TRANSPORT FOR NSW

FAULCONBRIDGE STATION UPGRADE

BIODIVERSITY ASSESSMENT REPORT

OCTOBER 2019

Question today
Imagine tomorrow
Create for the future

Faulconbridge Station Upgrade
Biodiversity Assessment Report

Transport for NSW

WSP
Level 27, 680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
wsp.com

REV	DATE	DETAILS
A	26/08/2019	Draft report
B	25/09/2019	Revised draft report
C	17/10/2019	Final

	NAME	DATE	SIGNATURE
Prepared by:	Mark Stables	17/10/2019	
Reviewed by:	Johan Goosen	17/10/2019	
Approved by:	Johan Goosen	17/10/2019	

TABLE OF CONTENTS

CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

LIST OF APPENDICES

GLOSSARY

*	Denotes exotic species
BAM	Biodiversity Assessment Methodology 2017 that supports the *Biodiversity Conservation Act 2016* (BC Act).
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: — Genetic diversity — the variety of genes (or units of heredity) in any population. — Species diversity — the variety of species. — Ecosystem diversity — the variety of communities or ecosystems.
Bioregion (region)	A bioregion defined in a national system of bioregionalisation. The site is in the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (Thackway and Cresswell 1995).
Candidate species	Species assessed as having a moderate to high likelihood of occurrence within the study area.
Critical habitat	The whole or any part or parts of an area or areas of land comprising the habitat of an Endangered species, an Endangered population or an Endangered Ecological Community that is critical to the survival of the species, population or ecological community (Department of Environment and Conservation 2004). Critical habitat is listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) with the Secretary (Department of the Environment and Energy) maintaining a register of this habitat. Capitalisation of the term 'Critical Habitat' in this report refers to the habitat listed specifically under Commonwealth legislation.
Cryptic species	An inconspicuous species which can be difficult to identify
Department of Environment and Energy	The department develops and implements national policy, programs and legislation to protect and conserve Australia's natural environment and cultural heritage and administers the EPBC Act. The Commonwealth Department of the Environment was previously known as: — Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) — Department of the Environment, Water, Heritage and the Arts (DEWHA) — Department of Environment and Heritage (DEH) — Department of the Environment and Water Resources (DEWR).
Ecological community	An assemblage of species occupying a particular area.
Environmental weed	Any plant that is not native to a local area that has invaded native vegetation.
Exotic	Introduced from outside the area (Stralberg, Jongsomjit et al. 2009). Used in the context of this report to refer to species introduced from overseas.
GPS	Global Positioning System – a navigational tool which uses radio receivers to pick up signals from four or more special satellites to provide precise determination of location.
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic components.

High Threat Weed	Vascular plants not native to Australia that if not controlled will invade and outcompete native species. A list of high threat weeds is available as part of the BAM Calculator (https://www.lmbc.nsw.gov.au/bamcalc)
Indigenous	Native to the area: not introduced (Stralberg, Jongsomjit et al. 2009).
Introduced	Not native to the area: not indigenous (Stralberg, Jongsomjit et al. 2009). Refers to both exotic and non-indigenous Australian native species of plants and animals.
Key threatening processes	A process that threatens, or could threaten, the survival, abundance or evolutionary development of native species, populations or ecological communities (Department of Environment and Conservation 2004). Key threatening processes are listed under the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act) and the EPBC Act. Capitalisation of the term 'Key Threatening Processes' in this report refers to those processes listed specifically under the relevant state and Commonwealth legislation.
Likely	Taken to be a real chance or possibility (Department of Environment and Conservation 2004).
Local population	The population that occurs within the site, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated as defined by Department of Environment and Climate Change (2007b).
Locality	The area within a 10 kilometre radius of the study area.
Migratory species	Species listed as Migratory under the EPBC Act relating to international agreements to which Australia is a signatory. These include Japan-Australia Migratory Bird Agreement, China-Australia Migratory Bird Agreement, Republic of Korea-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Capitalisation of the term 'Migratory' in this report refers to those species listed as Migratory under the EPBC Act.
NSW	New South Wales
Plant community type (PCT)	A NSW plant community type identified using the PCT classification system.
Priorities action statements (PAS)	Priorities action statements outline the broad strategies and detailed priority actions to be undertaken in NSW to promote the recovery of Threatened species, population and ecological communities and manage key threatening processes (Department of Environment and Climate Change 2007a).
Priority Weeds	An introduced species listed under the *Biosecurity Act 2015*. Under the Act, priority weeds have specific control measures for each region.
Proposal	The proposed works as described in detail in Section 1.2.
Protected species	Those species defined as protected under the *National Parks and Wildlife Act 1974*. Includes all native animals, as well as all native plants listed on Schedule 13 of the *National Parks and Wildlife Act 1974* (repealed).
Region	A bioregion defined in a national system of bioregionalisation. The Proposal is located within the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995).
Significant	Important, weighty or more than ordinary

Species richness	Species richness is simply the number of species present in a sample, community, or taxonomic group. Species richness is one component of the concept of species diversity, which also incorporates evenness, that is, the relative abundance of species (Matteson and Langellotto 2010).
Threatened biodiversity	Threatened species, populations or ecological communities as listed under the BC Act, FM Act or the EPBC Act.
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as Vulnerable, Endangered or Critically Endangered (collectively referred to as threatened) under the TSC Act, FM Act or the EPBC Act. Capitalisation of the terms 'Vulnerable', 'Endangered' or 'Critically Endangered' in this report refers to listing under the relevant state and/or Commonwealth legislation.
Viable local population	A population that has the capacity to live, develop and reproduce under normal conditions, unless the contrary can be conclusively demonstrated through analysis of records and references (Department of Environment and Climate Change 2007b).
Weed	A plant growing out of place or where it is not wanted: often characterised by high seed production and the ability to colonise disturbed ground quickly (Stralberg, Jongsomjit et al. 2009). Weeds include both exotic and Australian native species of plant naturalised outside of their natural range.

ABBREVIATIONS

BAM	Biodiversity Assessment Methodology (2017)
BC Act	NSW *Biodiversity Conservation Act 2016*
CAMBA	China Australia Migratory Bird Agreement
EEC	Endangered Ecological Community
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
HA	Hectares
ISCA	Infrastructure Sustainability Council of Australia
JAMBA	Japan Australia Migratory Bird Agreement
LEP	Local Environmental Plan
MNES	Matters of National Environmental Significance
OEH	Office of Environment and Heritage
OEES	Office of Environment, Energy and Science
PCT	Plant Community Type
RoKAMBA	Republic of Korea Australia Migratory Bird Agreement
TSC Act	NSW *Threatened Species Conservation Act 1995.*

1 PROPOSAL BACKGROUND

1.1 PURPOSE OF THIS REPORT

Transport for NSW (TfNSW) has identified the need to undertake a Biodiversity Assessment Report to inform the Review Environmental Factors (REF) for the Faulconbridge Station Upgrade (the Proposal).

This Biodiversity Assessment Report has been prepared to determine the impact of the proposal, test if the proposed activity is likely to significantly affect threatened species in accordance with Section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act) and recommend mitigation measures to avoid and/or minimise impact to threatened biodiversity.

This report will also determine if a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) must accompany the environmental assessment (REF) under Part 5 Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The key aims of this Biodiversity Assessment Report are to:

- present the results of desk-based and field-based investigations on biodiversity values within the study area
- provide a description of the biodiversity values and conservation significance within the study area
- undertake an evaluation of any impacts associated with the proposal (in the study area) including associated works implementing vegetation management actions
- undertake assessments of significance within the study area (five-part tests) as prescribed under Section 7.3 of the BC Act
- determine if a Species Impact Statement or Biodiversity Development Assessment must accompany the environmental assessment under Section 7.8 of the BC Act
- recommend relevant mitigation and management measures to minimise any impacts on biodiversity values within the study area
- identify trees for removal and tree replacement requirements in accordance with TfNSW's '*Vegetation Offset Guide*' (2019a).

This report also addresses biodiversity entities listed as Matters of National Environmental Significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

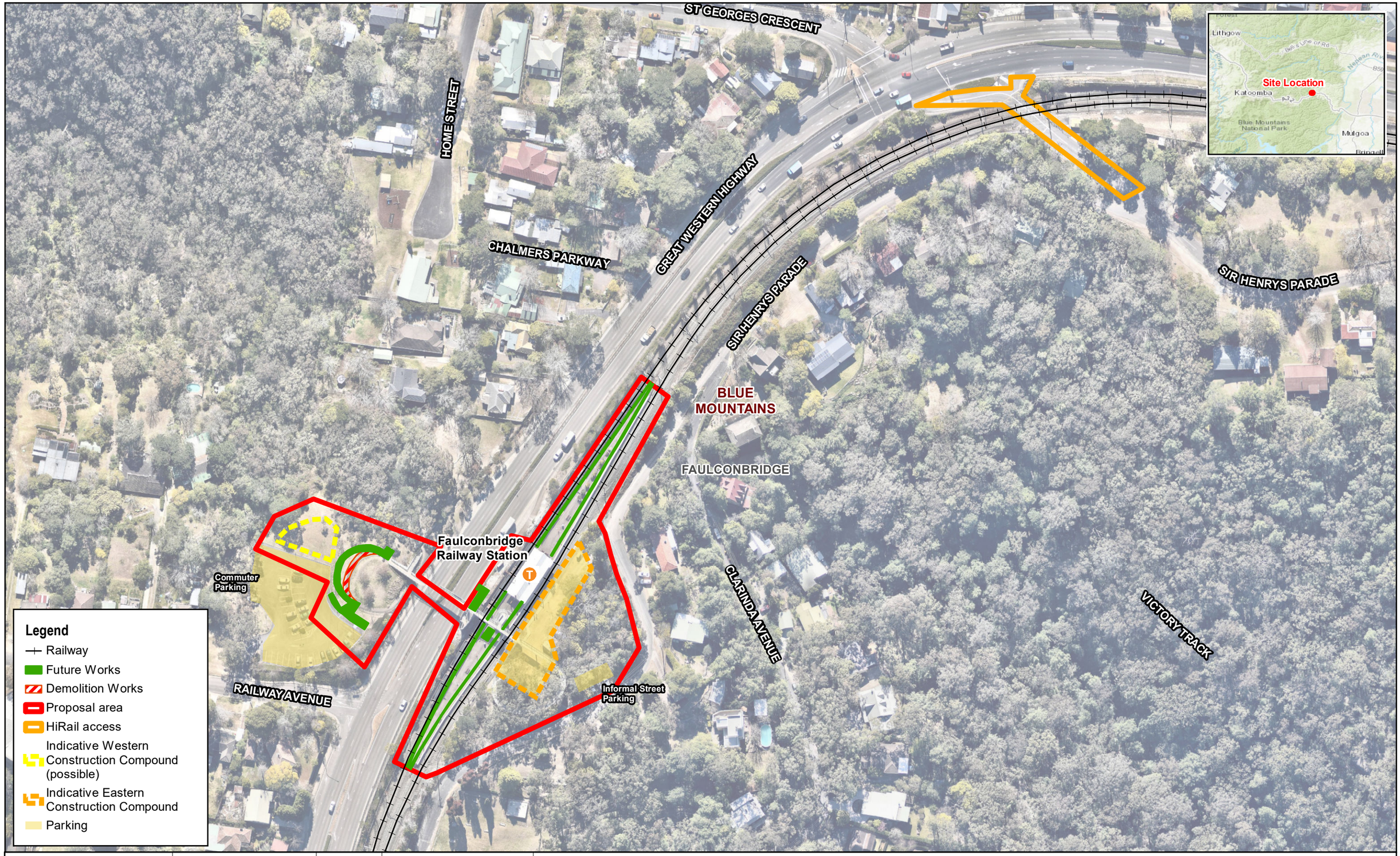
1.2 LOCATION OF THE PROPOSAL

Faulconbridge Station is located along the Great Western Highway, Faulconbridge. Faulconbridge Station is on the Blue Mountains Line approximately 83 kilometres west of the Sydney CBD and about 21 km east of Katoomba. Faulconbridge is located within the Blue Mountains City Council local government area (LGA). The town of Faulconbridge consists mostly of low density residential and recreational land uses. A pedestrian footbridge crosses the highway providing access to and from the station from the western side of the highway.

The Proposal study area is generally bounded by Railway Avenue to the South and Sir Henrys Parade to the East as well as low density residential properties.

The Proposal is mostly located within the station itself, the existing pedestrian footbridge and commuter car park at Railway Avenue on the western side of the station.

The regional location of the Proposal is shown in Figure 1.1.



Map: PS115008_GIS_001_A2	Author: Trent.Bowman		0 20 40 m 1:1,500
Date: 4/10/2019	Approved by: Johan.Goosen		Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community © Department Finance, Services and Innovation 2019

Faulconbridge Rail Station

Figure 1.1
Locality and Study Area

1.3 DESCRIPTION OF THE PROPOSAL

As described in Section 1.1 of the REF (WSP 2019), the Proposal involves an upgrade of Faulconbridge Station as part of the Transport Access Program which would improve accessibility and amenity for customers. The Proposal would include the following key elements:

- construction of a new lift on the platform to connect to the existing footbridge
- construction of a new lift off the Great Western Highway to connect to the existing footbridge
- upgrade of the existing pedestrian footbridge over the Great Western Highway and all stairs including new handrails, tactile ground surface indicators (TGSIs), nosings and modifying the existing balustrade
- internal station building works including:
  - reconfiguration of the existing station waiting room, door widening, and allocated spaces for wheelchairs and persons with disability
  - reconfiguration of the existing toilets to accommodate one new unisex family accessible toilet and one new unisex Ambulant toilet
- modifications to the commuter car park and Kiss and ride including:
  - upgrade of the two existing *Disability Discrimination Act 1992* parking spaces, and upgrade of the existing Kiss and ride bay
  - construction of a new *Disability Discrimination Act 1992* compliant ramp (including demolition of existing non-complaint path) from the existing pedestrian footbridge to the commuter car park
  - provision of a new rest area with seating at the western entrance of the existing footbridge
- upgrade of existing platform and access paths to include TGSIs and safety zone markings
- provision of access paths and circulation spaces to connect all customer facilities at the station (e.g. lifts, kiss-and-ride, DDA car space, family accessible toilet etc.)
- ancillary works including adjustments to lighting, relocation or replacement of existing customer facilities (drinking fountain, seating, telephone booth, guard indicators, Opal card readers, fencing etc.), improvement to station communications (including CCTV cameras, LED lighting, Public Address (PA) system, and hearing loops), wayfinding signage, yellow lines, bike rack etc.

2 LEGISLATIVE CONTEXT

Local Government, State and Commonwealth legislation and planning controls relevant to the protection of biodiversity and this Proposal are outlined briefly in this section. These statutory instruments provide conditions, matters for consideration and requirements to seek authorisation (licenses and approvals) to undertake various actions and activities.

2.1 STATE LEGISLATION

2.1.1 BIODIVERSITY CONSERVATION ACT 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act) came into effect on the 25 August 2017. This Act repealed the *Threatened Species and Conservation Act 1995* (TSC Act), *Native Vegetation Act 2003* and parts of the *National Parks and Wildlife Act 1974*. All threatened entities previously listed under the TSC Act have now been listed under the schedules of the BC Act.

The BC Act outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. The Biodiversity Offsets Scheme creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity (Office of Environment and Heritage 2017).

The Biodiversity Offsets Scheme is not mandatory for activities approved under Part 5 of the EP&A Act although the determining authority must be satisfied that the proposed activity is unlikely to significantly affect threatened species in accordance with Section 7.3 of the BC Act.

If the proposed activity is determined likely to significantly affect threatened species, a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) must accompany the environmental assessment (REF) under Part 5 Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

2.1.2 BIOSECURITY ACT 2015

The Biosecurity Act 2015 provides for risk-based management of biosecurity in NSW. It provides a statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds.

The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

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

No Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region were identified in the Proposal work areas.

2.2 COMMONWEALTH LEGISLATION

2.2.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Under the Commonwealth EPBC Act, any action that has, would have, or is likely to have a significant impact on a MNES or on Commonwealth land, triggers the Act and may require assessment and approval from the Commonwealth Minister for the Environment.

The nine matters of national environmental significance protected under the EPBC Act are:

- listed threatened species and ecological communities
- listed migratory species
- wetlands of international importance (listed under the Ramsar Convention)
- commonwealth marine areas
- world heritage properties
- national heritage places
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

Within the Proposal site, no Commonwealth listed threatened flora, fauna or ecological communities were recorded or considered likely to utilise habitats. It should be noted that The Greater Blue Mountains Area, listed as National and World heritage property under the EPBC Act is located within proximity to the Proposal. The Proposal will not impact these areas. All threatened biodiversity is discussed further in Section 5.

3 METHODS

3.1 DEFINITIONS

For this report the following definitions apply:

- Study area: defined as the area in which the Proposal is to occur.
- Proposal locality: is a 10-kilometre radius from the study area.
- Bioregion: for this study, the bioregion is the Sydney Basin as defined in the Interim Biogeographic Regionalisation for Australia (Thackway and Cresswell 1995).

All other definitions are provided in the glossary at the start of this document. The Proposal locality and study area are shown in Figure 1.1.

3.2 PERSONNEL

The contributors to the preparation of this report, their qualifications and roles are listed in Table 3.1.

Table 3.1 Contributors and their roles

NAME	QUALIFICATION	ROLE
Mark Stables	Bachelor of Science (Hons) BAM accredited assessor	Principal Ecologist – survey and report preparation.
Julia Emerson	Bachelor of Environment Cert 3 Conservation Land Management BAM accredited assessor	Ecologist – report preparation.
Alex Cockerill	Bachelor of Science (Hons) BAM accredited assessor	Ecology National Team Executive – Technical review
Jarryd Barton	Bachelor of Planning (Hons) Certified Environmental Practitioner (CEnvP)	Quality control and review

All work was carried out under the appropriate licences, including a scientific licence as required under Part 2 of the NSW BC Act (License Number: SL100630), and an Animal Research Authority issued by the Department of Primary Industries (Agriculture).

3.3 NOMENCLATURE

Names of vegetation communities used in this report are based on the Plant Community Types (PCTs) used in the BioNet Vegetation Classification (Office of Environment, Energy & Science 2019c).

These names are cross-referenced with those used for threatened ecological communities listed under the BC Act and/or the EPBC Act. They are also cross-referenced with existing vegetation mapping using dominant species and structure of the communities in Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands (Tozer *et al.* 2010).

Names of plants used in this document follow PlantNet Royal Botanic Gardens (Royal Botanic Gardens 2019) for recent taxonomic changes. Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided in plant lists in appendices. The names of introduced species are denoted with an asterisk (*).

For threatened species of plants, the names used in the OEES Threatened Species Website (Office of Environment, Energy & Science 2019d) are also provided in the tabulated data in appendices where these differ from the names used by PlantNet database.

Names of vertebrate fauna follow the Australian Faunal Directory maintained by the Department of the Environment (Department of Environment and Energy 2019). Common names are used in the report for species of animal. Scientific names are included in species lists found in appendices.

3.4 DESKTOP ASSESSMENT

A desktop study was conducted to identify:

- the likely distribution of vegetation communities, based on previous mapping and aerial photograph interpretation, for targeted field verification
- a list of threatened species and populations of plants to consider during vegetation surveys and habitat assessment
- a list of threatened species and populations of animals and migratory animals to consider during field-based habitat assessment
- local landscape-scale features of potential significance to biodiversity; e.g. riparian zones and potential wildlife movement corridors
- evaluate baseline information and determine whether additional surveys, mapping and reporting is required to progress to a rezoning application.

The desktop study included analysis of the following information sources:

- topographic map and aerial photographs
- priority weeds in the Greater Sydney region (Department of Primary Industries 2019b)
- previous vegetation mapping, ecological studies and other relevant studies of the study area: Faulconbridge Station
- Preliminary Environmental Assessment: Faulconbridge Station (WSP, 2018)
- *Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands* (Tozer *et al.* 2010).

In addition to the literature listed above database searches of threatened species, populations and communities were conducted in the locality and are summarised below in Table 3.2.

Table 3.2 Database searches

DATABASE	SEARCH DATE	AREA SEARCHES	REFERENCE
PlantNet Database	21/08/19	10 km radius centred on the study area	(Royal Botanic Gardens 2019)
OEES BioNet Atlas of NSW Wildlife	21/08/19	10 km x 10 km centred on the study area	(Office of Environment, Energy & Science 2019a)
EPBC Protected Matters Search Tool	19/08/19	10 km x 10 km centred on the study area	(Department of the Environment and Energy 2019)
NSW Department of Primary Industries (Fishing and Aquaculture) threatened Aquatic Fauna Database	21/08/19	Relevant catchment (Sydney Metro)	(Department of Primary Industries 2019a)

3.4.1 DESKTOP ANALYSIS OF VEGETATION

Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation. Analysis of the aerial photographs was used to identify areas of disturbance (e.g. buildings, vehicle tracks, dams and power lines), vegetation structure and likely native versus exotic species composition throughout the study area. This provided an initial definition of vegetation communities into simple structural and disturbance classifications for verification during field surveys.

3.5 FIELD SURVEY

A field survey was undertaken on the 26 August 2019 by Principal ecologist, Mark Stables. This survey sought primarily to assess the extent and condition of vegetation and fauna habitat, especially for threatened species and ecological communities. The vegetation inspection was used to identify variations in vegetation condition that were not apparent in existing vegetation mapping and refine vegetation community boundaries.

The field surveys undertaken are described in sections 3.5.1 to section 3.7.

3.5.1 FLORA SURVEY

The floristic diversity and possible presence of threatened species was assessed undertaking a random meander survey (Cropper 1993).

3.5.1.1 FIELD VERIFICATION OF EXISTING VEGETATION

Vegetation within the study area and locality has been mapped at the regional scale in '*Native vegetation of the Southeast NSW: Revised Classification and Map for the Coast and Eastern Tablelands'* (Tozer *et al.* 2010).

Data on geology, dominant canopy species, native diversity, vegetation structure and condition was collected across the study area to validate and refine this existing vegetation classification to determine their associated PCT in accordance with the BioNet Vegetation Information System(Office of Environment, Energy & Science 2019c).

3.5.1.2 MAPPING OF VEGETATION ZONES

Field validation (ground-truthing) of the existing vegetation classifications undertaken by regional vegetation mapping and previous ecological surveys of the study area was completed to confirm the vegetation structure, dominant canopy species, native diversity, condition and presence of threatened ecological communities. This was based on floristic sampling and vegetation integrity plots as described below.

Vegetation zones and conditions were identified and mapped following the Biodiversity Assessment Method (BAM) (Office of Environment & Heritage 2017). This was based on field verification of the PCT, class and formation as outlined in BioNet Vegetation Classification (Office of Environment, Energy & Science 2019b).

3.5.1.3 RANDOM MEANDER SURVEYS

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by Cropper (1993), whereby the recorder walks in a random meander throughout the study area recording dominant and key plant species (e.g. threatened species, priority weeds), boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness.

3.5.2 FAUNA SURVEY

3.5.2.1 FAUNA HABITAT ASSESSMENT

Fauna habitat assessments were undertaken to assess the likelihood of threatened species of animal (those species known or predicted to occur within the locality from the literature and database review) occurring within the study area. Fauna habitat assessments were the primary assessment tool in assessing whether a threatened species is likely to occur within the study area.

Fauna habitat characteristics assessed included:

- structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources
- presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, birds and reptiles
- presence of the ground cover vegetation, leaf litter, rock outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles and amphibians
- presence of waterways (ephemeral or permanent) and water bodies.

The following criteria were used to evaluate the condition of habitat values:

- **Good**: A full range of fauna habitat components are usually present (for example, old growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact.
- **Moderate**: Some fauna habitat components are missing or greatly reduced (for example, old-growth trees and fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
- **Poor**: Many fauna habitat elements in low quality remnants have been lost, including old growth trees (for example, due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive clearing in the past.

3.5.2.2 OPPORTUNISTIC RECORDING

Opportunistic sightings of animals were recorded including diurnal birds and reptiles. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows etc., was also noted. This provided indirect information on animal presence and activity.

During these surveys, a hand-held GPS was used to record the locations of:

- hollow-bearing trees
- aquatic habitat
- rock outcrops.

3.6 LIKELIHOOD OF OCCURRENCE ASSESSMENT

The likelihood of threatened and migratory and threatened species populations occurring within the subject site was assessed against the criteria outlined in Table 3.3.

Species subject to likelihood of occurrence assessments were those identified during the desktop and field-based investigations and any additional species considered having the potential to occur in the professional opinion of contributors to this assessment.

Table 3.3 Likelihood of occurrence

LIKELIHOOD OF OCCURRENCE	CRITERIA
Known	The species was observed in the subject site either during the current survey or during another recent survey.
High	A species has a high likelihood of occurrence if: — the subject site contains or forms part of a large area of high quality suitable habitat — important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the subject site — the species has been recorded recently in similar habitat in the locality — the subject site is likely to support a resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration.
Moderate	A species has a moderate likelihood of occurrence if: — the subject site contains or forms part of a small area of high quality suitable habitat — the subject site contains or forms part of a large area of marginal habitat — important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are sparse or absent within the subject site — the subject site is unlikely to support a resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration but is likely to be used occasionally during seasonal movements and/or dispersal.
Low	A species has a low likelihood of occurrence if: — potentially suitable habitat exists but the species has not been recorded recently (previous 10 years) in the locality despite intensive survey (i.e. the species is considered to be locally extinct) — the species is considered to be a rare vagrant, likely only to visit the subject site very rarely; e.g. during juvenile dispersal or exceptional climatic conditions (e.g. extreme drought conditions in typical habitat of inland birds).
None	Potentially suitable habitat is absent from the subject site.

3.7 LIMITATIONS

Even where field surveys are undertaken, no sampling technique can totally eliminate the possibility that a species is present on a site. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present on site during surveys. Where surveys were conducted outside the optimal time for detecting a particular species, or field surveys were of limited scope, a precautionary approach was taken and it was assumed that the species was present if suitable habitat was observed. Similarly, for areas of vegetation that were not accessible for field verification, vegetation was presumed to be of the community shown in what was considered to be the most accurate available pre-existing vegetation mapping.

The conclusions in this report are based upon the limited data acquired from the site during environmental field surveys and desktop assessment and are, therefore, merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of species and the distribution of vegetation types. Also, it should be recognised that site conditions, including the presence of threatened species, can change with time.

4 EXISTING ENVIRONMENT

4.1 VEGETATION COMMUNITIES

Two vegetation communities were recorded within or adjacent to the study area during field survey and comprise of one native vegetation type and one non-native vegetation type. A description of each vegetation community is provided below.

4.1.1 HIGHLY DISTURBED AREAS WITH NO OR LIMITED NATIVE VEGETATION

This non-native vegetation community occurs over most the Proposal area with all associated works being located wholly within this vegetation type. The vegetation comprises of ornamental landscape plantings, exotic lawn, opportunistic regrowth and environmental weeds.

On the western of the station the proposed upgrade of the existing pedestrian footbridge over the Great Western Highway several small immature native trees that are considered opportunistic regrowth occur (Photo 4.1). These trees include: *Acacia parramattensis* (Parramatta wattle), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum) and *Syncarpia glomulifera* (Turpentine) along with a specimen of *Acacia longifolia* subsp. *longifolia* (Sydney golden wattle) (Photo 4.3). Other planted ornamental trees include *Quercus robur* 'Fastigiata' (Columnar English Oak), *Quercus palustris* (Pin Oak) and *Acer palmatum* (Japanese Maple) (Photo 4.4).

On the eastern side of the station all works would be restricted to this highly disturbed area with the proposed eastern compound area wholly utilising existing cleared areas (Photo 4.2).

Photo 4.1 Proposed western compound area that will utilise existing exotic lawn area

Photo 4.2 Proposed new accessible ramp connecting the commuter car park and the pedestrian footbridge

Photo 4.3 Scattered opportunistic regrowth native trees on the western side of the station near the proposed upgrade of the existing pedestrian footbridge

Photo 4.4 Scattered ornamental plantings near the commuter car park on the western side of the station

4.1.1 PCT 1081 RED BLOODWOOD – GREY GUM WOODLAND ON THE EDGES OF THE CUMBERLAND PLAIN, SYDNEY BASIN BIOREGION

This native vegetation community was recorded to occur adjacent to the Proposal area on both the east and west sides of the station. The vegetation exhibits an open forest structure dominated by *Acacia parramattensis* (Parramatta wattle), *Allocasuarina littoralis* (Black She-oak), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus oblonga* (Sandstone Stringybark), *Eucalyptus punctata* (Grey Gum), *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum) and *Syncarpia glomulifera* (Turpentine). A shrub layer dominated by *Acacia longifolia* subsp. *longifolia* (Sydney golden wattle), *Kunzea ambigua* (Tick Bush) and *Pittosporum undulatum* (Sweet Pittosporum) also occurs.

Based on floristic, geographic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 1081 within BioNet Vegetation Classification (Office of Environment, Energy & Science 2019b).

PCT 1081 does not form part of any listed threatened ecological community under either the BC Act or EPBC Act.

On the western side of the station this vegetation type occurs to the north of the proposed construction compound (Photo 4.5) whilst on the eastern side of the station it occurs to the south and east of the proposed compound and is bordered by Sir Henrys Parade (Photo 4.6).

Photo 4.5 A patch of PCT 1081 on the western side of the station

Photo 4.6 PCT 1081 on the eastern side of the station showing *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum) in the foreground and flowering specimens of *Acacia parramattensis* (Parramatta wattle)

4.2 FAUNA HABITATS

The fauna habitat within the study area is limited, with majority of vegetation in the form of planted ornamental native and exotic/native trees and shrubs.

Much of the original vegetation within the study area has been cleared for rail infrastructure and urban development and what remains is landscape gardens, plantings and minor native regrowth. The habitat and vegetation within the study area provides limited resources and lacks important features such as hollow bearing trees, rocky outcrops, dense litter layer or fallen woody debris.

The study area does not provide any significant habitat for fauna and species likely to utilise resources are those that are well adapted to urban environments or those species that are highly mobile (i.e. birds and bats). The surrounding trees (both native and introduced) provide some foraging habitat (i.e. fruits and blossom) for mobile species (i.e. birds and bats). It is unlikely that these resources are heavily utilise or relied upon by majority of fauna but instead are intermittently used whilst foraging within the greater locality.

4.2.1 CONNECTIVITY

Within the Proposal area there is limited connectivity due to the Blue Mountains Railway Line which bisects the existing habitat. On either side of the railway line there is good connectivity to Blue Mountains National Park. Given the Proposal involves upgrades to either side of the Blue Mountains Railway Line, habitat connectivity is unlikely to be impacted by the Proposal.

4.3 WEEDS

No Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region were identified in the Proposal work areas (Department of Primary Industries 2019b).

5 THREATENED BIODIVERSITY

5.1 THREATENED ECOLOGICAL COMMUNITIES

No threatened ecological communities were identified within the study area. All vegetation observed within the study area comprised of ornamental planted exotic and native garden specimens that do not form part of any recognised native NSW Plant Community Type.

5.2 THREATENED FLORA

No threatened flora were identified during site inspections. Background investigations identified 28 threatened flora species listed under the BC Act and/or EPBC Act that were considered to have the potential to occur within the locality of the study area (Appendix A). Following field surveys, it is considered that the study area is unlikely to provide habitat to threatened flora species.

No specific assessment of significance for any threatened flora species listed under either the BC Act or EPBC Act are considered warranted to assess the impacts of the Proposal.

5.3 THREATENED FAUNA

No threatened fauna species were identified during site inspections. Background investigations identified 35 threatened fauna species listed under the BC Act and/or EPBC Act that have been previously recorded or have the potential to occur within the locality (Appendix B). The likelihood of these species occurring within the study area was determined based on field investigations and fauna habitat available.

Table 5.1 outlines each species considered likely to occur within the study area and the impact of the Proposal.

Based on available habitat and the potential impacts of the Proposal, it is considered unlikely that any threatened fauna have a moderate to high likelihood of occurrence or rely on the available habitat within the study area.

Table 5.1 Threatened fauna species considered likely to occur within the study area

COMMON NAME	SCIENTIFIC NAME	BC ACT	EPBC ACT	BIONET RECORDS	LIKELIHOOD OF OCCURRENCE	IMPACT TO SPECIES AND/OR ITS HABITAT
Sooty Owl	*Tyto tenebricosa*	V	-	3	Moderate. Though the study area is not considered likely to utilised by the Sooty Owl for breeding or roosting, this species is known to utilise the study area for foraging.	No. The habitat within the study area is foraging habitat only and represents a small proportion of available habitat within locality. Habitat within the locality are of higher quality habitat. It is considered unlikely that this species relies on habitat within the Proposal area.
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	31	Moderate. This species has been frequently recorded within close proximity to the study area. Though no known breeding camps are located nearby, the Grey-headed Flying-fox may utilise the study area for foraging.	
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	37	Moderate. Historically recorded within the study area. This species is considered unlikely to utilise the study area for breeding however may utilise the habitat within the study area intermittently for foraging.	

5.4 MIGRATORY SPECIES

Migratory species are protected under international agreements, to which Australia is a signatory, including JAMBA, CAMBA, RoKAMBA and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered MNES and are protected under the EPBC Act.

A total of five species listed as migratory under the EPBC Act were identified during background investigations that have been previously recorded or have the potential to occur within the locality (Appendix B). Of these, no species are considered likely to utilise the habitat present within the study area.

The habitats within the study area are unlikely to constitute important habitat for any of the listed species. The habitat present is unlikely to support significant proportions of the population of any migratory species, nor are the habitats critical to any life stage of these species. Due to their mobile nature, the mentioned species are likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur.

6 POTENTIAL IMPACTS

Potential impacts to biodiversity resulting from the construction and operation phases of the Proposal have been considered below.

6.1 IMPACTS DURING CONSTRUCTION

6.1.1 DIRECT IMPACTS

Direct impacts to biodiversity because of the Proposal are considered negligible due to the existing disturbed nature of the available habitat and the nature of the construction works to be undertaken. Vegetation clearing would be minimal and limited to 11 trees including six exotic ornamental trees and five native trees. Exotic ornamental tree species included *Acer palmatum* (Japanese Maple) and *Quercus palustris* (Pin Oak). Native trees recorded included *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum). The species recorded as of a young age cohort and do not bear hollows.

No impacts to patches of remnant native vegetation or high quality fauna habitat are predicted because of the Proposal. Direct mortality or trauma to fauna is also expected to be minimal as habitat to be removed is of low quality (i.e. planted native trees and landscape gardens).

6.1.2 IMPACTS TO THREATENED FAUNA

No threatened fauna is likely to be significantly impacted by the Proposal. It is unlikely that any threatened fauna identified within the locality would have a moderate to higher likelihood to utilise the habitat within the study area or are likely to be reliant on the habitat to be removed or impacted. The mitigation measures outlined below in Section 7 would ensure that any possible indirect impacts would be minimised.

6.1.3 REMOVAL OF VEGETATION

The removal of vegetation will be limited to 11 trees. Species to be impacted include; *Acer palmatum* (Japanese Maple), *Quercus palustris* (Pin Oak) and *Corymbia gummifera* (Red Bloodwood) *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum). A total of four *Eucalyptus sclerophylla* (Hard-leaved Scribbly Gum) will be retained and excluded from impact.

These trees are considered of very low ecological value and do not form part of any threatened ecological community or important habitat for threatened species. On the eastern side of the station all works will be located within existing disturbed areas and will not result in vegetation removal. Impacts on the eastern side will be limited to tree pruning at most and unlikely to pose any long-term impact on existing biodiversity values.

The vegetation identified within the study area does not contain important habitat features (i.e. hollows for breeding) for any potential threatened species known or predicted to occur within the locality. Given this, the Proposal is considered unlikely to significantly affect threatened species or ecological communities, or their habitats.

6.1.4 POTENTIAL ENVIRONMENTAL IMPACT OF NOISE, LIGHT AND VIBRATIONS ON WILDLIFE

Many animals detect and depend on sound to communicate, navigate, evade danger and find food, but human-made noise can alter the behaviour of animals or interfere with their normal functioning. In some cases it can harm their health, reproduction, survivorship, habitat use, distribution, abundance, or genetic composition (Forman *et al.* 2000). However, variation in ambient noise, such as from wind or other animals, is part of the natural environment and many animals display behavioural adaptations to this variation. For example, certain species of frogs avoid vocalising during loud calling by cicadas or other frogs and some species will time their calls during brief periods of silence (Schwartz & Henderson 1991).

It is likely that noise from the existing rail corridor and arterial roads would already impact background levels of noise in the study area. However, construction and operation phases of the Proposal (along with its ancillary activities) may cause disturbance to animals. The impacts from noise emissions are likely to be localised close to the project and are not likely to have a significant long-term impact on wildlife populations, given that populations are already exposed to noise associated with the existing rail corridor. Furthermore, it is likely that most animal species would habituate to periodic noise disturbance from regular maintenance activities (Forman *et al.* 2000).

Artificial light that alters the natural patterns of light and dark in ecosystems is referred to as 'ecological light pollution' (Longcore and Rich 2004). Types of ecological light pollution include chronic or periodically increased illumination, unexpected changes in illumination, and direct glare (Longcore and Rich 2004).

Impact of ecological light pollution on animals include increased orientation or disorientation from additional illumination and attraction or repulsion responses which may affect foraging, reproduction, communication, and other critical behaviours (Longcore and Rich 2004). One of the most notable implications of light pollution is alteration of interspecific interactions (e.g. predator-prey and competitive interactions) (Longcore and Rich 2004).

Some species of insectivorous bats (chiefly fast-flying species e.g. *Tadarida spp*.) forage on insects attracted to lights while other slow-flying bat (e.g. some Myotis and Rhinolophus species) are thought to avoid lighted areas. Artificially illuminated habitat may be avoided by nocturnal animals if lighting is perceived to increase the risk of predation (Longcore and Rich 2004).

Under present conditions there is moderate light pollution within the study area associated with the Faulconbridge train station and carpark. The increase of lighting during the construction and operation of the proposal is likely to be inconsequential and significant ecological light pollution impact to wildlife is unlikely.

6.1.5 WEEDS

The Proposal is unlikely to impact any Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region such that they would pose a risk to any areas of native vegetation.

6.2 IMPACTS DURING OPERATION

The operation of the Proposal is not anticipated to result in any further impacts to biodiversity.

7 AVOID, MINIMISE AND MITIGATE

Construction of the Proposal must be undertaken in accordance with TfNSW's *Vegetation Management (Protection and Removal) Guideline*, TfNSW's *Fauna Management Guideline* and TfNSW's Biodiversity Offsets Calculator. Specifically, the following measures would be undertaken:

- All workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity.
- Disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. Trimming of vegetation required to move equipment should be kept to a minimum.
- Trees/vegetation nominated to be removed in the Proposal plans would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed below.
- Where the loss of trees is unable to be mitigated, Transport for NSW would replace trees removed because of the project in accordance with the TfNSW's *Vegetation Offset Guide* (TfNSW, 2019c). In accordance with Section 5 of the guideline it is expected that 40 trees would be required to meet this offset requirement.
- Construction of the Proposal must be undertaken in accordance with TfNSW's Vegetation Management (Protection and Removal) Guideline SD-111 (TfNSW, 2019b) and TfNSW's Fauna Management Guideline SD-113 (TfNSW, 2019a).
- Tree Protection Zones (TPZs) would be established around trees to be retained, as nominated in the Arboricultural Impact Assessment Report (Earthscape Horticultural Services, August 2019). Tree protection would be undertaken in line with *AS 4970-2009 Protection of Trees on Development Sites* and would include exclusion fencing of TPZs.
- In the event of any tree to be retained becoming damaged during construction, the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager to coordinate the response which may include contacting an arborist to inspect and provide advice on remedial action, where possible.
- Should the detailed design or onsite works determine the need to remove or trim any additional trees, which have not been identified in the REF, the Contractor would be required to complete TfNSW's Tree Removal Application Form and submit it to TfNSW for approval.
- For new landscaping works, mulching and watering would be undertaken until plants are established.

Weed control measures, consistent with TfNSW's *Weed Management and Disposal Guideline,* would be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during the construction phase of the Proposal. This would include the management and disposal of weeds in accordance with the *Biosecurity Act 2015*.

8 OFFSETTING

In accordance with the Transport for NSW Vegetation Offset Guide (2019c) individual trees should be offset in areas where individual's trees will be impacted. Table 8.1 outlines the offsetting calculations for individual trees which is based on the Diameter at Breast Height (DBH) of each affected tree.

Table 8.1 Offsetting for individual trees

TREE TYPE	OFFSET
Large tree (DBH greater than 60 cm)	Plant minimum 8 trees
Medium tree (DBH greater than 15 cm, but less than 60 cm)	Plan minimum 4 trees
Small young tree (DBH less than 15 cm)	Plan minimum 2 trees

Source: (Transport for NSW, 2019c)

The offsets required for the Proposal are outlined in Table 8.2 below. Tree identification numbers and trunk diameters were obtained from Appendix 3 of the Arboricultural Impact Assessment Report (Earthscale Horticultural Services, 2019).

Table 8.2 Offsets required for the Proposal

TREE IDENTIFICATION NO.	TRUNK DIAMETER (MM)	OFFSET	TOTAL
T13	170	Plant minimum 4 trees	4
T14	100	Plant minimum 2 trees	2
T15	191	Plant minimum 4 trees	4
T16	182	Plant minimum 4 trees	4
T17	191	Plant minimum 4 trees	4
T18	207	Plant minimum 4 trees	4
T19	137	Plant minimum 2 trees	2
T20	153	Plant minimum 4 trees	4
T21	207	Plant minimum 4 trees	4
T22	166	Plant minimum 4 trees	4
T25	150	Plant minimum 4 trees	4
Total			**40**

9 CONCLUSION

This Biodiversity Assessment Report has been prepared to inform a Review Environmental Factors (REF) for the Faulconbridge Station Upgrade. The findings from desktop assessment and field investigations have identified minimal impacts to native vegetation and fauna habitat. Due to the activity occurring within an urban precinct the biodiversity value of the existing environment is low.

All vegetation observed within the Proposal impact area is comprised of ornamental planted exotic and native individual tree specimens that do not form part of any recognised native NSW Plant Community Type. The native vegetation community PCT 1081 was recorded to occur adjacent to the Proposal works on both the east and west sides of the station. This vegetation does not form part of any listed threatened ecological community and provides limited habitat for locally occurring flora and fauna. The proposed works will not impact on these areas of native vegetation.

The Proposal will result in the loss of eleven exotic ornamental and native trees on the western side of the station and minor tree pruning on the eastern side of the station. The impact of this vegetation loss is unlikely to constitute an impact to important biodiversity value.

Threatened fauna species identified within the locality would likely intermittently utilise the planted vegetation as foraging habitat, however, the habitat is considered low in quality and unlikely to play an important role in the lifecycle of these species.

The Proposal does not involve any impact to native plant community types, threatened terrestrial or aquatic species, endangered ecological communities or their habitat. The proposed activity is deemed unlikely to significantly affect threatened species in accordance with Section 7.3 of the BC Act. Given this, a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) is not required to accompany the REF.
The proposed activity is also unlikely to significant affect Matters of National Environmental Significance and as such a referral of this activity is not deemed required under the EPBC Act.

The impacts to native biodiversity are predicted to be negligible and any residual or indirect impacts will be mitigated by undertaking works in accordance with TfNSW's *Vegetation Management (Protection and Removal) Guideline*, TfNSW's *Vegetation Offset Guide* and TfNSW's *Fauna Management Guideline.*

The mitigation measures outlined in Section 7 would ensure any potential impact to native biodiversity would have no significant impact to biodiversity.

10 LIMITATIONS

10.1 SCOPE OF SERVICES

This report has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

10.2 RELIANCE ON DATA

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

10.3 ENVIRONMENTAL CONCLUSIONS

In accordance with the scope of services, WSP has relied upon the data provided for the preparation of the report. Within the limitations imposed by the scope of services, the surveys and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

10.4 REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the client (and no other party). WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Except as provided below parties other than the client should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

REFERENCES

- Cropper, S. C. (1993). Management of Endangered Plants. Melbourne, CSIRO Australia.
- Department of Environment and Climate Change (2007a). Introducing the NSW threatened species priorities action statement (PAS). Sydney South NSW, Department of Environment and Climate Change.
- Department of Environment and Climate Change (2007b). Threatened species assessment guidelines. The assessment of significance. Hurstville, Department of Environment and Climate Change.
- Department of Environment and Conservation (2004). Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft). Hurstville, Department of Environment and Conservation.
- Department of Primary Industries (2019a). "Listed threatened species, populations, ecological communities and key threatening processes." from https://www.dpi.nsw.gov.au/fishing/species-protection/what-current.
- Department of Primary Industries (2019b) "WeedWise – Priority Weeds in the Great Sydney region" from: https://weeds.dpi.nsw.gov.au/
- Department of the Environment and Energy (2019). "EPBC Protected Matters Search Tool." 2019, from http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf.
- Earthscape Horticultural Services (2019). "Arboricultural Impact Assessment Report" – Transport Access Program 3 Faulconbridge Station – Great Western Highway, Faulconbridge, NSW Version 1 – 29th August 2019
- Forman, R. T. T., et al. (2000). Road Ecology. Science and Solutions. Washington, Island Press.
- Larkin, R. P. (2005). "Effect of Military Noise on Wildlife." Retrieved 11/12/2009, 2009, from http://www.aerohabitat.org/link/2005/09-06-2005%20%20Larkin,%20Effect%20military%20noise%20and%20wildlife%20(0.4MB).pdf.
- Longcore, T. and C. Rich (2004). "Ecological Light Pollution." Frontiers in Ecology and the Environment 2(4): 191-198.
- Matteson, K. C. and G. A. Langellotto (2010). "Determinates of inner city butterfly and bee species richness." Urban Ecosyst: 1-15.
- Office for Environment & Heritage (2018). "BioNet Vegetation Classification Database ". Retrieved February, 2018, from http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx.
- Office of Environment & Heritage (2017). "Biodiversity Assessment Method."
- Office of Environment, Energy & Science (2019a). "BioNet Atlas of NSW Wildlife", from https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx.
- Office of Environment, Energy & Science (2019b). "BioNet Vegetation Classification 2.1.", from http://www.environment.nsw.gov.au/research/Visclassification.htm.
- Office of Environment, Energy & Science (2019c). "Vegetation Information System (VIS) Classification 2.1.", from http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx.
- Office of Environment, Energy & Science (2019d) "Threatened Species Profile Search", from: https://www.environment.nsw.gov.au/threatenedSpeciesApp/.
- Royal Botanic Gardens (2019). "Plantnet - The Plant Information Network System of Botanic Gardens Trust Version 2.0." 2018, from http://plantnet.rbgsyd.nsw.gov.au/.
- Schwartz, A. and R. W. Henderson (1991). Amphibians and Reptiles of the West Indies: descriptions, distributions, and natural history. Gainesville, University of Florida Press.

- Stralberg, D., et al. (2009). "Re-Shuffling of Species with Climate Disruption: A No-Analog Future for California Birds?" PLoS ONE 4(9): e6825.
- Thackway, R. and I. D. Cresswell (1995). An Interim Biogeographic Regionalisation of Australia. Canberra, Australian Nature Conservation Agency.
- Tozer, M., et al. (2010). "Native Vegetation of southeast NSW: a revised classification and map for the coast and tablelands." Cunninghami 11(3).
- Transport for NSW (2019a) Fauna Management Guideline Version 5.2, Transport for NSW.
- Transport for NSW (2019b) Vegetation Management (Protection and Removal) Guideline Version 5 from: https://www.transport.nsw.gov.au/sites/default/files/media/documents/2017/Vegetation%20Management%20%28Protection%20and%20Removal%29%20Guideline%20-%209TP-SD-111.pdf.
- Transport for NSW (2019c) Vegetation Offset Guide Version 2.1, Transport for NSW.

APPENDIX A

THREATENED FLORA LIKELIHOOD OF OCCURRENCE ASSESSMENT

A1 THREATENED FLORA LIKELIHOOD OF OCCURRENCE ASSESSMENT

SPECIES NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	DATA SOURCE	LIKELIHOOD OF OCCURRENCE[4]
Acacia bynoeana	Bynoes Wattle	E	V	Occurs south of Dora Creek-Morisset area to Berrima and the Illawarra region and west to the Blue Mountains. It grows mainly in heath and dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes disturbed sites such as trail margins and recently burnt areas. Typically occurs in association with *Corymbia gummifera, Eucalyptus haemastoma, E. gummifera, E. parramattensis, E. sclerophylla, Banksia serrata and Angophora bakeri*.	Bionet, PMST	Low – no suitable habitat occurs within study area
Acacia gordonii	Downy Wattle	E	E	Grows in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops. Restricted to the north-west of Sydney, it has a disjunct distribution occurring in the lower Blue Mountains in the west, and in the Maroota/Glenorie area in the east.	Bionet, PMST	Low – no suitable habitat occurs within study area
Acacia pubescens	Downy Wattle	V	V	Restricted to the Sydney Region from Bilpin to the Georges River and at Woodford where it usually grows in open sclerophyll forest and woodland on clay soils. Typically, it occurs at the intergrade between shales and sandstones in gravely soils often with ironstones.	Bionet, PMST	Low – no suitable habitat occurs within study area
Acrophyllum australe	-	V	V	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows on lateritic soil in open forest.	PMST	Low – no suitable habitat occurs within study area

SPECIES NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	DATA SOURCE	LIKELIHOOD OF OCCURRENCE[4]
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	Occurs south from the Gibraltar Range, chiefly in coastal districts but also extends on to tablelands. Grows in swamp-heath and drier forest on sandy soils on granite & sandstone. Occurs in small, localised colonies most often on the flat plains close to the coast but also known from some mountainous areas growing in moist depressions and swampy habitats.	PMST	Low – no suitable habitat occurs within study area
Cynanchum elegans	White-flowered Wax Plant	E	E	Occurs from the Gloucester district to the Wollongong area and inland to Mt Dangar where it grows in rainforest gullies, scrub and scree slopes. This species typically occurs at the ecotone between dry subtropical forest/woodland communities.	PMST	Low – no suitable habitat occurs within study area
Dillwynia tenuifolia	-	V	V	Occurs on the Cumberland Plain from the Blue Mountains to Howes Valley area where it grows in dry sclerophyll woodland on sandstone, shale or laterite. Specifically, occurs within Castlereagh woodlands, particularly in shale gravel transition forest. Associated species include *Eucalyptus fibrosa, E. sclerophylla, Melaleuca decora, Daviesia ulicifolia, Dillwynia juniperina and Allocasuarina littoralis*.	PlantNET	Low – no suitable habitat occurs within study area
Epacris purpurascens var. purpurascens	-	V	-	Occurs in the area between Colo Heights and Castle Hill in north-western Sydney, with historical records from central Sydney. It grows as an emergent tree in scrub, heath and low woodland on sandy soils, generally on flat ridge tops. It usually occurs as isolated individuals or occasionally in small clustered groups. Associated soils are laterised clays overlying sandstone.	Bionet, PlantNET	Low – no suitable habitat occurs within study area
Epacris sparsa	-	V	V	Grows in Riparian Sandstone Scrub, where it is found on the base of cliffs or rock faces, on rock ledges or among rocks in the riparian flood zone. Grows in small pockets of damp clay soil, chiefly on south-west facing slopes. Restricted to the lower Grose River, within the Hawkesbury and Blue Mountains LGAs.	PMST	Low – no suitable habitat occurs within study area

SPECIES NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	DATA SOURCE	LIKELIHOOD OF OCCURRENCE[4]
Eucalyptus aggregata	Black Gum	V	V	Grows on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers. Black Gum is found in the NSW Central and Southern Tablelands, with small isolated populations in Victoria and the ACT. In NSW it occurs in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. Black Gum has a moderately narrow distribution, occurring mainly in the wetter, cooler and higher parts of the tablelands, for example in the Blayney, Crookwell, Goulburn, Braidwood and Bungendore districts.	PMST	Low – no suitable habitat occurs within study area
Genoplesium baueri	Yellow Gant-orchid	V	E	Grows in dry sclerophyll forest and moss gardens over sandstone. The species has been recorded from locations between Ulladulla and Port Stephens. About half the records were made before 1960 with most of the older records being from northern Sydney suburbs. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments.	PMST	Low – no suitable habitat occurs within study area
Haloragis exalata subsp. exalata	Wingless Raspwort	V	V	Found in the south coast, central coast and north west slopes botanical regions where it appears to require protected and shaded damp situations in riparian habitats.	PMST	Low – no suitable habitat occurs within study area
Haloragodendron lucasii	Hal	E	E	Associated with dry sclerophyll forest and reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. The known locations of this species are confined to a very narrow distribution on the north shore of Sydney.	PMST	Low – no suitable habitat occurs within study area
Leucopogon exolasius	Woronora Beard-heath	V	V	The plant occurs in woodland on sandstone with flowering occurs in August and September. Woronora Beard-heath is found along the upper Georges River area and in Heathcote National Park.	Bionet, PlantNET, PMST	Low – no suitable habitat occurs within study area

SPECIES NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	DATA SOURCE	LIKELIHOOD OF OCCURRENCE[4]
Leucopogon fletcheri subsp. fletcheri	-	E	-	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Flowers August to September. Fruit produced October. 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.	Bionet	Low – no suitable habitat occurs within study area
Melaleuca deanei	Deane's Melaleuca	V	V	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone. Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate.	BioNet, PMST	Low – no suitable habitat occurs within study area
Persicaria elatior	Tall Knotweed	V	V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes). In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland.	PMST	Low – no suitable habitat occurs within study area
Persoonia acerosa	Needle Geebung	V	V	The Needle Geebung occurs in dry sclerophyll forest, scrubby low-woodland and heath on low fertility soils. The Needle Geebung has been recorded only on the central coast and in the Blue Mountains, from Mt Tomah in the north to as far south as Hill Top where it is now believed to be extinct. Mainly in the Katoomba/ Wentworth Falls/ Springwood area.	PMST	Low – no suitable habitat occurs within study area

SPECIES NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	DATA SOURCE	LIKELIHOOD OF OCCURRENCE[4]
Persoonia hirsuta	Hairy Geebung	E	E	The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Persoonia hirsuta 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. Persoonia hirsuta has a large area of occurrence, but occurs in small populations, increasing the species' fragmentation in the landscape.	PMST	Low – no suitable habitat occurs within study area
Persoonia nutans	Nodding Geebung	E	E	Confined to the Cumberland Plain where it grows in Castlereagh Scribbly Gum Woodlands and Agnes Banks Woodlands.	Bionet, PlantNET, PMST	Low – no suitable habitat occurs within study area
Pomaderris brunnea	Rufous Pomaderris	V	V	Confined to the Colo and Upper Nepean Rivers where it grows in open forest; in western Sydney (Camden to Picton area) known from sandy alluvium on levee and creek banks.	PMST	Low – no suitable habitat occurs within study area
Prasophyllum fuscum	Slaty Leek Orchid	CE	V	Grows in moist heath, often along seepage lines. The known population grows in moist sandy soil over sandstone amongst sedges and grasses in an area that appears to be regularly slashed by the local council.	PMST	Low – no suitable habitat occurs within study area
Pultenaea glabra	Smooth Bush-pea	V	V	This species is primarily associated with riparian or swamp habitat areas in the mid to upper altitudes of the central Blue Mountains on sandstone derived soils. Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone. Restricted to the higher Blue Mountains and has been recorded from the Katoomba-Hazelbrook and Mount Victoria areas, with unconfirmed sightings in the Mount Wilson and Mount Irvine areas.	PMST	Low – no suitable habitat occurs within study area
Rhizanthella slateri	Eastern Underground Orchid	V	E	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Flowers September to November. Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	PMST	Low – no suitable habitat occurs within study area

SPECIES NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	DATA SOURCE	LIKELIHOOD OF OCCURRENCE[4]
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Occurs between Bulahdelah and St Georges Basin where it grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea. 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.	PMST	Low – no suitable habitat occurs within study area
Thelymitra kangaloonica	Kangaloon Sun Orchid	CE	CE	It is found in swamps in sedgelands over grey silty grey loam soils. It is thought to be a short-lived perennial, flowering in late October and early November. *Thelymitra kangaloonica* is only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. It is known to occur at three swamps that are above the Kangaloon Aquifer.	PMST	Low – no suitable habitat occurs within study area
Thesium australe	Austral Toadflax	V	V	Grows in grassland or woodland often in damp sites. It is a semi-parasitic herb and hosts are likely to be *Themeda australis* and *Poa* spp.	PMST	Low – no suitable habitat occurs within study area
Zieria murphyi	Velvet Zieria	V	V	The Velvet Zieria is found in sheltered positions in moist gullies in moist eucalypt forest with sandy soil. Velvet Zieria is found in the Blue Mountains at Mt Tomah and in the southern highlands where it has been recorded in Morton National Park in the Bundanoon area, and at Penrose.	PMST	Low – no suitable habitat occurs within study area

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory under the EPBC Act

(3) Habitat Descriptions were obtained from Threatened Biodiversity Profile Search published by the Office of Environment, Energy and Science (2019d)

(4) BioNet = NSW Threatened Species Sightings Search Tool, PMST = Commonwealth Protected Matters Search Tool

APPENDIX B

THREATENED FAUNA LIKELIHOOD OF OCCURRENCE ASSESSMENT

B1 THREATENED FAUNA LIKELIHOOD OF OCCURRENCE ASSESSMENT

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Amphibians							
Litoria booroolongensis	Booroolong Frog	E	E	The Booroolong Frog is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. It has disappeared from much of the Northern Tablelands, however several populations have recently been recorded in the Namoi catchment. The species is rare throughout most of the remainder of its range. This species live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses and shelter under rocks or amongst vegetation near the ground on the stream edge.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.
Heleioporus australiacus	Giant Burrowing Frog	V	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 300m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Breeding habitat of this species is generally soaks or pools within first or second order streams. Species is dependent on hanging swamps on the top of sandstone plateaus and deeply dissected gullies that occur as erosion features in the Sydney Basin.	3	BioNet, PMST	Low. Generally unsuitable habitat recorded within the study area. Nearest record is on the periphery of Blue Mountains National Park.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Litoria aurea	Green and Golden Bell Frog	E1	V	Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. The majority of records are from within the Sydney Basin Bioregion with only scattered records south to the Victorian border and this species has not been recorded in southern NSW within the last decade. Records are isolated and tend to be at high altitude. This species breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath based forests and woodlands where it shelters under leaf litter and low vegetation, and hunts for invertebrate prey either in shrubs or on the ground.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Pseudophryne australis	Red-crowned Toadlet	V	-	The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Red-crowned Toadlets are quite a localised species that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. Red-crowned Toadlets are usually found as small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites.	48	BioNet	Low. Though recorded frequently within locality, historical records occur within Blue Mountains National Park and/or creekline. The study area provided generally unsuitable habitat for this species.
Mixophyes balbus	Stuttering Frog	E1	V	Occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east NSW. It is the only Mixophyes species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. The Dorrigo region, in north-east NSW, appears to be a stronghold for this species. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Birds							
Botaurus poiciloptilus	Australian Bittern	E1	E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.). Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.
Rostratula australis	Australian Painted Snipe	E1	V; M	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.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.
Calidris ferruginea	Curlew Sandpiper	E1	CE; M; Ma	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.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Dasyornis brachypterus	Eastern Bristlebird	E	E	The distribution of the Eastern Bristlebird has contracted to three disjunct areas of south-eastern Australia. There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone. Age of habitat since fires (fire-age) is of paramount importance to this species.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.
Numenius madagascariensis	Eastern Curlew	-	CE; M; Ma	Inhabits coastal estuaries, mangroves, mud flats and sand pits. It is a migratory shorebird which generally inhabits sea and lake shore mudflats, deltas and similar areas, where it forages for crabs and other crustaceans, clam worms and other annelids, molluscs, insects and other invertebrates. Its migration route ranges from its wintering grounds in Australia to its breeding grounds in northern China, Korea and Russia.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee. In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (*Eucalyptus pauciflora*) woodland and occasionally in temperate rainforests. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	9	BioNet	Low. This species is considered unlikely to utilise the study area given the lack of preferred feed tree species and nesting/roosting habitat. Flyovers cannot be discounted.
Calyptorhynchus lathami	Glossy Black-Cockatoo	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. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak (*Allocasuaraina diminuta*). Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (*Casuarina cristata*). Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites.	4	BioNet	Low. This species is considered unlikely to utilise the study area given the lack of preferred feed tree species and nesting/roosting habitat. Flyovers cannot be discounted.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Glossopsitta pusilla	Little Lorikeet	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. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs. 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. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards.	2	BioNet	Low. This species is considered unlikely to utilise the study area given the lack of feed tree species which may provide seasonal blossom resourced. Flyovers cannot be discounted.
Tyto novaehollandiae	Masked Owl	V	-	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares.	5	BioNet	Low. Though the study area is not considered likely to utilised by the Masked Owl for breeding or roosting, this species is known to utilise roadsides for foraging.
Grantiella picta	Painted Honeyeater	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Ninox strenua	Powerful Owl	V	-	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations. It inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. It requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider.	10	BioNet	Low. Though the study area is not considered likely to utilised by the Powerful Owl for breeding or roosting, this species is known to utilise urbanised areas for foraging.
Anthochaera phrygia	Regent Honeyeater	E4A	CE	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. It inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. It feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany.	1	BioNet, PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Tyto tenebricosa	Sooty Owl	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 such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*). Nests in very large tree-hollows.	3	BioNet	Moderate. Though the study area is not considered likely to utilised by the Sooty Owl for breeding or roosting, this species is known to utilise the study area for foraging.
Lathamus discolor	Swift Parrot	E1	CE; Ma	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. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). Commonly used lerp infested trees include Inland Grey Box (*E. macrocarpa*), Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*).	0	PMST	Low. Generally unsuitable habitat recorded within the study area.
Hirundapus caudacutus	White-throated Needletail	-	M; Ma	Occurs in airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns. Breeds in the northern hemisphere and migrates to Australia in October-April.	0	PMST	Low. Generally unsuitable habitat recorded within the study area. May occur as flyover during migration movements.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Mammals							
Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V	The range of the Brush-tailed Rock-wallaby extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. However the distribution of the species across its original range has declined significantly in the west and south and has become more fragmented. In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night. Highly territorial and have strong site fidelity with an average home range size of about 15 ha.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Habitat includes dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. This species will roost mainly in tree hollows but will also roost under bark or in man-made structures. This species is usually solitary but also recorded roosting communally, probably insectivorous.	1	BioNet	Low. Generally unsuitable habitat recorded within the study area.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	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.	4	BioNet	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Cercartetus nanus	Eastern Pygmy-possum	V	-	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable.	5	BioNet	Low. Generally unsuitable habitat recorded within the study area.
Scoteanax rueppellii	Greater Broad-nosed Bat	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 500m. Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3-6m.	2	BioNet	Low. Generally unsuitable habitat recorded within the study area.
Petauroides volans	Greater Glider	-	V	The Greater Glider has a restricted distribution in eastern Australia, from the Windsor Tableland in north Queensland to central Victoria, with an elevated range from sea level to 1200m above sea level. The species is largely restricted to eucalypt forests and woodlands, feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. It is found in abundance in montane eucalypt forest with relatively old trees and an abundance of hollows. It also favours forests with a diversity of eucalypts to cater for seasonal variation in food abundance.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Grey-headed Flying-foxes are generally found within 200km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South 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 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Can travel up to 50km from the camp to forage; commuting distances are more often <20km. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.	31	BioNet, PMST	Moderate. This species has been frequently recorded within close proximity to the study area. Though no known breeding camps are located nearby, the Grey-headed Flying-fox may utilise the study area for foraging.
Phascolarctos cinereus	Koala	V	V	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. It was briefly historically abundant in the 1890s in the Bega District on the south coast of NSW, although not elsewhere, but it now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Some preferred species include Forest Red Gum, Grey Gum. In coastal areas, Tallowwood and Swamp Mahogany are important food species, while in inland areas White Box, Bimble Box and River Red Gum are favoured. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	15	BioNet, PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. This species forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves. Hunt in forested areas, catching moths and other flying insects above the tree tops.	7	BioNet	Low. Generally unsuitable habitat recorded within the study area. Roosting habitat for this species is considered unlikely to occur given the footbridges within the study area are within close proximity to an active train line.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies.	2	BioNet, PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Miniopterus australis	Little Bent-winged Bat	V	-	Found along east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. Only five nursery sites /maternity colonies are known in Australia.	1	BioNet	Low. Generally unsuitable habitat recorded within the study area. Roosting habitat for this species is considered unlikely to occur given the footbridges within the study area are within close proximity to an active train line.
Pseudomys novaehollandiae	New Holland Mouse	-	V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Genetic evidence indicates that the New Holland Mouse once formed a single continuous population on mainland Australia and the distribution of recent subfossils further suggest that the species has undergone a large range contraction since European settlement. Total population size of mature individuals is now estimated to be less than 10,000 individuals although, given the number of sites from which the species is known to have disappeared between 1999 and 2009, it is likely that the species' distribution is actually smaller than current estimates. Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Isoodon obesulus	Southern Brown Bandicoot	E1	E	The Southern Brown Bandicoot has a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland. They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruiting) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares.	0	PMST	Low. Generally unsuitable habitat recorded within the study area.
Myotis macropus	Southern Myotis	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. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	1	BioNet	Low. Given the absence of waterways within or near the study area this species is unlikely to utilise habitat within the study area.
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. 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. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Are known to traverse their home ranges along densely vegetated creek lines.	37	BioNet, PMST	Moderate. Historically recorded within the study area. This species is considered unlikely to utilise the study area for breeding however may utilise the habitat within the study area intermittently for foraging.

SCIENTIFIC NAME	COMMON NAME	BC ACT[1]	EPBC ACT[2]	HABITAT[3]	RECORDS	SOURCE[4]	LIKELIHOOD OF OCCURRENCE
Reptiles							
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250km of Sydney. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevices or hollows in large trees within 500m of escarpments in summer.	2	BioNet, PMST	Low. Generally unsuitable habitat recorded within the study area.

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered under the BC Act

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory under the EPBC Act

(3) Habitat Descriptions were obtained from Threatened Biodiversity Profile Search published by the Office of Environment, Energy and Science (2019d)

(4) BioNet = NSW Threatened Species Sightings Search Tool, PMST = Commonwealth Protected Matters Search Tool

Note: Threatened fish species have been excluded from this assessment due to the lack of suitable habitat within the study area.