Database Search*, <[http://www.environment.nsw.gov.au/atlaspublicapp/UI\\_Modules/ATLAS\\_/AtlasSearch.aspx](http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx)>.
- Office of Environment and Heritage 2018, *BioNet Vegetation Classification*, NSW Government, viewed 2018, <<http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx>>
- Planning NSW, 2010, Assessment of Consistency between the Relevant Biodiversity Measures of the Biodiversity Certification Order and Alex Avenue and Riverstone Precincts.

## APPENDIX A FLORA AND FAUNA SITE LISTS

### A.1 FLORA SPECIES

N = Native, E = Exotic, HTE = High Threat Exotic, R = Rare, U = Uncommon, C = Common, VC = Very Common

Family	Exotic	Scientific Name	Common Name	BC Status	EPBC Status	N, E or HTE	Abundance
Myrtaceae		<i>Angophora floribunda</i>	Rough-barked Apple			N	R
Poaceae	*	<i>Cenchrus clandestinum</i>	Kikuyu Grass			HTE	VC
Asteraceae	*	<i>Cirsium vulgare</i>	Spear Thistle			E	U
Asteraceae	*	<i>Conyza spp.</i>	Fleabane			E	R
Convolvulaceae		<i>Dichondra repens</i>	Kidney Weed			N	R
Myrtaceae		<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark			N	R
Myrtaceae		<i>Eucalyptus tereticornis</i>	Forest Red Gum			N	R
Poaceae	*	<i>Paspalum dilatatum</i>	Paspalum			HTE	C
Plantaginaceae	*	<i>Plantago lanceolata</i>	Lamb's Tongues			E	R
Rosaceae	*	<i>Rubus fruticosus sp. agg.</i>	Blackberry complex			HTE	R
Asteraceae	*	<i>Taraxacum officinale</i>	Dandelion			E	C
Fabaceae (Faboideae)	*	<i>Trifolium spp.</i>	Clover			E	U

### A.2 FAUNA SPECIES

Class	Scientific name	Common name	Aquatic species	Count
Aves	<i>Accipiter fasciata</i>	Brown Goshawk		1
	<i>Anas superciliosa</i>	Pacific Black Duck	*	5
	<i>Egretta novaehollandiae</i>	White-faced Heron	*	1
	<i>Rhipidura leucophrys</i>	Willie Wagtail		1
	<i>Gallinago hardwickii</i>	Latham's snipe	*	1
	<i>Dacelo novaeguineae</i>	Kookaburra		1
	<i>Hieraaetus morphnoides</i>	Little Eagle		1



Class	Scientific name	Common name	Aquatic species	Count
	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant	*	1
	<i>Ardea alba</i>	Great Egret	*	
	<i>Chenonetta jubata</i>	Australian Wood Duck	*	7
	<i>Corvus coronoides</i>	Australian raven		3
	<i>Cracticus tibicen</i>	Australian Magpie		2
	<i>Fulica atra</i>	Eurasian Coot	*	4
	<i>Grallina cyanoleuca</i>	Magpie-lark		2
	<i>Malurus cyaneus</i>	Superb Fairy-wren		3
	<i>Manorina melanocephala</i>	Noisy Miner		5
	<i>Sturnus tristis</i>	Indian Myna		7
	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	*	2
	<i>Trichoglossus moluccanus</i>	Rainbow Lorikeet		8
<b>Reptilia</b>	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake		1
<b>Amphibia</b>	<i>Litoria fallax</i>	Eastern Dwarf Tree Frog	*	No census taken-numerous
	<i>Crinia signifera</i>	Eastern Common Froglet	*	No census taken - numerous
<b>Mammalia</b>				
	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat		Po - 2 Pr -0 De - 0
	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat		Po - 1 Pr -17 De - 22
	<i>Myotis macropus</i>	Southern Myotis		Po - 0 Pr -1 De - 0
	<i>Nyctophilus sp.</i>	Long-eared Bat		Po - 0 Pr -3 De - 0

Class	Scientific name	Common name	Aquatic species	Count
	<i>Mormopterus ridei</i>	Eastern Freetail Bat		Po - 1 Pr -10 De - 7
	<i>Austronomus australis</i>	White-striped Freetail Bat		Po - 0 Pr -1 De - 9
	<i>Scoteanax ruepellii</i>	Greater Broad-nosed Bat		Po - 0 Pr -0 De - 11
	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle		Po - 0 Pr -2 De - 0

## APPENDIX B DATABASE SEARCH RESULTS



# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 04/02/19 11:55:45

## [Summary](#)

## [Details](#)

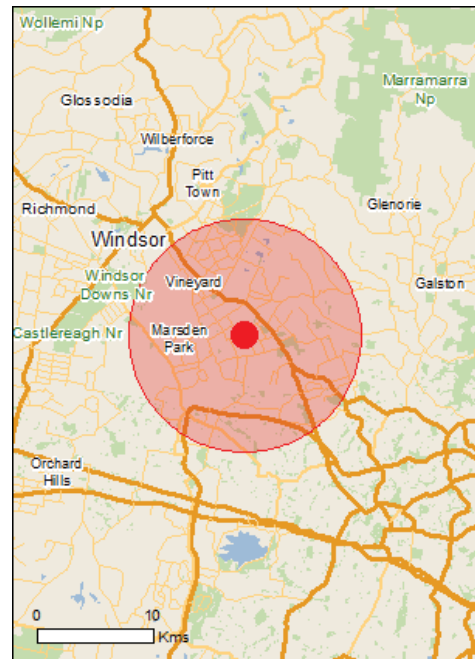
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

## [Caveat](#)

## [Acknowledgements](#)



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[Coordinates](#)

Buffer: 10.0Km





# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	7
<a href="#">Listed Threatened Species:</a>	50
<a href="#">Listed Migratory Species:</a>	16

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Land:</a>	12
<a href="#">Commonwealth Heritage Places:</a>	1
<a href="#">Listed Marine Species:</a>	22
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<a href="#">State and Territory Reserves:</a>	3
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	52
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

### Listed Threatened Ecological Communities

[ [Resource Information](#) ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
<a href="#">Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion</a>	Endangered	Community likely to occur within area
<a href="#">Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community</a>	Endangered	Community may occur within area
<a href="#">Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion</a>	Critically Endangered	Community likely to occur within area
<a href="#">Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest</a>	Critically Endangered	Community likely to occur within area
<a href="#">Shale Sandstone Transition Forest of the Sydney Basin Bioregion</a>	Critically Endangered	Community likely to occur within area
<a href="#">Turpentine-Ironbark Forest of the Sydney Basin Bioregion</a>	Critically Endangered	Community likely to occur within area
<a href="#">Western Sydney Dry Rainforest and Moist Woodland on Shale</a>	Critically Endangered	Community may occur within area

### Listed Threatened Species

[ [Resource Information](#) ]

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Dasyornis brachypterus</a> Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area
<a href="#">Grantiella picta</a> Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted-snipe, Australian Painted Snipe	Endangered	Species or species

Name	Status	Type of Presence
[77037]		habitat likely to occur within area
<b>Fish</b>		
<a href="#">Maccullochella peelii</a> Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
<a href="#">Macquaria australasica</a> Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
<a href="#">Prototroctes maraena</a> Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
<b>Frogs</b>		
<a href="#">Heleioporus australiacus</a> Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Litoria aurea</a> Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Litoria littlejohni</a> Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
<a href="#">Mixophyes balbus</a> Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
<b>Mammals</b>		
<a href="#">Chalinolobus dwyeri</a> Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
<a href="#">Petauroides volans</a> Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Petrogale penicillata</a> Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</a> Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pseudomys novaehollandiae</a> New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pteropus poliocephalus</a> Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<b>Other</b>		
<a href="#">Pommerhelix duralensis</a> Dural Land Snail [85268]	Endangered	Species or species habitat known to occur within area
<b>Plants</b>		
<a href="#">Acacia bynoeana</a> Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
<a href="#">Acacia gordonii</a> [5031]	Endangered	Species or species habitat likely to occur within area
<a href="#">Acacia pubescens</a> Downy Wattle, Hairy Stemmed Wattle [18800]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Allocasuarina glareicola</a> [21932]	Endangered	Species or species habitat likely to occur within area
<a href="#">Asterolasia elegans</a> [56780]	Endangered	Species or species habitat likely to occur within area
<a href="#">Caladenia tessellata</a> Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat may occur within area
<a href="#">Cryptostylis hunteriana</a> Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
<a href="#">Cynanchum elegans</a> White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
<a href="#">Darwinia biflora</a> [14619]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eucalyptus sp. Cattai (Gregson s.n., 28 Aug 1954)</a> [89499]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Genoplesium baueri</a> Yellow Gnat-orchid [7528]	Endangered	Species or species habitat likely to occur within area
<a href="#">Haloragis exalata subsp. exalata</a> Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
<a href="#">Melaleuca deanei</a> Deane's Melaleuca [5818]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Micromyrtus minutiflora</a> [11485]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Olearia cordata</a> [6710]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Pelargonium sp. Striatellum (G.W.Carr 10345)</a> Omeo Stork's-bill [84065]	Endangered	Species or species habitat may occur within area
<a href="#">Persoonia hirsuta</a> Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat known to occur within area
<a href="#">Persoonia nutans</a> Nodding Geebung [18119]	Endangered	Species or species habitat likely to occur within area
<a href="#">Pimelea curviflora var. curviflora</a> [4182]	Vulnerable	Species or species habitat known to occur within area



Name	Status	Type of Presence
<a href="#">Pimelea spicata</a> Spiked Rice-flower [20834]	Endangered	Species or species habitat known to occur within area
<a href="#">Pterostylis gibbosa</a> Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
<a href="#">Pterostylis saxicola</a> Sydney Plains Greenhood [64537]	Endangered	Species or species habitat likely to occur within area
<a href="#">Pultenaea parviflora</a> [19380]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Syzygium paniculatum</a> Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Thesium australe</a> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
<a href="#">Zieria involucrata</a> [3087]	Vulnerable	Species or species habitat likely to occur within area

#### Reptiles

<a href="#">Hoplocephalus bungaroides</a> Broad-headed Snake [1182]	Vulnerable	Species or species habitat may occur within area
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#### Listed Migratory Species

[ [Resource Information](#) ]

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
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#### Migratory Marine Birds

<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
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#### Migratory Terrestrial Species

<a href="#">Cuculus optatus</a> Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Monarcha trivirgatus</a> Spectacled Monarch [610]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat likely to occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area

#### Migratory Wetlands Species

Name	Threatened	Type of Presence
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat likely to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Land [\[ Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Airservices Australia
Commonwealth Land - Australian & Overseas Telecommunications Corporation
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of Defence Service Homes
Commonwealth Land - Director of War Service Homes
Commonwealth Land - Telstra Corporation Limited
Defence - HMAS NIRIMBA
Defence - RICHMOND - OUTER MARKER

### Commonwealth Heritage Places [\[ Resource Information \]](#)

Name	State	Status
<b>Natural</b>		
<a href="#">Shale Woodland Llandilo</a>	NSW	Listed place

### Listed Marine Species [\[ Resource Information \]](#)

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		within area  Species or species habitat known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Monarcha trivirgatus</a> Spectacled Monarch [610]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat likely to occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat likely to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Rouse Hill	NSW
Scheyville	NSW
Windsor Downs	NSW

Invasive Species	[ Resource Information ]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.	

Name	Status	Type of Presence
<b>Birds</b>		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area



Name	Status	Type of Presence
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Frogs</b>		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern,		Species or species

Name	Status	Type of Presence
Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] Asparagus asparagoides		habitat likely to occur within area
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Chrysanthemoides monilifera		Species or species habitat likely to occur within area
Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Lycium ferocissimum		Species or species habitat likely to occur within area
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding		Species or species

Name	Status	Type of Presence
Pine [20780]		habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area
<b>Reptiles</b>		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

## Coordinates

-33.68373 150.89328



# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

## APPENDIX C THREATENED SPECIES EVALUATIONS

The tables in this appendix present the habitat evaluation for threatened species, ecological communities and endangered populations listed for the study locality in the *Atlas of NSW Wildlife*<sup>1</sup> and those identified as potentially occurring in the area according to the Commonwealth EPBC *Protected Matters Search Tool*<sup>2</sup>.

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

### **Presence of habitat:**

Present: Potential or known habitat is present within the study area

Absent: No potential or known habitat is present within the study area

### **Likelihood of occurrence**

Unlikely: Species known or predicted within the locality but unlikely to occur in the study area

Possible: Species could occur in the study area

Present: Species was recorded during the field investigations

### **Possible to be impacted**

No: The proposal would not impact this species or its habitats. No Test of Significance (ToS) is necessary for this species

Yes: The proposal could impact this species or its habitats. An ToS has been applied to these entities.

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<sup>1</sup> The *Atlas of NSW Wildlife* is administered by the NSW Department of Environment & Heritage (OEH) and is an online database of fauna and flora records that contains over four million recorded sightings.

<sup>2</sup> This online tool is designed for the public to search for matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is managed by the Commonwealth Department of the Environment and Energy.

## C.1 EVALUATION OF THE LIKELIHOOD AND EXTENT OF IMPACT ON THREATENED FLORA

Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
<b>Trees</b>					
Narrow-leaved Black Peppermint <i>Eucalyptus nicholii</i> BC-V	A medium-sized tree 15 - 20 m tall with rough, thick, grey-brown bark which extends to the larger branches. This species is widely planted as an urban street tree and in gardens but is quite rare in the wild. It is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield, largely on private property. It occurs in grassy or sclerophyll woodland in association with many other eucalypts that grow in the area, including <i>E. andrewsii</i> and many of the stringybarks, such as <i>E. caliginosa</i> . Grows on shallow relatively infertile soils on shales and slates; Niangala to Glen Innes. The species is reserved in Single National Park and also in Oxley Wild Rivers National Park. The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, and Upland Wetlands of the New England Tablelands and the Monaro Plateau.	3	Absent	None	No
Eucalyptus sp. Cattai <i>Eucalyptus sp. Cattai</i> BC-E	A small, often mallee-form tree to 4.5 m with thick, somewhat fibrous, furrowed bark which is loose on the lower trunk. Occurs in the area between Colo Heights and Castle Hill, northwestern Sydney, with historical records from central Sydney. 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. Associated soils are laterised clays overlying sandstone. There are no known populations that occur in conservation reserves.	441	Absent	None	No

<sup>3</sup> Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's Species Profiles and Threats database (SPRAT) unless otherwise stated.  
OEH threatened species database: <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>  
SPRAT: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
Magenta Lilly Pilly <i>Syzygium paniculatum</i> BC-E, EPBC-V	A tree to 15 m tall, but is generally 3–8 m high and shrubby in form. Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State Forest. Has been recorded in widely scattered small populations along the NSW coast from Booti Booti (near Forster) in the north to Conjola State Forest (near Jervis Bay) in the south. Found in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas. Rainforests are often remnant stands of littoral or gallery rainforest. Associated species include <i>Alphitonia excelsa</i> , <i>Acmena smithii</i> , <i>Cryptocarya glaucescens</i> , <i>Toona ciliata</i> , <i>Eucalyptus saligna</i> , <i>Ficus fraseri</i> , <i>Syzygium oleosum</i> , <i>Acmena smithii</i> , <i>Cassine australe</i> , <i>F. obliqua</i> , <i>Glochidion ferdinandi</i> , <i>Endiandra sieberi</i> , <i>Synoum glandulosum</i> , <i>Podocarpus elatus</i> , <i>Notelaea longifolia</i> , <i>Guioa semiglaucula</i> and <i>Pittosporum undulatum</i> . Is thought to tolerate wet and dry conditions on sands. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. Flowers December to March, with fruit ripe from March to May, occasionally to September.	9	Absent	None	No
<b>Shrubs</b>					
Bynoe's Wattle <i>Acacia Bynoeana</i> BC-E, EPBC-V	Bynoe's Wattle is a semi-prostrate shrub to a metre high. This species is confined to the northern portion of the Sydney Basin Bioregion and the southern portion of the north coast Bioregion. Occurs in heath or dry sclerophyll forest on sandy clay soils, often containing ironstone gravels. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Bynoe's Wattle is a semi-prostrate shrub to a metre high. The single flower heads, on short hairy stems, appear anytime from September to March. Its seedpods are mature from September to January. The hairy branchlets distinguish the species from the similar and more common Three-veined Wattle <i>Acacia trinervata</i> . It is more likely to occur in sclerophyllous heath or woodland on Sandstone based substrates in association with <i>Corymbia gummifera</i> , <i>Eucalyptus sclerophylla</i> , <i>Banksia serrata</i> & <i>Angophora bakeri</i> , none of which occur in Cumberland Plain Woodland. It has been recorded in Castlereagh Nature Reserve.	14	Absent	None	No

Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
Downy Wattle <i>Acacia pubescens</i> BC-E, EPBC-V	A spreading shrub, 1 - 5 m high with brilliant yellow flowers, bipinnate leaves (divided twice pinnately) and conspicuously hairy branchlets. Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland. The topography of the habitat of the species is flat to gently undulating, a characteristic of the Cumberland Plain region. The sites of <i>A. pubescens</i> range in altitude from 0 to 650 metres a.s.l. The species often associated with <i>A. pubescens</i> include <i>Melaleuca nodosa</i> , <i>M. styphelioides</i> , <i>Angophora bakeri</i> , <i>Ozothamnus diosmifolius</i> , <i>Acacia parramattensis</i> , <i>Dillwynia sieberi</i> , <i>Pultenaea villosa</i> , <i>Bursaria spinosa</i> , <i>Acacia falcata</i> , <i>Exocarpos cupressiformis</i> , <i>Themeda australis</i> , <i>Lomandra longifolia</i> , <i>Microlaena stipoides</i> , <i>Aristida vagans</i> , <i>Austrodanthonia tenuior</i> , <i>Dianella longifolia</i> , <i>Lepidosperma laterale</i> and other species characteristic of the above plant communities. Stands of <i>A. pubescens</i> have been recorded in open, disturbedLongevity is unknown, but clonal species have been known to survive for many decades. Flowers from August to October. Pollination of Acacia flowers is usually by insects and birds. The pods mature in October to December. Recruitment is more commonly from vegetative reproduction than from seedlings. The percentage of pod production and seed fall for this species appears to be low. Acacia species generally have high seed dormancy and long-lived persistent soil seedbanks. It is thought that the species needs a minimum fire free period of 5 - 7 years to allow an adequate seedbank to develop.	35	Absent	None	No
Netted Bottle Brush <i>Callistemon linearifolius</i> BC-V	A shrub up to 3-4m tall. Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coal Cliffs in the Southern Rivers CMA. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Was more widespread across its distribution in the past. There are currently only 5-6 populations in the Sydney area, of the 22 populations recorded in the past. Three of these are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve, and Spectacle Island Nature Reserve. Further north it has been recorded from Yengo National Park. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring to summer.	1	Absent	None	No



Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
Darwinia biflora <i>Darwinia biflora</i> BC-V, EPBC-V	An erect to spreading shrub to 80cm high. Occurs at 129 sites in the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively. The largest and most significant areas of habitat occur around the North Turrumurra - North Wahroonga areas. Seventy-one of the 216 known sites (33%) occur in Ku-Ring-Gai Chase, Marramarra and Lane Cove National Parks and Berowra Valley Regional Park. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. In addition, the species appears to occur frequently on sheet rock which often contains moss beds. The species occurs in Sandstone Ridgeway Woodland, which is equivalent to Sydney Sandstone Ridge-top Woodland/ Open Forest and Sydney Sandstone Scrub-heath complex. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . It is often associated with the Vulnerable <i>Tetratheca glandulosa</i> . The vegetation structure is usually woodland, open forest or scrub-heath. Longevity is thought to be 15-20 years. Flowering occurs throughout the year but is concentrated in autumn, with mature fruits being produced from May to August. Self-pollination is the usual form of pollination. Flowers and fruit are produced 18 months after germination, though at this stage few reach maturity. Maturation rates are higher for plants older than 5 years. Seed viability is high (up to 99%). Fire is an important factor in the life cycle of this species. Fire kills all plants, but also produces 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.	348	Absent	None	No
Dillwynia tenuifolia – endangered population <i>Dillwynia tenuifolia</i> BC-V	A low spreading pea-flower shrub to a metre high. The core distribution is the Cumberland Plain from Windsor to Penrith east to Deans Park. 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. Disjunct localities include: the Bulga Mountains at Yengo in the north, Kurrajong Heights and Woodford in the Lower Blue Mountains. In western Sydney, this species may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. At Yengo, is reported to occur in disturbed escarpment woodland on Narrabeen sandstone. Flowering occurs sporadically from August to March depending on environmental conditions. Dispersal is likely to be localised and ants are the probable vectors. If killed by fire it re-establishes from soil-stored seed. Abundance is influenced by past disturbance history e.g. fire. The current high population densities at some sites (200,000+ individuals) reflect prolific seed germination in response to fire.	228	Absent	None	No

Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
Epacris purpurascens var. purpurascens <i>Epacris purpurascens</i> var. <i>purpurascens</i> BC-V	An erect shrub, 50 - 180 cm high. Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. <i>E. purpurascens</i> var. <i>purpurascens</i> has been recorded from Ku-Ring-Gai Chase National Park, Berowra Valley Regional Park, Muogamarra Nature Reserve, and Brisbane Waters National Park, with unconfirmed records from Gulger Nature Reserve and Bents Basin State Recreation Area. Large populations exist in protected water supply catchment lands in the vicinity of Picton Road. Found in a range of habitat types, most of which have a strong shale soil influence. These include ridgetop drainage depressions supporting wet heath within or adjoining shale cap communities eg. Stringybark and Ironbark woodlands, various shale/sandstone transition forest associations including Turpentine Ironbark Margin Forest, Stringybark/Scribbly Gum Woodland and Scribbly Gum/ Grey Gum/ Red Bloodwood Woodland. The species also occurs in riparian zones draining into Sydney Sandstone Gully Forest, shale lenses within sandstone habitats and colluvial areas overlying or adjoining sandstone or tertiary alluvium. Lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild. Killed by fire and re-establishes from soil-stored seed.	68	Absent	None	No
Juniper Leaved Grevillea <i>Grevillea juniperina</i> subsp. <i>juniperina</i> BC-V	A broadly spreading to erect shrub to 2.5 m high. Endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town. It is generally found in flat or gently sloping, low-lying sites between 30-70 m asl. Potential habitat comprises woodland areas on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often close to the boundary between the two geologies), and is usually associated with lateritic gravels. Populations are often found in relatively open and/or disturbed sites and wetter areas. Key associated species include <i>Eucalyptus tereticornis</i> , <i>E. fibrosa</i> , <i>Melaleuca decora</i> , <i>Bursaria spinosa</i> , <i>Dillwynia sieberi</i> , <i>Daviesia ulicifolia</i> , <i>Goodenia hederacea</i> and <i>Themeda australis</i> . Flowering may occur sporadically throughout the year, but particularly between July and October. Physical disturbance of the soil appears to result in an increase in seedling recruitment. Has a tendency to colonise mechanically disturbed areas.	554	Absent	None	No
Hibbertia superans <i>Hibbertia superans</i> BC-E	A low spreading shrub to 30 cm high. Occurs 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. No populations are known from a formal conservation reserve. Flowering time is July to December. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides. Highly sensitive to both frequent and infrequent fire and other disturbance regimes. Flowers first appear from resprouting material about 2 years after fire. Most occurrences are in or near Shale/Sandstone Transition Forest and are often associated with other threatened flora including <i>Pimelea curviflora</i> var. <i>curviflora</i> , <i>Darwinia biflora</i> , <i>Epacris purpurascens</i> var. <i>purpurascens</i> , <i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i> , <i>Acacia bynoeana</i> , <i>Eucalyptus</i> sp. <i>Cattai</i> and <i>Persoonia hirsuta</i> . These plants tend to be very strongly associated due to their habitat requirements and restricted distribution.	72	Absent	None	No

Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
<i>Lasiopetalum joyceae</i> <i>Lasiopetalum joyceae</i> BC-V, EPBC-V	An erect shrub to 2 m tall. Has a restricted range occurring on lateritic to shaley ridgetops on the Hornsby Plateau south of the Hawkesbury River. It is currently known from 34 sites between Berrilee and Duffys Forest. Seventeen of these are reserved. Grows in heath on sandstone. Flowers in spring. The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities: Shale/Sandstone Transition Forest, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, and Turpentine-Ironbark Forest in the Sydney Basin Bioregion.	11	Absent	None	No
<i>Leucopogon fletcheri</i> susp. <i>fletcheri</i> <i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i> BC-E	An erect densely branched shrub, seldom more than 1 m high. Restricted to north-western Sydney between St Albans in the north and Annangrove in the south, within the local government areas of Hawkesbury, Baulkham Hills and Blue Mountains. Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Associated with the Mittagong Formation between the Wianamatta Shale and the Hawkesbury Sandstone. Flowers August to September. Fruit produced October. Fire response unknown, but <i>Leucopogon fletcheri</i> subsp. <i>brevisepalus</i> is fire tolerant and capable of resprouting following fire.	26	Absent	None	No
Deane's Paperbark <i>Melaleuca deanei</i> BC-V, EPBC-V	A shrub to 3 m high with fibrous, flaky bark. Occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. Locations are known from the following National Parks and Wildlife Service reserves: Berowra Valley Regional Park, Brisbane Water National Park, Ku-ring-gai Chase National Park, Garigal National Park, Lane Cove National Park, Royal National Park, Heathcote National Park. The species grows in heath on sandstone. Mostly occupies broad flat ridgetops, dry ridges and slopes. In southern Sydney, the species is most often found on flat broad ridge tops more than 100 metres wide. The altitudinal range of <i>M. deanei</i> is between 20 and 410 metres above sea level. Strongly associated with sandy loam soils that are low in nutrients, sometimes with ironstone present. Is most often found in Coastal Sandstone Ridgetop Woodland. Flowers appear in summer.	1	Absent	None	No
<i>Micromyrtus minutiflora</i> <i>Micromyrtus minutiflora</i> BC-E, EPBC-V	Slender spreading shrub to 2 m high. Restricted to the general area between Richmond and Penrith, western Sydney. Sites include Castlereagh Nature Reserve, the Australian Defence Industries site and Marsden Park. Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments. Occurs on sandy clay or gravelly soils. Sporadic flowering, June to March. Response to fire and mechanical disturbance is uncertain	10	Absent	None	No

Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
Hairy Geebung <i>Persoonia hirsuta</i> BC-E, EPBC-E	Has a scattered distribution around Sydney. The species is distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. <i>Persoonia hirsuta</i> has a large area of occurrence, but occurs in small populations, increasing the species fragmentation in the landscape. The Hairy Geebung has been recorded in the Sydney coastal area (subsp. <i>hirsuta</i> - Gosford to Berowra to Manly to Royal National Park), the Blue Mountains area (subsp. <i>evoluta</i> - Springwood, Lithgow, Putty) and the Southern Highlands (subsp. <i>evoluta</i> - Balmoral, Buxton, Yanderra and Hill Top areas). The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone from near sea level to 600m altitude. It is usually present as isolated individuals or very small populations. It is probably killed by fire (as other <i>Persoonia</i> species are) but will regenerate from seed. Flowering is generally in summer.	27	Absent	None	No
Nodding Geebung <i>Persoonia nutans</i> BC-E, EPBC-E	An erect to spreading shrub to 2.5 m high. Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Core distribution occurs within the Penrith, and to a lesser extent, Hawkesbury, local government areas (LGA), with isolated and relatively small populations also occurring in the Liverpool, Campbelltown, Bankstown and Blacktown LGAs. Specific localities at which this species has been collected include: Londonderry; Kemps Creek; Georges River opposite East Hills; Macquarie Fields; near Richmond & Nepean Rivers. Confined to aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland. Peak flowering is from December to January with sporadic flowering all year round. An obligate seed regenerator. Seed germination is promoted, not only by fire, but also by physical disturbance. Plants appear to set abundant fruit.	52	Absent	None	No
<i>Pimelea curviflora</i> var. <i>curviflora</i> <i>Pimelea curviflora</i> var. <i>curviflora</i> BC-V, EPBC-V	A much-branched subshrub or shrub 20 to 120cm high with hairy stems. Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Found in the Baulkham Hills, Blacktown, Hornsby, Parramatta, and Warringah Local Government Areas. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Flowers October to May. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots.	67	Absent	None	No

Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
Spiked Rice-flower <i>Pimelea spicata</i> BC-E, EPBC-E	A shrub to 50 cm tall that may be erect or somewhat prostrate in habit. Once widespread on the Cumberland Plain, Spiked Rice-flower occurs in two disjunct areas, the Cumberland Plain (Narellan, Marayong, Prospect Reservoir, Freemans Reach, Georges Hall areas) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. Associated species include: Grey Box ( <i>Eucalyptus moluccana</i> ), Forest Red Gum ( <i>E. tereticornis</i> ), Narrow-leaved Ironbark ( <i>E. crebra</i> ), Blackthorn ( <i>Bursaria spinosa</i> ), and Kangaroo Grass ( <i>Themeda australis</i> ). On the inland Cumberland Plain sites it is associated with Grey Box and Ironbark. In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a more well developed shrub and grass understorey. Has been recorded from both shale hills and shale plains woodland. Cryptic and difficult to detect. Flowers sporadically throughout the year (but mostly in summer), with flowering likely to depend upon climatic conditions, particularly rainfall.	83	Absent	None	No
Pultenaea parviflora <i>Pultenaea parviflora</i> BC-E, EPBC-V	A small, erect to prostrate shrub generally less than 1 m high. Endemic to the Cumberland Plain. Core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce. Populations occur in Windsor Downs Nature Reserve and near Long Neck Lagoon (Hawkesbury); at five locations in Penrith; Castlereagh Nature Reserve, in or adjoining Agnes Banks Nature Reserve, on Australian Defence Industries land at St Marys, at Shanes Park and on remnant bushland at Kemps Creek; at Marsden Park (Blacktown) and Badgerys Creek (Liverpool). 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. <i>Eucalyptus fibrosa</i> is usually the dominant canopy species. <i>Eucalyptus globoidea</i> , <i>E. longifolia</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> and <i>E. sideroxylon</i> may also be present or co-dominant, with <i>Melaleuca decora</i> frequently forming a secondary canopy layer. Associated species may include <i>Allocasuarina littoralis</i> , <i>Angophora bakeri</i> , <i>Aristida</i> spp. <i>Banksia spinulosa</i> , <i>Cryptandra</i> spp., <i>Daviesia ulicifolia</i> , <i>Entolasia stricta</i> , <i>Hakea sericea</i> , <i>Lissanthe strigosa</i> , <i>Melaleuca nodosa</i> , <i>Ozothamnus diosmifolius</i> and <i>Themeda australis</i> . Often found in association with other threatened species such as <i>Dillwynia tenuifolia</i> , <i>Dodonaea falcata</i> , <i>Grevillea juniperina</i> , <i>Micromyrtus minutiflora</i> , <i>Persoonia nutans</i> and <i>Styphelia laeta</i> . Flowering may occur between August and November depending on environmental conditions. Killed by fire and re-establishes from soil-stored seed. There is no evidence of vegetative spread.	280	Absent	None	No



Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
Tetratheca glandulosa Tetratheca glandulosa BC-V, EPBC-V	A small, spreading shrub which grows 20–50 cm in height. Restricted to the following Local Government Areas: Baulkham Hills, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Pittwater, Ryde, Warringah, and Wyong. There are approximately 150 populations of this plant ranging from Sampons Pass (Yengo NP) in the north to West Pymble (Lane Cove NP) in the south. The eastern limit is at Ingleside (Pittwater LGA) and the western limit is at East Kurrajong (Wollemi NP). The current north-south range is approximately 65km. Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gynea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridgetop Woodland. Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> , with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae. Can also be found with the endangered species <i>Darwinia biflora</i> , usually as part of the Shale/Sandstone Transition Forest community. Flowers July-November however residual flowers may persist until late December. Flowering is influenced by seasonal weather conditions and/or the microclimate effects (eg. exposure) of each particular site. Resprouts from a woody root following fire.	52	Absent	None	No
<b>Herbs &amp; Forbs</b>					
Masrdenia viridiflora subsp. viridiflora Marsdenia viridiflora subsp. viridiflora Status code	<b>Endangered Population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGAs.</b> A climber with twining stems to 4 m high. Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range. Occurs as very scattered plants in areas of remnant vegetation. There are relatively recent records from Prospect Reservoir, Cabramatta Creek, Smithfield and the former Australian Defence Industries site at St Marys. Grows in vine thickets and open shale woodland. Flowers in spring.	5	Absent	None	No
Hypsela sessiliflora Hypsela sessiliflora BC-E, EPBC-X	A prostrate herb. Currently known from only two adjacent sites on a single private property at Erskine Park in the Penrith LGA. Previous sightings are all from western Sydney, at Homebush and at Agnes Banks. Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (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 <i>Cyndon dactylon</i> . Mainly flowers in spring.	3	Absent	None	No
<b>Orchids</b>					

Species	Description of habitat <sup>3</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Possible impact?
Sydney Plains Greenhood <i>Pterostylis saxicola</i> BC-E, EPBC-E	A cryptic ground orchid with reddish brown and green translucent flowers on a slender stem to 35 cm tall. Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Localities include: Georges River National Park (near Yerramba Lagoon), Ingleburn, Holsworthy, Peter Meadows Creek and St Marys Towers near Douglas Park. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils. The time of emergence and withering has not been recorded for this species, however flowering occurs from October to December and may vary due to climatic conditions. The above ground parts of the plant wither and die following seed dispersal and the plant persists as a tuberoid until the next year.	1	Absent	None	No
<b>Ferns</b>					
Austral Pillwort <i>Pilularia novae-hollandiae</i> BC-E	A semi-aquatic fern, resembling a small fine grass. In NSW, Austral Pillwort has been recorded from suburban Sydney, Khancoban, the Riverina between Albury and Urana (including Henty, Walbundrie, Balldale and Howlong), Oolambeyan National Park near Carathool and at Lake Cowal near West Wyalong. The populations at Lake Cowal and Oolambeyan NP are the only known extant populations in NSW, although the species is obscure and has possibly been overlooked elsewhere. The species has also been recorded in the Australian Capital Territory, Victoria, Tasmania, South Australia and Western Australia. Most of the records in the Albury-Urana area were from table drains on the sides of roads. The ACT record was from a subalpine grassy plain. This species is probably ephemeral (especially in the drier parts of its range), appearing when soils are moistened by rain. Grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous.	1	Absent	None	No
<b>EECs</b>					
E TSC = listed as Endangered under Schedule 1 of the NSW <i>Biodiversity Conservation Act 2016</i> E EPBC = listed as Endangered under the Commonwealth <i>Environment Protection &amp; Biodiversity Conservation Act 1999</i> . V TSC = listed as Vulnerable under Schedule 2 of the NSW <i>Biodiversity Conservation Act 2016</i> . V EPBC = listed as Vulnerable under the Commonwealth <i>Environment Protection &amp; Biodiversity Conservation Act 1999</i> .			EEC TSC = Endangered Ecological Community listed under Schedule 1 of the NSW <i>BC Act 1995</i> CE EPBC = listed as Critically Endangered under the Commonwealth <i>Environment Protection &amp; Biodiversity Conservation Act 1999</i> .		

## C.2 EVALUATION OF THE LIKELIHOOD AND EXTENT OF IMPACT ON THREATENED FAUNA

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
	<b>Aves</b>				
Regent Honeyeater <i>Anthochaera phrygia</i> BC-CE, EPBC-E, Migratory	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years non-breeding flocks converge on flowering coastal woodlands and forests. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises <i>E. microcarpa</i> , <i>E. punctata</i> , <i>E. polyanthemos</i> , <i>E. mollucana</i> , <i>Corymbia robusta</i> , <i>E. crebra</i> , <i>E. caleyi</i> , <i>Corymbia maculata</i> , <i>E. mckieana</i> , <i>E. macrorhyncha</i> , <i>E. laevopinea</i> , and <i>Angophora floribunda</i> . Nectar and fruit from the mistletoes <i>A. miquelii</i> , <i>A. pendula</i> and <i>A. cambagei</i> are also eaten during the breeding season. When nectar is scarce lerp and honeydew comprise a large proportion of the diet. A shrubby understorey is an important source of insects and nesting material. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria.	13	Marginal	Low	No

<sup>4</sup> Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's *Species Profiles and Threats* database (SPRAT) unless otherwise stated.

OEH threatened species database: <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx>

SPRAT: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i> BC-V	Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	115	Absent	None	No
Australasian Bittern <i>Botaurus poiciloptilus</i> BC-E, EPBC-E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes ( <i>Typha</i> spp.) and spikerushes ( <i>Eleocharis</i> spp.)	2	Marginal	Low	No
Curlew Sandpiper <i>Calidris ferruginea</i> BC-CE, EPBC-CE	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	7	Marginal	Low	No
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i> BC-E	A relatively small, dark grey cockatoo, 33 - 36 cm in total length. Feathers are distinctively squarish on the ends, with a lighter coloured margin producing a scalloped appearance. Males have a bright red head and crest. Females have a grey head and crest and the scalloped margins of females breast feathers are reddish - pink. This endangered population is found in the Ku-ring-gai and Hornsby local government areas. The population is believed to be largely confined to an area bounded by Thornleigh and Wahroonga in the north, Epping and North Epping in the south, Beecroft and Cheltenham in the west and Turrumurra/South Turrumurra to the east. It is known to inhabit areas of Lane Cove National Park, Pennant Hills Park and other forested gullies in the area.	2	Marginal	Low	No
Glossy Black Cockatoo <i>Calyptorhynchus lathami</i> BC-V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Dependent on large hollow-bearing eucalypts for nest sites. One or two eggs are laid between March and August. Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak ( <i>Allocasuarina littoralis</i> ), Forest She-oak ( <i>A. torulosa</i> ) or Drooping She-oak ( <i>A. verticillata</i> ) occur. In the Riverina area, inhabits open woodlands dominated by Belah ( <i>Casuarina cristata</i> ). Feeds almost exclusively on the seeds of several species of she-oak ( <i>Casuarina</i> and <i>Allocasuarina</i> species), shredding the cones with the massive bill.	17	Marginal	Low	No

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Speckled Warbler <i>Chthonicola sagittata</i> BC-V	The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	320	Marginal	Low	No
Spotted Harrier <i>Circus assimilis</i> BC-V	The Spotted Harrier is a medium-sized, slender bird of prey having an owl-like facial ruff that creates the appearance of a short, broad head, and long bare yellow legs. The upperparts are blue-grey with dark barring, and the wingtips are black. The face, innerwing patch, and underparts are chestnut. The long tail is boldly banded, with a wedge-shaped tip. Juveniles are mottled and streaked ginger and brown, with prominent ginger shoulders, fawn rump and banded tail. The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population.	3	Marginal	Low	No
Brown Treecreeper <i>Climacteris picumnus victoriae</i> BC-V	The Brown Treecreeper, Australia's largest treecreeper, is a grey-brown bird with black streaking on the lower breast and belly and black bars on the undertail. Pale buff bands across the flight feathers are obvious in flight. The face is pale, with a dark line through the eye, and a dark crown. Sexes differ slightly in all plumages, with small patches of black and white streaking on the centre of the uppermost breast on males, while the females exhibit a rufous and white streaking. Juveniles differ from adults mainly by the pattern of the under-body, and by their a pale bill and gape. Subspecies <i>victoriae</i> is distinguished from subspecies <i>picumnus</i> by colour differences on the face, body and tail markings. The two subspecies grade into each other through central NSW. Individuals are active, noisy and conspicuous, and give a loud 'pink' call, often repeated in contact, and sometimes given in a series of 5 - 10 descending notes. Breeds from July to Feb across its range. The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of <i>Climacteris picumnus victoriae</i> runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper <i>Climacteris picumnus picumnus</i> which then occupies the remaining parts of the state. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. The population density of this subspecies has been greatly reduced over much of its range, with major declines recorded in central NSW and the northern and southern tablelands. Declines have occurred in remnant vegetation fragments smaller than 300 hectares, that have been isolated or fragmented for more than 50 years.	4	Marginal	Low	No



Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Varied Sittella <i>Daphoenositta chrysoptera</i> BC-V	In NSW most individuals have a grey head and are streaked with dark brown, but in the extreme north-east they have a white head, and in the extreme south-west a black cap. The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades.	63	Marginal	Low	No
White-fronted Chat <i>Epthianura albifrons</i> BC-E	The White-fronted Chat is an endemic Australian passerine bird, 12 cm in length and weighing approximately 13 g. It has a short slender bill, long spindly legs, a short square-tipped tail and rounded wings. Classified as a honeyeater it is most similar in form to its close relatives, the Orange Chat, Yellow Chat and Crimson Chat from which it is easily distinguished by its black and white colouration. The male's plumage is more striking than the females; juvenile plumage is most similar to the female. A distinctive 'tang, tang' is used as a contact call. The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas. Two isolated sub-populations of White-fronted Chats are currently known from the Sydney Metropolitan Catchment Management Authority (CMA) area; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay. These sub-populations are separated from each other by 25 km of urbanised land, across which the Chats are unlikely to fly. The nearest extant populations outside Sydney Metropolitan CMA are at Ash Island north of Newcastle and Lake Illawarra, south of Wollongong. White-fronted Chats were previously recorded at Penrith Lakes (2001), Hawkesbury Swamps (2002), Tuggerah Lake (1997) and Lake Macquarie (1998).		Marginal	Low	No
Black-necked Stork <i>Ephippiorhynchus asiaticus</i> BC-E	Black-necked Storks are widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas). In NSW, the species becomes increasingly uncommon south of the Clarence Valley, and rarely occurs south of Sydney. Since 1995, breeding has been recorded as far south as Buladelah. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	4	Marginal	Low	No

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Black Falcon <i>Falco subniger</i> BC-V	The Black Falcon <i>Falco subniger</i> G.R. Gray 1843 (family <i>Falconidae</i> ), is a large (45-55 cm in length), very dark falcon with pale grey cere, eye-rings and feet. It is uniformly dark brown to sooty black, with a pale throat and an indistinct black streak below each eye. Some individuals have faint, narrow barring under the wings and tail. The dark form of the Brown Falcon <i>Falco berigora</i> is sometimes mistaken for the Black Falcon. However the Brown Falcon can be distinguished by its double cheek-mark, longer legs, bicoloured, barred underwings and comparatively slow flight (Debus 1998). The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993). The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring.	4	Marginal	Low	No
Little Lorikeet <i>Glossopsitta pusilla</i> BC-V	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Occupies isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	20	Marginal	Low	No
Little Eagle <i>Hieraaetus morphnoides</i> BC-V	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. The species often occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	15	Marginal	Low	No
Black Bittern <i>Ixobrychus flavicollis</i> BC-V	The Black Bittern has a wide distribution, from southern NSW north to Cape York and along the north coast to the Kimberley region. The species also occurs in the south-west of Western Australia. In NSW, records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	4	Marginal	Low	No
Swift Parrot <i>Lathamus discolor</i> BC-CE, EPBC-CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between March and October. No breeding in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> .	11	Marginal	Low	No

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Latham's Snipe <i>Gallinago hardwickii</i> BC-C,J,K	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	1	Present	Recorded	Low
Major Mitchell's Cockatoo <i>Lophochroa leadbeateri</i> BC-V	An unmistakable cockatoo of the dry inland, Major Mitchell's Cockatoo is the only Australian cockatoo that is salmon-pink below and white above. It is also called the Pink Cockatoo, and until recently was listed under the name of <i>Cacatua leadbeateri</i> . It is smaller than the Sulphur-crested Cockatoo <i>C. galerita</i> , but slightly larger than a Galah <i>Eolophus roseicapillus</i> . Its most prominent feature is its large white-tipped crest that is banded in red and gold. Its call is a distinctive stammering whinny. Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that.	1	Marginal	Low	No
Square-tailed Kite <i>Lophoictinia isura</i> BC-V	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.  In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland.	14	Marginal	Low	No
Hooded Robin (south-eastern form) <i>Melanodryas cucullata cucullata</i> BC-V	The Hooded Robin is a large Australian robin reaching 17 cm in length. The male is strikingly marked in black and white, with a bold black hood extending down a white breast. The back is black with distinct white shoulder and wing-bar. The tail is black, with prominent white side-panels. Females and immatures are duller, with light brownish-grey upperparts, but the same striking black and white wings. Flight is short and swiftly undulating. The call is a series of descending, fading, mellow notes. The adult male is unmistakable but the female and young males may be confused with other species, such as the Jacky Winter. Hooded Robins are distinguished by their larger size, distinctive white wing bar and different shaped tail markings ('hourglass' shaped). The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies <i>cucullata</i> ) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies <i>picata</i> . Two other subspecies occur outside NSW.	1	Marginal	Low	No

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Black-chinned Honeyeater (eastern subspecies) <i>Melithreptus gularis gularis</i> BC-V	The Black-chinned Honeyeater is the largest of its genus, reaching 17 cm in length. The cap is black, with a white crescent around the nape, and there is a diagnostic black 'chin' beneath the bill and extending down the white throat (though this can be difficult to see in the field). There is a small crescent of blue skin above the eye. The back and wings are a dull olive-green and the tail is greyish-brown. The underparts are white, with a greyish-buff tint on the breast. The bill is short, black and slightly downcurved. The call is a ringing, bubbling trill, repeated several times. A combination of larger size, black chin, bright blue eye crescent and call distinguishes this from similar species, such as the White-naped ( <i>Melithreptus lunatus</i> ) and White-throated ( <i>M. lunatus</i> ) Honeyeaters. The Black-chinned Honeyeater has two subspecies, with only the nominate ( <i>gularis</i> ) occurring in NSW. The other subspecies ( <i>laetior</i> ) was formerly considered a separate species (Golden-backed Honeyeater) and is found in northern Australia between central Queensland west to the Pilbara in Western Australia. The eastern subspecies extends south from central Queensland, through NSW, Victoria into south eastern South Australia, though it is very rare in the last state. In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence River areas. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions, though it is very rare in the latter.	9	Marginal	Low	No
Turquoise Parrot <i>Neophema pulchella</i> BC-V	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. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	2	Marginal	Low	No
Powerful Owl <i>Ninox strenua</i> BC-V	In NSW the Powerful Owl lives in forests and woodlands occurring in the coastal, escarpment, tablelands and western slopes environments. Specific habitat requirements include eucalypt forests and woodlands on productive sites on gentle terrain; a mosaic of moist and dry types, with mesic gullies and permanent streams; presence of leafy sub-canopy trees or tall shrubs for roosting; presence of large old trees to provide nest hollows. Optimal habitat includes a tall shrub layer and abundant hollows supporting high densities of arboreal marsupials. Roosts in groves of dense mid-canopy trees or tall shrubs in sheltered gullies, typically on wide creek flats and at the heads of minor drainage lines, but also adjacent to cliff faces and below dry waterfalls. Species commonly used for roosting include the She-oaks <i>Allocasuarina</i> spp., rainforest species such as Coachwood <i>Ceratopetalum apetalum</i> , Lilly Pilly <i>Acmena smithii</i> and Sassafras <i>Doryphora sassafras</i> , Black Wattle <i>Acacia melanoxylon</i> , Turpentine <i>Syncarpia glomulifera</i> and eucalypts.	50	Marginal	Low	No

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Barking Owl <i>Ninox connivens</i> BC-V	Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. Many populations crashed as woodland on fertile soils was cleared over the past century, leaving linear riparian strips of remnant trees as the last inhabitable areas. Surveys in 2001 demonstrated that the Pilliga Forest supported the largest population in southern Australia. The owls sometimes extend their home range into urban areas, hunting birds in garden trees and insects attracted to streetlights.	2	Marginal	Low	No
Blue-billed Duck <i>Oxyura australis</i> BC-V	The Blue-billed Duck is one of only two Australian species of stiff-tailed ducks - diving ducks with spine-like tail-feathers. It is a small and compact duck, with a length of 40 cm. The male's head and neck are glossy black, and the back and wings are a rich, chestnut to dark-brown. During the summer breeding season the male's bill turns bright blue. The female is brownish-black above, with narrow bands of light brown and mottled light brown and black below. The female's bill is dark grey-green. In the non-breeding season the male resembles a dark female. The tail is usually held flat on the water, although during courtship, or when alarmed, it is held fully erect. The Blue-billed Duck is endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas.	2	Marginal	Low	No
Scarlet Robin <i>Petroica boodang</i> BC-V	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. The Scarlet Robin is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. The Scarlet Robin is found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter.	12	Marginal	Low	No



Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Superb Parrot <i>Polytelis swainsonii</i> BC-V, EPBC-V	The Superb Parrot is a distinctive large, bright grass-green parrot with a long, narrow tail and sharply back-angled wings in flight. Males have yellow foreheads and throats and a red crescent that separates the throat from the green breast and belly. Females are slightly duller green and have a dull, light blue wash in place of the males' red and yellow markings. The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild.	1	Marginal	Low	No
Flame Robin <i>Petroica phoenicea</i> BC-V	The Flame Robin is a small Australian robin that reaches 14 cm in length. The male has a dark grey head and upperparts, a small white forehead patch, and white wing stripes and white tail-edges. The male has a bright orange-red throat, breast and upper-belly. The lower belly is white. The female is brown, darker above, and has a whitish throat and lower belly. The whitish mark on the female's forehead is inconspicuous. Female Flame Robins also have white and buffish marked wings and tail. Immature males resemble females. The main call of the Flame Robin is a thin, pretty, piping descending song. The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands.	2	Marginal	Low	No
Australian Painted Snipe <i>Rostratula australis</i> BC-E, EPBC-E	The Australian Painted Snipe is small freshwater wader, with a long bill that droops slightly at the tip. The female has a chestnut-black hood with a bold white eye-patch and a cream stripe along the middle of the crown. The back and wings are patterned bronzy-greenish-grey with a few cream streaks and the underparts are white. The male is slightly smaller and has greyer, less contrasting patterns, but also has large cream spots on the wings. The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves.		Marginal	Low	No

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Freckled Duck <i>Stictonetta naevosa</i> BC-V	The Freckled Duck is a dark, greyish-brown bird with a large head that is peaked at the rear, and a distinctive narrow, slightly up-turned bill. Their dark brownish-black plumage is evenly freckled all over with white or buff. During the winter-spring breeding season, the male's bill becomes crimson at the base. The Freckled Duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. The duck is forced to disperse during extensive inland droughts when wetlands in the Murray River basin provide important habitat. The species may also occur as far as coastal NSW and Victoria during such times.		Marginal	Low	No
Masked Owl <i>Tyto novaehollandiae</i> BC-V	Extends from the coast where it is most abundant to the western plains. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. Habitat for this species is also widespread throughout the dry eucalypt forests of the tablelands, western slopes and the undulating wet-dry forests of the coast. Optimal habitat includes an open understorey and a mosaic of sparse (grassy) and dense (shrubby) ground cover on gentle terrain. Roosts in hollows in live or occasionally dead eucalypts; dense foliage in gullies; and caves. Nest in old hollow eucalypts, live or dead, in a variety of topographic positions, with hollows greater than 40 cm wide and greater than 100 cm deep. Hollow entrances are at least 3 m above ground, in trees of at least 90 cm diameter at breast height. A specialist predator of terrestrial mammals, particularly native rodents. Home range has been estimated as 400-1000 ha according to habitat productivity.		Marginal	Low	No
Sooty Owl <i>Tyto tenebriosa</i> BC-V	Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Territories are occupied permanently. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals. Nests in very large tree-hollows.		Marginal	Low	No
Insects					

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Cumberland Plain Land Snail <i>Meridolum corneovirens</i> BC-E	Superficially similar to the familiar exotic Garden Snail ( <i>Helix aspera</i> ). It differs most obviously in its 25 - 30 mm diameter shell. While this shell may be almost any shade of brown, it is always uniform in colour, while that of <i>Helix</i> consists of dark patches on a pale background. A green or yellow tinge may be present. The Cumberland Land Snail also has a more flattened shell that is very thin and fragile, compared with the thick shell of the Garden Snail. The under side of the shell, especially in living individuals, tends to have a glossy appearance and is semitransparent, enabling the observer to see the animal colour and some internal organs. The upper side of the shell has a coarse wrinkly appearance. In adult shells the edge of the aperture is reflected, forming a slight lip. This is typically white in colour. However, the feature is absent in both juvenile and sub-adult individuals. The juveniles have a more angular shell and tend to have an open area in the central part of the underside of the shell, known as the umbilicus. Generally, in adults the umbilicus is closed or partially covered. Sometimes there is a reddish brown patch around the umbilical area. Lives in small areas on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. known from over 100 different locations, but not all are currently occupied, and they are usually isolated from each other as a result of land use patterns.	180	Absent	None	No
Dural Woodland Snail <i>Pommerhelix duralensis</i> BC-E, EPBC-E	<i>Pommerhelix duralensis</i> (the Dural land snail), also commonly known as the Dural woodland snail, is a medium sized snail with a dark brown to black semi-translucent, subglobose (almost spherical shaped) shell. Adults grow approximately 10–23 mm in height and 14–23 mm in width. The Dural land snail superficially resembles the related species <i>Meridolum corneovirens</i> (Cumberland Plain land snail), with which the Dural land snail is parapatric (the species' ranges are immediately adjacent to each other but do not significantly overlap). Unless identified otherwise, referenced material and statements in this description are drawn from the Commonwealth Listing Advice and references therein, and that should be used for further information and referencing purposes. 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. <i>Pommerhelix duralensis</i> in the strict sense is found in an area of north-western Sydney between Rouse Hill - Cattai and Wiseman's Ferry, west from Berowra Creek. North of the Hawkesbury and Wiseman's Ferry there is an entity with morphologically similar shells but which have not had the DNA sequenced. The Blue Mountains records have been assigned to <i>Pommerhelix</i> 'Elizabeth', a genetically distinct species which has been sampled at Elizabeth Lookout in Glenbrook, and which extends along the eastern escarpment of the Blue Mountains. In the northern side of Sydney, between Parramatta and Port Jackson and east of Berowra Creek is identified as <i>Meridolum middenense</i> . The species is definitely found within the Local Government Areas of The Hills Shire, Hawkesbury Shire and Hornsby Shire. Records from the Blue Mountains City, Penrith City and Parramatta City may represent this species. Occurrence in Wollondilly Shire is considered unlikely in light of current knowledge.	16	Absent	None	No
<b>Mammals</b>					

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Large-eared Pied Bat <i>Chalinolobus dwyeri</i> BC-V, EPBC-V	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin ( <i>Petrochelidon ariel</i> ), frequenting low to mid-elevation dry open forest and woodland close to these features. Found in well-timbered areas containing gullies.	7	Marginal	Low	No
Koala <i>Phascolarctos cinereus</i> BC-V, EPBC-V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery.	1	Marginal	Low	No
Spot-tailed Quoll <i>Dasyurus maculatus maculatus</i> BC-E, EPBC-E	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common.	8	Absent	None	No
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i> BC-V	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	35	Present	Recorded	Low
Little Bent-winged Bat <i>Miniopterus australis</i> BC-V	Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bent-wing bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bent-wing bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats ( <i>M. schreibersii</i> ) and appears to depend on the large colony to provide the high temperatures needed to rear its young.	26	Marginal	Low	No

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Eastern Bent Wing Bat <i>Miniopterus schreibersii oceanensis</i> BC-V	Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	107	Present	Recorded	Low
Eastern Freetail-Bat <i>Mormopterus norfolkensis</i> BC-V	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	81	Marginal	Low	No
Southern Myotis <i>Myotis Macropus</i> BC-V	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	51	Present	Recorded	Low
Yellow-bellied Glider population on the Bago Plateau <i>Petaurus australis</i> BC-E	The Yellow-bellied Glider is a large, active, sociable and vocal glider. Adults weigh 450 - 700 grams, have a head and body length of about 30 cm and a large bushy tail that is about 45 cm long. Yellow-bellied Glider's have grey to brown fur above with a cream to yellow belly, which is paler in young animals. The dark stripe down the back is characteristic of the group. It has a large gliding membrane that extends from the wrist to the ankle. It has a loud, distinctive call, beginning with a high-pitched shriek and subsiding into a throaty rattle. The endangered population of the Yellow-bellied Glider occurs on the Bago Plateau; a westward extension of the Kosciuszko highlands in southern New South Wales. The population is disjunct owing to the steep valleys and unsuitable habitat surrounding the Bago Plateau which includes cleared agricultural land to the west and the Tumut River and Talbingo Reservoir to the east. The area of the population includes a large portion of Bago and Maragle State Forests, a small area of Kosciuszko National Park and some freehold land.	14	Marginal	Low	No
Grey-headed Flying-fox <i>Pteropus poliocephalus</i> BC-V, EPBC-V	The Grey-headed Flying-fox is the largest Australian bat, with a head and body length of 23 - 29 cm. It has dark grey fur on the body, lighter grey fur on the head and a russet collar encircling the neck. The wing membranes are black and the wingspan can be up to 1 m. It can be distinguished from other flying-foxes by the leg fur, which extends to the ankle. Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November.	70	Marginal	Low	No



Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Yellow-bellied Sheathtail-Bat <i>Saccolaimus flaviventris</i> BC-V	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.	20	Marginal	Low	No
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i> BC-V	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m. Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	45	Present	Recorded	Low
Eastern Cave Bat <i>Vespadelus troughtoni</i> BC-V	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. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. 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 rainforests.	1	Marginal	Low	No
<b>Amphibians</b>					
Giant Burrowing Frog <i>Heleioporus australiacus</i> BC-V, EPBC-V	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size. Individuals move into the breeding site either immediately before or following heavy rain and occupy these sites for up to 10 days. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. When breeding, frogs will call from open spaces, under vegetation or rocks or from within burrows in the creek bank. Males show strong territoriality at breeding sites. This species breeds mainly in autumn, but has been recorded calling throughout the year.	1	Present – marginal quality	Possible	Low

Species and Status	Description of habitat <sup>4</sup>	Number of records within 10km	Presence of habitat	Likelihood of occurrence	Potential for impact?
Green and Golden Bell Frog <i>Litoria aurea</i> BC-E, EPBC-V	A relatively large, stout frog, ranging in size from approximately 45 mm to approximately 100 mm snout to vent length. Diagnostic features are a gold or creamish white stripe running along the side, extending from the upper eyelids almost to the groin, with a narrow dark brown stripe beneath it, from nostril to eye. It also has blue or bluish-green colour on the inside of the thighs. The colour of the body varies. Usually a vivid pea-green, splotched with an almost metallic brassy brown or gold. The backs of some individuals may be almost entirely green; in others golden-brown markings may dominate. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes ( <i>Typha spp.</i> ) or spikerushes ( <i>Eleocharis spp.</i> ). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow ( <i>Gambusia holbrooki</i> ), have a grassy area nearby and diurnal sheltering sites available.	7	Present – marginal quality	Possible	Loq
Red-crowned Toadlet <i>Pseudophryne australis</i> BC-V	The Red-crowned Toadlet is an unmistakable small frog, usually measuring less than 30 mm long. It is dark brown to black, with distinctive reddish-orange patches, one between the eyes and one along the rump. It also has a white patch at the base of each arm. The belly is marbled black and white. The tadpoles are black and reach about 25 mm. The short, grating and "squelchy" call can be heard all year round. The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.	13	Absent	Low	No
BC-E = listed as Endangered under Schedule 1 of the NSW <i>Biodiversity Conservation Act 2016</i> BC-V = listed as Vulnerable under Schedule 2 of the NSW <i>Biodiversity Conservation Act 2016</i> . EPBC-V = listed as Vulnerable under the Commonwealth <i>Environment Protection &amp; Biodiversity Conservation Act 1999</i> . EPBC-M = listed as Migratory under the Commonwealth <i>Environment Protection &amp; Biodiversity Conservation Act 1999</i> .			EPBC-CE = listed as Critically Endangered under the Commonwealth <i>Environment Protection &amp; Biodiversity Conservation Act 1999</i> . CAMBA = Chinese-Australia Migratory Bird Agreement JAMBA = Japan-Australia Migratory Bird Agreement		

## APPENDIX D TESTS OF SIGNIFICANCE

Part 7.3 of the *Biodiversity Conservation Act 2016* (BC Act) specifies five factors to be taken into account in deciding whether a development is likely to significantly affect threatened species, populations or ecological communities, or their habitats, listed at the state level under the *Biodiversity Conservation Act 2016*.

The following Tests of Significance (ToS) characterises the significance of likely impacts associated with the proposal on the following Threatened Ecologically Community/threatened species:

- Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community (CPW CEEC)
- Microchiropteran bats (*Saccolaimus flaviventris*, *Mormopterus norfolkensis*, *Chalinolobus dwyeri*, *Falsistrellus tasmaniensis*, *Miniopterus australis*, *Miniopterus schreibersii oceanensis*, *Myotis macropus*, *Scoteanax rueppellii*, *Vespadelus troughtoni*)

### D.1 CUMBERLAND PLAIN WOODLAND TEST OF SIGNIFICANCE

a) In the case of a threatened species, whether the action proposed 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.

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

- a. 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.
- b. 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 this TEC is taken to be the community that occurs within the study area and all contiguous vegetation of the same TEC. Risk of extinction is used here as the likelihood that the local occurrence of the ecological community will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the TEC from the proposal. Composition refers to the assemblage of species and the physical structure of the community.

CPW is listed as critically endangered and endangered respectively, and as such is already at risk of extinction. The proposed works would marginally exacerbate this risk, however the impacts to the community considered unlikely to have an adverse effect on the extent of the communities such that its local occurrence is likely to be placed at risk of extinction. The proposal will impact approximately 0.07 ha of CPW in poor condition. It is considered likely that despite these impacts the communities will continue to exist within areas adjacent to the proposal sites and with larger patches of higher ecological integrity protected in the broader locality.

The proposal is considered unlikely to substantially and adversely modify the composition of the community to the extent that its local occurrence is placed at risk of extinction. The CPW present occurs in a highly modified and degraded state with only 2 canopy trees present within the proposal site. It is not considered likely that the loss of these trees will exacerbate that diversity loss such that the local occurrence of the community (11.87 ha) is placed at risk of extinction.

**c) In relation to the habitat of a threatened species or ecological community:**

- I. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
- II. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
- III. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The extent of the community to be impacted as a result of the proposal is up to 0.07 ha. The proposal would not result in the breaking apart of large blocks of high-quality examples of the community. No further habitat fragmentation on a landscape scale would occur because of the proposal. Isolation of habitats is likely to increase by a small extent as the distance between patches on either side of The Northern Road would be increased.

Due to the conservation significance of the community, the remaining patches of this community within NSW are likely to be important for their survival. However, the patches within the study area are very small and only consist of two canopy trees. Furthermore, no patches of vegetation in the study area have been recognised as priority conservation land or as part of core habitats or regional corridors by the OEH. As such, the patches within the study area can be considered less important than larger, high quality examples in the locality that retain high levels of ecological integrity and function.

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

AOBVs refer only to those areas of land listed in Part 3 of the *Biodiversity Conservation Regulation 2017* (NSW). This question is not applicable, as no AOBV has been listed for the community subject to this assessment.

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

A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. KTPs are listed under Schedule 4 of the BC Act. KTPs relevant to the proposal include:

Key Threatening Processes	
TSC Act	Relevance
<b>Clearing of native vegetation</b>	Native vegetation would be removed as part of the proposed works. This vegetation is in low condition. Weed control and management at the proposal sites would prevent the spread of weeds and associated decline in biodiversity values.
<b>Loss of Hollow-bearing Trees</b>	One hollow-bearing trees may be removed as part of the proposal.
<b>Invasion of native plant communities by exotic perennial grasses</b>	Exotic perennial grasses were recorded within the proposal sites which can benefit from disturbance to natural vegetation. Weed management at the sites would help prevent these species from spreading within or between sites.

<b>Infection of native plants by <i>Phytophthora cinnamomi</i></b>	Evidence of this pathogen was not observed at the proposal sites during the surveys and will be managed throughout construction.
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The Cumberland Plain Recovery Plan (Department of Environment Climate Change and Water 2011) has been prepared with the overall objective provide for the long-term survival of the threatened biodiversity of the Cumberland Plain. The recovery objectives include:

- 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.

OEH action statements for the management of CPW under the Saving Our Species Program have a large focus on identified priority conservation lands. An action also states that in circumstances where impacts are unavoidable, as part of any consent, approval or license that is issued, ensure that offset measures are undertaken within the priority conservation lands where practicable. The proposal is considered unlikely to interfere with any actions or objectives planned for recovery of the community.

## Conclusion

In summary, the proposal is considered unlikely to have an adverse effect on the extent of CPW CEEC and within the study area such that the local occurrence of the community is likely to be placed at further risk of extinction. The impact is small when considered in the context of the actual impact in hectares and the extent of the community within the broader locality. The proposal is considered unlikely to substantially and adversely modify the composition of the community as the current composition of the communities is highly modified.

There is unlikely to be any further increase in fragmentation from the proposal. However, an increase in isolation of habitat patches is expected as the gap between extant vegetation patches is widened resulting in increased distance between patches on either side of the works. The community within the study area is not recognised as important to the long-term survival of the CPW in the locality as the patches are small, in poor to moderate condition. Furthermore, none of the CPW patches to be impacted are identified as important under the Cumberland Plain Recovery Plan. No AOBVs will be impacted.

The proposal is not inconsistent with the objectives or actions of the Cumberland Plain Recovery Plan and the proposal is not considered likely to interfere with any of the identified recovery objectives or actions for the community. The proposal would contribute to some KTPs that cannot be mitigated against including clearing of native vegetation.

Considering the context of the community and intensity of the potential impacts to the community from the proposal, an overall conclusion has been made that the proposal is unlikely to result in a significant impact to CPW CEEC and the preparation of a Species Impact Statement is not considered necessary. Additionally, as the proposal site occurs within lands biocertified under the Growth Centres SEPP (2007), impacts to threatened species and communities are taken to be non-significant.

Table 8-1 CPW CEEC Summary of Test of Significance

BC Act ToS						
Threatened species, or communities	Significance assessment question					Likely significant impact?
	a	b	c	d	e	No
Cumberland Plain Woodland in the Sydney Basin Bioregion	X	N	N	X	Y	

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ?= unknown impact.



## D.2 MICROBAT TEST OF SIGNIFICANCE

- a) In the case of a threatened species, whether the action proposed 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.

Those microchiropteran bats which have been recorded within 10km of the subject site include the:

- Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*;
- Eastern Cave Bat *Vespadelus troughtoni*;
- Eastern False Pipistrelle *Falsistrellus tasmaniensis*;
- Eastern Freetail-bat *Mormopterus norfolkensis*;
- Greater Broad-nosed Bat *Scoteanax rueppellii*;
- Large-eared Pied Bat *Chalinolobus dwyeri*;
- Little Bentwing-bat *Miniopterus australis*;
- Southern Myotis *Myotis macropus*; and
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*.

Of these, four of the nine species have been recorded foraging on the proposal site. Two of the recorded species roost within caves, culverts and man-made structures, thus the proposal site does not constitute suitable roosting habitat. The Southern Myotis and Eastern Bentwing-bat would only forage within the site as part of a larger foraging range.

Microchiropteran bats can roost in tree hollows, under bark and in tree fissures, in caves and also in human structures such as houses, abandoned warehouses and drains. These species have widespread foraging habitat.

The proposal includes removal of 2 Eucalypts (*E. crebra* and *A. floribunda*) including 1 large hollow-bearing tree (DBH >80cm) with fissured and decorticated bark. The hollow-bearing tree is an isolated paddock tree.

Two species of bat recorded on site have potential to roost within the hollow bearing tree; Eastern False Pipistrelle and Greater Broad-nosed Bat. The removal of the hollow-bearing tree has the potential to impact the roosting habitat of these species, however it is considered unlikely that these species would be solely reliant on a single tree as a roosting resource, and would likely roost and forage within the broader locality.

The proposed works are unlikely to have any adverse effects on the life cycle of any of these threatened microchiropteran species that have been recorded within 10kms of the proposal site such that they would be placed at risk of extinction.

- b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.
- 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.

- c) In relation to the habitat of a threatened species or ecological community:

- i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
- ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

**iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**

The proposal will impact approximately 0.07 ha of roosting habitat in the form of one hollow-bearing tree, and approximately 2.4 ha of occasional foraging habitat in the form of open exotic grassland. The threatened species detected within the proposal site forage typically within and around canopy layers of vegetation, with the exception of the Eastern Bentwing-bat and Southern Myotis, who forage within open grassland and above waterbodies predominantly.

As the species are highly mobile, the proposal is not considered to isolate areas of habitat or fragment the available habitat any further than the current level of fragmentation that exists.

The habitats to be removed are not considered important to the long-term survival of the species in the locality. The hollow-bearing tree to be removed would likely be one of several roosts utilised by threatened species within the locality, and the marginal quality foraging habitat to be removed would likely be used only as part of a wider foraging range.

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

AOBVs refer only to those areas of land listed in Part 3 of the *Biodiversity Conservation Regulation 2017* (NSW). This question is not applicable, as no AOBV has been listed for the community subject to this assessment.

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

A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. KTPs are listed under Schedule 4 of the BC Act. KTPs relevant to the proposal include:

Key Threatening Processes	
TSC Act	Relevance
<b>Clearing of native vegetation</b>	Native vegetation would be removed as part of the proposed works. This vegetation is in low condition. Weed control and management at the proposal sites would prevent the spread of weeds and associated decline in biodiversity values.
<b>Loss of Hollow-bearing Trees</b>	One hollow-bearing trees may be removed as part of the proposal.
<b>Invasion of native plant communities by exotic perennial grasses</b>	Exotic perennial grasses were recorded within the proposal sites which can benefit from disturbance to natural vegetation. Weed management at the sites would help prevent these species from spreading within or between sites.
<b>Infection of native plants by <i>Phytophthora cinnamomi</i></b>	Evidence of this pathogen was not observed at the proposal sites during the surveys and will be managed throughout construction.

The clearing of native vegetation and loss of hollow-bearing trees are considered a major contributor to the loss of biodiversity. The NSW Scientific Committee found that 'clearing of any area of native vegetation, including areas less than two hectares in extent, may have significant impacts on biological diversity'. Clearing can lead to direct habitat loss, habitat fragmentation and associated genetic impacts, habitat degradation and off-site impacts such as downstream sedimentation. Given that only

2 trees are proposed to be cleared within an already disturbed and fragmented environment, the proposal would not cause a substantial increase in the operation of these threatening processes.

### Conclusion

In summary, the proposal is considered unlikely to have an adverse effect on the life cycle of microbat species such that a viable local population of the species is likely to be placed at risk of extinction. The impact is small when considered in the context of the actual impact in hectares and the extent of the habitat available within the broader locality. The proposal would contribute to some KTPs that cannot be mitigated against including clearing of native vegetation and loss of hollow bearing trees. The preparation of a Species Impact Statement is not considered necessary. Additionally, as the proposal site occurs within lands biocertified under the Growth Centres SEPP (2007), impacts to threatened species and communities are taken to be non-significant.

Table 8-2 Microbat Summary of Test of Significance

BC Act ToS						
Threatened species, or communities	Significance assessment question					Likely significant impact?
	a	b	c	d	e	No
Microchiropteran species	N	X	X	N	Y	

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ?= unknown impact.

## **D.3 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT PRINCIPAL SIGNIFICANT IMPACT ASSESSMENT**

The *Environment Protection and Biodiversity Conservation Act 1999* specifies factors to be taken into account in deciding whether a development is likely to significantly affect Endangered Ecological Communities, threatened species and migratory species, listed at the Commonwealth level. The following assessment assesses the significance of the likely impacts associated with the proposed works on:

- Latham's Snipe *Gallinago hardwickii* - Marine
- Eastern Great Egret *Ardea alba* - Marine/ Migratory

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

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

An area of 'important habitat' for a migratory species is:

- a) habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- b) habitat that is of critical importance to the species at particular life-cycle stages, and/or
- c) habitat utilised by a migratory species which is at the limit of the species range, and/or d. habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates).

### **Latham's snipe *Gallinago hardwickii* and Eastern Great Egret *Ardea alba***

**Will the action substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species**

The farm dam within the proposal site is not considered to constitute important habitat for Latham's Snipe or the Eastern Great Egret, as it is considered unlikely that the dam would support an ecologically significant proportion of the population of these species, would not be of critical importance for particular life stages of the species, and is not at the limit of the species range. As such, the action will not substantially modify, destroy or isolate important habitat for these species.

**a) Will the action result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species?**

The existing suitable habitat will be removed by the proposed works. The proposal would be unlikely to result in any invasive species becoming established which threaten Latham's Snipe or Eastern Great Egret habitat.

**b) Will the action seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species?**

As discussed above, the proposal site is not considered to constitute habitat for an ecologically significant proportion of the population. The site is unlikely to provide habitat that enables successful reproduction and recruitment into the local population. Given that successful breeding at the site is very unlikely, the proposal would not constitute further disruption.

## References

Department of Environment and Energy, 2017, *Industry Guidelines for Avoiding, Assessing and Mitigating Impacts on EPBC Act Listed Migratory Shorebird Species*, Commonwealth of Australia.



## APPENDIX E SITE PHOTOS



Figure 8-1 The dam and surrounds





Figure 8-2 Sewerage installation works underway along the south-eastern side of the proposal site





Figure 8-3 Sewage cistern installed below dam on proposal site





Figure 8-4 *Gambusia holbrooki* collected during dipnetting