Jemena Gas Networks (NSW) Ltd

Former Newcastle Gasworks (Clyde Street) Remediation Project

Biodiversity Assessment Report

July 2018

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1. Introduction

1.1 Overview

Jemena Gas Networks (NSW) Ltd (Jemena) is proposing to remediate the former Newcastle gasworks (the Project area) at 1 Chatham Road, Hamilton North (the Project). The Project area is located on Lot 1 DP 79057 and Lot 270 DP 812689, within the Newcastle Local Government Area (LGA) in the Lower Hunter region of New South Wales (NSW) (Figure 1-1).

Jemena is proposing to remediate the Project area to reduce the risk to human health and the environment in accordance with Management Order no. 20151403 issued by the NSW Environment Protection Authority (EPA) on 21 December 2015. The *Jemena Gas Networks (NSW) Limited Stage 2 Remedial Action Plan Former Newcastle Gasworks 1 Chatham Road, Hamilton North, NSW* (JBS&G, 2017a) (the RAP) has been prepared to address the requirements of the Management Order.

GHD Pty Ltd (GHD) has been engaged by Jemena to prepare an Environmental Impact Statement (EIS) to support a development application for the Proposal under Part 4 of the New South Wales (NSW) *Environmental Planning & Assessment Act 1979* (EP&A Act).

This biodiversity assessment report (BAR) has been prepared as part of the EIS in accordance with the provisions of the EP&A Act and addresses the Department of Planning & Environment (DP&E) Secretary's Environmental Assessment Requirements (SEARs) (SSD 7676) issued for the Proposal on 8 September 2016.

1.2 Background

Jemena owns the Project area located at 1 Chatham Road, Hamilton North a suburb within Newcastle (Figure 1-1). Jemena acquired the Project area in 2006.

The Project area was operated by the Newcastle Gas Company (AGL) from 1913 to 1985, producing 'town gas' as well as by-products that included ammonia liquors, coal tars and spent oxides. Over time, these by-products accumulated in the soil. Other solid materials, including concrete, asphalt and building materials, are scattered throughout the Project area. The Project area is heavily contaminated and currently presents human health and environmental risks from contaminated soils (including stockpiles), tar sources and hydrocarbon, cyanide, and ammonia contaminated groundwater migrating off-site.

The Project area was declared significantly contaminated land by the NSW Environment Protection Authority (EPA) on 18 August 2011 under the *Contaminated Land Management Act 1997* (CLM Act) (Declaration No 20111101/Area No. 3060).

In response, Jemena has embarked on a staged remediation approach which comprised preliminary remediation works of above ground infrastructure (Stage 1) to prepare the Project area for the main remediation works (Stage 2 – the Project). The Stage 1 work was completed in 2015 and documented in *Clyde Street (former Newcastle Gasworks) Remediation Project – Validation Report* (Parsons Brinckerhoff, 2015a). A number of stockpiles are currently present on-site, resulting from the Stage 1 remediation works. These stockpiles include building rubble and potentially impacted soils and are covered by anchored geofabric to prevent erosion of contaminated materials. These stockpiles are regularly inspected to check that the geofabric is in place and working effectively until such time as Stage 2 remediation occurs, following receipt of development consent.

LEGEND

- Project area
- Cadastre

Paper Size A4

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Jemena Gas Networks (NSW) Ltd
Former Newcastle Gasworks (Clyde Street)
Remediation Project: Environmental Impact Statement

Job Number	22-17312
Revision	0
Date	13 Jul 2018

Project location

Figure 1-1

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\17312\GIS\Maps\Deliverables\Biodiversity\2217312_B001_ProjectLocation_0.mxd

Data source: LPI: DCDB & DTDB 2012. Nearmap: Aerial Imagery, 2015; Geoscience Australia: 250k Topographic Data Series 3 2006. Created by: fmackay, tmorton

Following completion of Stage 1 works, on 29 October 2015, the Project was declared as State Significant Development (SSD) by the NSW Minister for Planning, under section 4.36(3) of the EP&A Act. On 21 December 2015 the EPA issued Management Order (no. 20151403) to Jemena in accordance with the CLM Act. The Project, for which the EIS applies, is to address the requirements of the Management Order.

In accordance with one of the requirements of the Management Order, the RAP was prepared for the Project. The RAP outlines the remediation strategy for the Project.

1.3 Objectives of the project

The objectives of the Project are to:

- Achieve compliance with the requirements of the Management Order by:
  - Addressing groundwater within the Project area that has been degraded by gasworks waste contaminants at concentrations exceeding criteria for beneficial use and protection of aquatic ecosystems.
  - Addressing contaminated groundwater within the Project area which may migrate further off-site and ultimately impact the Hunter River.
  - Addressing risks posed by vapours during subsurface works within the Project area.
- Develop and implement measures to manage and mitigate the potential environmental, heritage, social, and health and safety impacts from the Project that are identified in the EIS.
- Develop and implement a long-term environmental management plan (LTEMP) to address residual contamination within the Project area following the Stage 2 remediation works (being the remediation works comprising the Project).

It is not an objective of the Project to make the Project area suitable for any specific use, rather it is envisaged that once the requirements of the Management Order have been met redevelopment of the Project area may occur at a later stage. Any remediation works required to make the Project area suitable for a specific future use would be the subject of a separate assessment and approvals process.

1.3.1 Key features of the Project

The Project proposes to remediate the Project area to address and manage the risk to human health and the environment in accordance with the requirements of the Management Order and the RAP, and would be undertaken as outlined below.

Early works

Early works would be undertaken in advance of the main project works over an approximate one week period and would involve:

- Installation of nested monitoring wells immediately upgradient and downgradient of the subterranean barrier wall at four locations, with each nested well comprising two wells (total of 16 wells).
- Installation of automated pressure transducers/loggers programmed to log water pressure data at not less than hourly intervals, including in wells along the subterranean barrier wall alignment, and in selected off-site wells on Emerald Street (parallel to Chatham Road).

Site establishment

Site establishment would be undertaken over an approximate two week period and would involve:

- Establishment of environmental and safety controls.
- Establishment of site compound/parking areas.
- Clearing and mulching of vegetation and stockpiling on-site prior to being transported off-site as general solid waste (non-putrescible) for recycling/disposal at an appropriately licensed facility.
- Reinforcement of the driveway to protect an existing gas main located beneath the site access on the eastern side of Chatham Road.

Remediation

Remediation would be undertaken over an approximate seven month period. Remediation would occur in a staged manner with work commencing in the north of the Project area and progressing to the south as shown on Figure 1-2. Further information on the indicative Project staging is provided in the EIS. Remediation would involve:

- Demolition of the existing concrete slabs and Former Residence Building. Demolition materials would either remain on-site (following crushing and screening) for use during the remediation phase, located behind the subterranean barrier wall and below the capping layer, or transported off-site as special waste (asbestos waste) or general solid waste (non-putrescible) for disposal at an appropriately licensed facility.
- Relocation of stockpiles generated from the previously completed Stage 1 remediation works behind the subterranean barrier wall and below the capping layer, with screening and crushing of building rubble undertaken prior to placement.
- Installation of an approximately 510 metre long subterranean barrier wall to redirect groundwater flow around the areas of highest contamination (primarily where old/stable non aqueous phase liquid (NAPL) has been identified).
- Capping layer construction and regrading of the entire Project area, including installation of drainage and sealing of the capping layer via a bitumen spray seal. In the final stage of work the site compound/parking area in the south-west corner would be removed.

Demobilisation

Demobilisation would be undertaken over an approximate one week period and would involve:

- Removal of redundant environmental and safety controls.
- General site tidy up activities.

Post-remediation

Jemena would undertake long-term management and monitoring of the Project area in accordance with EPA requirements.

A detailed description of the Project is provided in Section 4 of the EIS, with a Project overview shown on Figure 1-2. Three hotspot areas were identified in the RAP as requiring excavation. However, based on additional soil sampling and analysis undertaken by GHD (2018), there was no evidence of subsurface contamination in these areas requiring removal. As such, the previously nominated hotspot areas are not included as part of the scope of the Project, with this approach endorsed by the Site Auditor and the EPA.

LEGEND

- Project area
- Light and heavy vehicle access
- Existing buildings
- Stockpile locations
- Stockpile Asbestos impacted soil / fill material
- Capping layer
- Indicative location of crusher and screener
- Site compound / parking
- Indicative asbestos emplacement
- Barrier wall

Paper Size A4

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Jemena Gas Networks (NSW) Ltd
Former Newcastle Gasworks (Clyde Street)
Remediation Project: Biodiversity Assessment Report

Job Number	22-17312
Revision	0
Date	13 Jul 2018

Project overview

Figure 1-2

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\17312\GIS\Maps\Deliverables\Biodiversity\2217312_B006_ProjectOverview_0.mxd

Data source: LPI: DCDB & DTDB 2012. Nearmap: Aerial Imagery, 2015. Stockpile data: JBSG, 2017. Buildings data: SKM, 2017. Created by: fmackay, tmorton

1.4 Project location

The Project area is located on Lot 1 DP 79057 and Lot 270 DP 812689, identified as 1 Chatham Road, Hamilton North (see Figure 1-1).The site is located within the LGA in the Lower Hunter region of NSW. The Project will occur across the majority of the approximate 7.4 hectare site, referred to as the 'Project area' throughout this report.

1.5 Purpose of this report

This BAR has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) which were provided on the 8 September 2016 by the DP&E. Table 1-1 sets out the biodiversity assessment requirements of the SEARs.

Table 1-1 Secretary's environmental assessment requirements

Assessment requirements
Biodiversity – including a Biodiversity Assessment Report prepared by a person accredited under the *Threatened Species Conservation Act 1995* and in accordance with the Office of Environment and Heritage (OEH) *Framework for Biodiversity Assessment.*

This BAR has been prepared to describe the impacts of the Project on biodiversity values using the Framework for Biodiversity Assessment (FBA) and the NSW Biodiversity Offsets Policy for Major Projects (OEH, 2014a and 2014b).

The main components of the methodology for the BAR are:

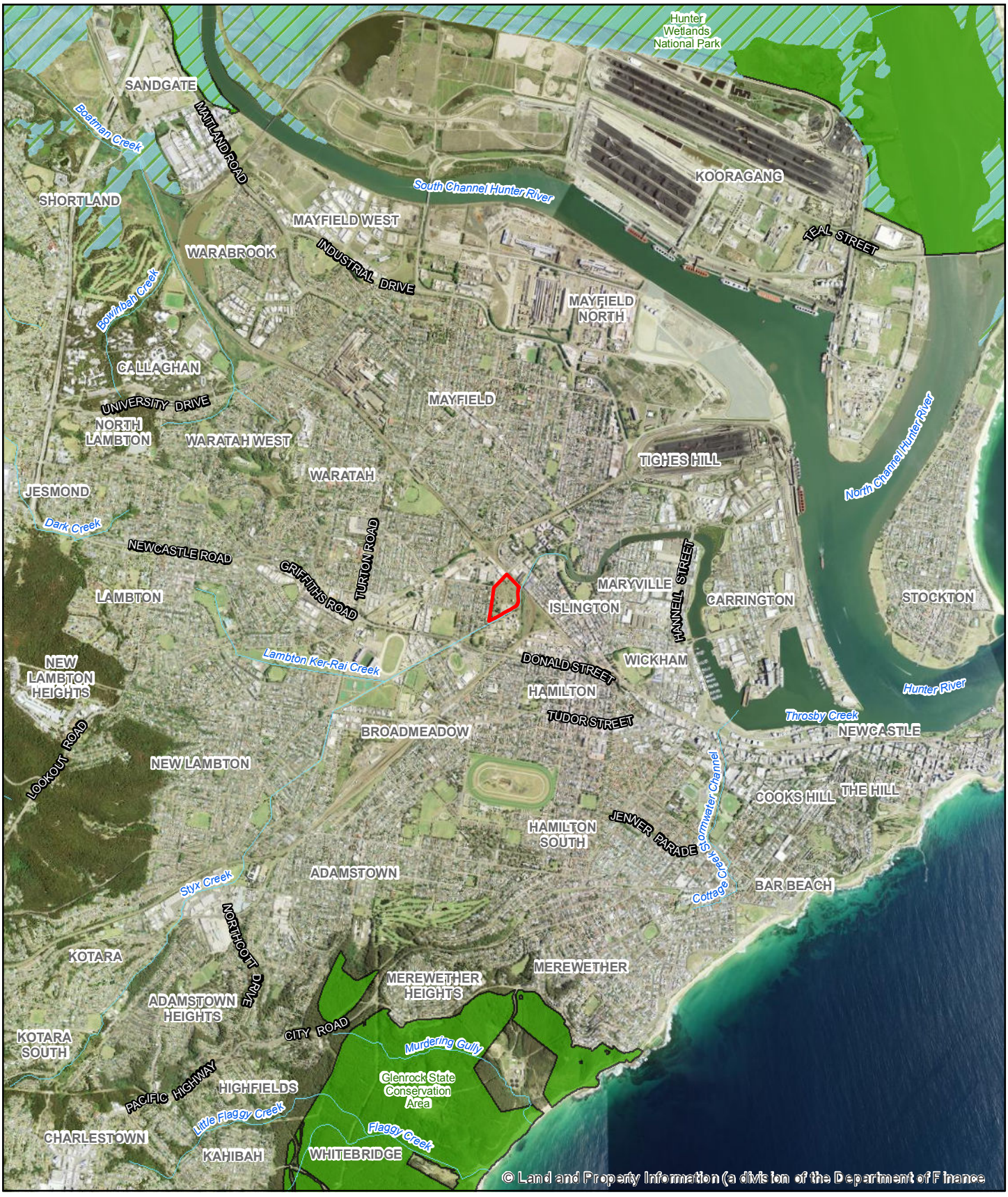
- Desktop assessment to describe the existing environment and landscape features of the Project area and to identify the suite of threatened biota previously recorded or predicted to occur in the locality that may potentially be affected by the Project.
- Field survey to describe the biodiversity values of the disturbance footprint and surrounding Project area and determine the likelihood of threatened and migratory biota and their habitats occurring in the disturbance footprint or being affected by the Project.
- Assessment of the impacts of the Project on biodiversity values and determination of the need or otherwise for the provision of biodiversity offsets in accordance with the FBA.

1.6 Definitions

The following terms are used in this report:

- Project area – all areas owned and managed by Jemena as part of this Project, which includes areas that will be subject to direct and indirect impacts of the Project (Figure 1-2).
- Disturbance footprint – all areas within the Project area that will be directly impacted by the Project (Figure 1-2), this is the entire Project area with the exception of the listed local heritage items (Newcastle Gas Co. Office, and Pump house and fence – both on the north-western boundary of the Project area), which would be retained on-site.
- Locality – an area within a 10 km radius of the Project area (Figure 1-3).

Throughout this document, the terms 'disturbance footprint' and 'Project area' are used to describe the locations of ecological values in relation to the Project so that both direct and indirect impacts can be identified and discussed.



LEGEND

- Project area
- SEPP14 wetlands
- Nature Reserve
- Watercourse

Paper Size A4

0 500 1,000 1,500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Jemena Gas Networks (NSW) Ltd
Former Newcastle Gasworks (Clyde Street)
Remediation Project: Biodiversity Assessment Report

Job Number 22-17312
Revision 0
Date 13 Jul 2018

Project locality

Figure 1-3

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Data source: LPI: DCDB & DTDB 2012\Aerial Imagery, 2017. Created by: fmackay, tmorton

1.7 Scope and limitations

This report: has been prepared by GHD for Jemena Gas Networks and may only be used and relied on by Jemena Gas Networks for the purpose agreed between GHD and Jemena Gas Networks as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Jemena Gas Networks arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Jemena Gas Networks and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report that were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

1.8 Assumptions

This BAR has been prepared based on the assumption that all vegetation within the Project area would be cleared and that the former residence building on-site in the south-west of the Project area will be removed/demolished. However, the listed local heritage items (Newcastle Gas Co. Office, and Pump house and fence – both on the north-western boundary of the Project area) would be retained on-site.

It is assumed that there would be no impact to vegetation outside the Project area.

2. Legislative context

2.1 State legislation

The principal approval required for the Project is State Significant Development Consent under Division 4.1 of Part 4 of the EP&A Act.

2.1.1 Environmental Planning and Assessment Act 1979

Applicability of Division 4.1 of Part 4

Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning and determination regime for SSD in NSW.

Clause 89C(3) of the EP&A Act specifies that "the Minister for Planning may, by order published in the Gazette, declare specified development on specified land to be State significant development, but only if the Minister has obtained and made publicly available advice from the Planning Assessment Commission about the State or regional planning significance of the development."

In May 2015, Jemena submitted an application to the Minister for Planning to declare the site and Project as SSD. The Minister for Planning then obtained (and made publicly available) advice from the Planning Assessment Commission (PAC) about the State or regional planning significance of the Project. On 29 October 2015, the Minister for Planning declared the site and Project to be SSD via a Declaration Order issued under Section 89C(3) of the EP&A Act. As a result, the Project will be subject to the provisions of Division 4.1 of Part 4 of the EP&A Act. The EIS, and this BAR, have addressed the SEARs provided for the Project. The DP&E issued SEARs for the Project on 8 September 2016. The SEARs outline the specific requirements to be addressed by the EIS and this BAR.

The NSW biodiversity offsets policy for major projects (the policy) applies to SSD and state significant infrastructure. The policy is underpinned by the Framework for Biodiversity Assessment (FBA) which commenced in October 2014. It provides the methodology for assessing impacts and determining biodiversity offsets for major projects. The FBA is a modified form of the BioBanking methodology and includes increased flexibility in delivery of biodiversity offsets for Major Projects.

Under the policy, the SEARs for the Project require Jemena to apply the FBA to assess impacts on biodiversity values. The FBA has also been applied to the Project to identify reasonable measures and strategies that can be taken to avoid and minimise impacts on biodiversity. This Biodiversity Assessment Report describes the biodiversity values present in the Project site and the impact of the Project on these values.

2.1.2 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) was passed by NSW Parliament in November 2016 and came into effect on 25 August 2017. The BC Act repeals the *Threatened Species Conservation Act 1995*, the *Nature Conservation Trust Act 2001* and parts of the *National Parks and Wildlife Act* 1974 (NPW Act). As a result, the matters relating to the listing of threatened species, threatened ecological communities, key threatening processes. biodiversity impact assessment, offsetting and related offences are now contained within the BC Act.

Under the *Biodiversity Conservation* (*Savings and Transitional*) *Regulation 2017*, major project development applications (or modification applications) can be considered under the former planning provisions of the EP&A Act (ie before amendment by the BC Act), if environmental assessment requirements were issued prior to the commencement of the BC Act (i.e. before 25 August 2017) and the application is made within 18 months after the commencement of the BC Act (i.e. before 25 February 2019). The DP&E issued the environmental assessment requirements (the SEARs) for the Project on 8 September 2016. Consequently, the Project has been assessed under the previous planning provisions of the EP&A Act and in accordance with the Project SEARs (see Section 2.1.1 above).

The potential presence or likely occurrence of threatened biota on the subject site and potential impacts on threatened biota are addressed in accordance with the TSC Act and are detailed in Section 4, and Appendix A.

2.1.3 Threatened Species Conservation Act 1995

The TSC Act provides legal status for biota of conservation significance in NSW. The TSC Act aims to 'conserve biological diversity and promote ecologically sustainable development'. It provides for:

- The listing of 'threatened species, populations and ecological communities', with endangered species, populations and communities listed under Schedule 1, 'critically endangered' species and communities listed under Schedule 1A, vulnerable species and communities listed under Schedule 2.
- The listing of 'Key Threatening Processes' (under Schedule 3).
- The preparation and implementation of Recovery Plans and Threat Abatement Plans.
- Requirements or otherwise for the preparation of a Species Impact Statement (SIS).

The TSC Act has been addressed in the current assessment through:

- Desktop review to determine the threatened species, populations or ecological communities that have been previously recorded within the locality of the site or have distributions that encompass the Project area and hence could occur subject to the habitats present.
- Targeted field surveys for threatened species, populations and ecological communities listed under the TSC Act.
- Identification, assessment and mapping of endangered ecological communities (EECs) and threatened species (or their habitat) listed under the TSC Act.
- Assessment of potential impacts on threatened species, populations and ecological communities listed under the TSC Act.

2.1.4 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) contains schedules that list endangered, critically endangered and vulnerable aquatic species, populations, ecological communities, and key threatening processes of relevance to aquatic environments. The proposed rezoning does not involve any dredging or reclamation that would require specific consideration under the Act. As for biota listed under the TSC Act, potential impacts on any of these species must be addressed through 7 part tests in accordance with Section 5A of the EP&A Act. If a significant impact is likely, an SIS must be completed and a licence obtained pursuant to Part 7A of the FM Act.

Although there are no aquatic environments within the Project area, the highly modified Styx Creek adjoins the southern boundary of the site. This creek is unlikely to be either directly or indirectly impacted by the Project and therefore the FM Act does not apply.

2.1.5 Biosecurity Act 2015

The *Biosecurity Act 2015* aims to provide a streamlined statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds.

The primary object of the *Biosecurity Act 2015* 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.

The following priority weeds were identified within the Project area:

- *Rubus anglocandicans* (Blackberry)
- *Cortaderia selloana* (Pampas Grass)
- *Senecio madagascariensis* (Fireweed)

Mandatory measures for priority weeds include the prohibition of importation of these species into the state and prohibition of their sale. Mitigation measures to control the spread of these priority weeds are discussed in Section 4.2.3.

2.1.6 State planning policies

State Environmental Planning Policy 44: Koala Habitat

State Environmental Planning Policy 44 Koala Habitat Protection (SEPP 44) aims to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline'.

Schedule 1 of SEPP 44 lists the local government areas to which SEPP 44 applies. The Project is located within the Newcastle local government area (LGA) which is listed under Schedule 1. Whilst SEPP 44 does not apply to Major Projects, the potential for koalas to occur in the Project site was assessed during field surveys and potential impacts on the koala have been considered in this report.

SEPP 44 requires that before granting consent for development on land over one hectare in area, a consent authority must be satisfied as to whether or not the land is 'potential' and 'core' koala habitat. Potential koala habitat is defined as 'an area of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 per cent of the total number of trees in the upper or lower strata of the tree component'. Core koala habitat, is defined as 'an area of land with a resident breeding population of koalas, evidenced by attributes such as breeding females and recent sightings and historical records of a population'. Where core koala habitat is found to occur, SEPP 44 requires that a site-specific Koala Plan of Management be prepared, unless a local government area-based Koala Plan of Management exists.

Newcastle LGA is listed on Schedule 1 of SEPP 44, therefore the Project site was assessed for the potential presence of Koala habitat during this investigation.

No koala habitat or evidence of koala presence was identified within the Project area.

State Environmental Planning Policy No. 14 – Coastal Wetlands

State Environmental Planning Policy No. 14 – Coastal Wetlands (SEPP 14) aims to protect coastal wetlands in NSW. According to clause 7(1) of SEPP 14, *a person shall not:*

(a) clear that land,

(b) construct a levee on that land,

(c) drain that land, or

(d) fill that land,

except with the consent of the council and the concurrence of the Director.

No SEPP 14 wetland lands occur on or adjoining the site. The closest wetlands are the Hunter Estuary Wetlands Ramsar site located approximately three kilometres north of the Project site. This site would not be affected by the Project.

State Environmental Planning Policy No. 26 - Littoral Rainforest

State Environmental Planning Policy No. 26 - Littoral Rainforest (SEPP 26) provides a mechanism for the consideration of applications for development that are likely to damage or destroy littoral rainforest areas with a view to the preservation of those areas in their natural state. The closest littoral rainforest mapped under SEPP 26 is approximately 10 kilometres to the south of the Project area. The proposed works would not directly or indirectly impact on littoral rainforest mapped under SEPP 26.

2.2 Commonwealth legislation

2.2.1 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on Matters of National Environmental Significance (MNES) undergo an assessment and approval process. Under the EPBC Act, an action includes a proposal, undertaking, proposal or activity. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Government Minister for the Environment (the 'Minister').

The EPBC Act identifies MNES as:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The great barrier reef marine park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development

The significance of potential impacts on MNES are determined via *Assessments of Significance* pursuant to the EPBC Act Significant Impact Guidelines (DEE, 2013). If a significant impact is considered likely, a referral under the EPBC Act must be submitted to the Minister.

No MNES were identified within the Project area. One threatened species listed under the EPBC Act (Grey-headed Flying-fox) has potential to forage within the Project site. This species would not be significantly impacted by the Project and therefore a referral to the Commonwealth DoEE is not required (refer to Section 5.5).

3. Methods

3.1 Desktop assessment

A desktop database review was undertaken to identify threatened flora and fauna species, populations and ecological communities (biota) listed under the TSC Act and FM Act, and MNES listed under the EPBC Act, that could be expected to occur in the locality, based on previous records, known distribution ranges, and habitats present. These were also used to obtain the necessary site data to perform FBA calculations. Biodiversity resources pertaining to the project site and locality (i.e. within a 10 km radius of the site) that were reviewed prior to conducting field investigations included:

- The Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST), for all MNES online database selected for a 10 km radius of the scheme envelope (DoEE, 2017a), database queried on 02 August 2017 (Appendix B).
- DoEE online species profiles and threats database (DoEE 2017b).
- Office of Environment and Heritage (OEH) Wildlife Atlas database (licensed) for records of threatened species, populations and threatened ecological communities listed under the TSC Act that have been recorded within the locality (OEH 2017a), data supplied by OEH on 02 August 2017 (Appendix B).
- OEH threatened biota profiles for descriptions of the distribution and habitat requirements of threatened biota (OEH 2017b). This resource was also used to identify the suite of threatened ecological communities (TECs) and threatened species that could potentially be affected by the Project and to inform habitat assessments.
- The *NSW Vegetation Information System: Classification* (VIS) (OEH 2016c) to identify matching plant community types (PCTs) in the study area, as required by the FBA.
- Regional-scale vegetation mapping of the study area (DEC, 2006).
- Mapping and descriptions of the NSW Mitchell landscapes (DECC 2008a, 2008b).
- The Atlas of Groundwater Dependent Ecosystems (GDEs) (BOM 2016)
- Aerial photographs and satellite imagery of the Project area.

Following collation of database records and species and community profiles, a 'likelihood of occurrence' assessment was prepared (refer Section 4.2.3) with reference to the broad habitats contained within the disturbance footprint. This was further refined following field surveys, as described below. The likelihood of threatened and migratory biota occurring in the disturbance footprint was assessed based on presence of records from the locality since 1980, species distribution and habitat preferences, and the suitability of potential habitat present in the disturbance footprint. The results of this assessment are provided in Appendix A.

3.2 Field survey

3.2.1 Overview

Field surveys were undertaken by two GHD ecologists (a botanist and zoologist) on 8 August 2017. Survey methods included:

- Flora surveys including random meander and vegetation mapping
- Threatened flora searches and habitat assessment

- Fauna habitat assessment, including targeted searches for resources of relevance for threatened fauna species
- Fauna surveys

3.2.2 Flora survey

Vegetation surveys and mapping

The vegetation in the Project area comprises exotic grassland and planted trees, comprising a mix of exotic and native species, including non-indigenous natives and garden cultivars. This vegetation clearly did not comprise 'native vegetation' or threatened species habitat according to the FBA and so was not sampled using plot/transects.

Flora species were recorded during walked traverses of the site and a list of species compiled. All vascular plant species (i.e. not mosses, lichens or fungi) were recorded on proforma field data sheets. Plant identifications were made according to nomenclature in Harden (1990-93). Plant specimens which were difficult to identify (either insufficient sample collected or buds/fruiting bodies were not available at the time of the survey) were identified to genus level.

Vegetation within the Project area was assessed against identification criteria for State and Commonwealth listed Threatened Ecological Communities (i.e. Critically Endangered Ecological Communities (CEECs) and Endangered Ecological Communities (EECs). Vegetation and habitats were compared with descriptions provided in OEH (2016b) and DEE (2016b) TEC profiles.

Threatened flora searches

The habitat requirements for threatened flora predicted to occur in the locality by the desktop assessment were identified prior to the field survey. Those requirements were then compared with those habitats present within the site during the field survey and an assessment of the likelihood of occurrence was completed based on consideration of known distributions, previous records in the locality and habitat requirements for each species. Searches for threatened plants were conducted during all traverses across the Project area. A waypoint was captured with a hand-held GPS for threatened species recorded.

The timing of field surveys was suitable for the detection/identification of the majority of threatened flora previously recorded or predicted to occur within 10 km of the Project area. The habitat assessments involved identification of habitat resources for cryptic species with flowering times outside of the survey period to assess their likelihood of occurring within the disturbance footprint. The Project area has been highly modified and does not provide suitable habitat for naturally-occurring threatened flora species in its current condition.

Fauna survey

The site survey methodology included relatively limited targeted fauna survey techniques (e.g. no trapping) because of the limited extent and quality of fauna habitat in the study area and because the FBA assesses the majority of threatened fauna species that could potentially occur in the Project area based on habitat surrogates.

An assessment was made of the type and quality of habitats present in the Project area for native fauna. Habitat quality was based on the level of breeding, nesting, feeding and roosting resources available. The study area was searched for habitat features of particular relevance to threatened species, such as hollow-bearing trees, specific feed trees, and water bodies. Habitat assessments included searches for evidence of fauna, such as tracks, scats, burrows and worn edges on hollows. Locations of significant habitat features were logged on a hand-held GPS.

Diurnal bird surveys were conducted during the site inspection, with species identified by sight and call. Opportunistic and incidental observations of other fauna groups were recorded during field surveys. Survey effort was concentrated on suitable areas of habitat throughout the course of the survey, for instance fallen timber where present was scanned and/or turned for reptiles and mature trees were scanned for roosting birds.

Given the lack of intact and connected native vegetation in the Project area, no targeted nocturnal surveys were conducted.

Fauna habitat assessment

Habitat assessments were conducted to help describe the suite of native fauna likely to occur in the Project area. Particular attention was made to habitat features and resources considered diagnostic of threatened species.

Habitat assessments included the following:

- Assessment of:
  - Vegetation patch size, age, disturbance and structural diversity (important for many threatened birds and mammals)
  - Quality of substrate for sheltering frogs and reptiles including rocks, logs, debris, peeling bark, leaf litter and native grassland
- Surveys to identify:
  - Winter-flowering eucalypts and feed trees of the Koala (*Phascolarctos cinereus*)
  - Hollow-bearing trees and logs that may provide refuge, nest and den sites for a range of threatened fauna species
  - Stags and other roost sites for raptors and owls
  - Wetlands, moist grassland and other foraging habitat for waterbirds (including migratory birds) and frogs
  - Mammal scats at the base of trees or along tracks and runways
  - Tracks in soft substrate,
  - Nest/den sites within logs, tree bases or tree trunks
  - Guano or moth remains at the base of hollow-bearing trees (diagnostic of the presence of tree-roosting bats)
  - Scratches on tree trunks (diagnostic of koalas, gliders or goannas) and worn bark around tree hollows (diagnostic of active use of hollows)
  - Owl pellets, whitewash or animal remains beneath trees (diagnostic of owl or raptor roosts)

3.2.3 Survey effort considerations

The Preliminary Environmental Assessment Report (GHD 2016) identified minimal habitat for flora and fauna species within the Project area. This was confirmed during the latest site inspection, which found the Project area to be a highly modified environment, comprising variously cleared and degraded industrial land with scattered patches of planted vegetation and shrubs. The small areas of vegetation on site are very limited in terms of structural and floristic diversity, and being isolated within a highly urbanised/industrial landscape, are unlikely to be of high habitat value for any threatened biota.

Given the nature of the Project area, a one-day site assessment by two ecologists (botanist and zoologist specialists) was undertaken. The survey was not designed to detect all species, rather to provide an overall assessment of the ecological values within the Project area in order to predict potential impacts of the Project, with particular emphasis on threatened biota and their habitats. No fauna trapping, nocturnal surveys (i.e. spotlighting), Anabat or call playback was conducted as part of the fauna surveys. Given the timing of the field survey (early spring), it is likely that many species that utilise the overall study area were detected during the survey. However, it is likely that some common and widespread species that occur in the Project area on occasion were not detected during the surveys given its short duration.

Threatened flora species are not expected to occur in the Project area given the highly modified environment. Similarly, the limited range of habitat resources and high levels of modification of vegetation mean that the Project area is unlikely to comprise important habitat for any threatened fauna species.

Habitat assessment was used to assess the likelihood of threatened species occurring in the Project area.

3.3 FBA assessment

The Project was assessed according to the methodology presented in the FBA (OEH, 2014a), and with particular reference to Section 9.5. Pursuant to Section 9.5, an assessor is not required to assess areas of land on a development site without native vegetation in accordance with Chapter 4 or Chapter 5 of the FBA, unless the SEARs issued for the Project specifically require an assessment of the land in accordance with those chapters.

The Project area contains predominantly exotic vegetation, which is not consistent with any native plant community type (PCT) or threatened ecological community (TEC). The landscape assessment provided in Section 4.1 details the extent of native vegetation within the locality and confirms that the site is unlikely to contribute to native vegetation extent within the locality.

Areas of land that do not contain native vegetation must still be assessed for threatened species, in accordance with Chapter 6 of the FBA. While the subject site contains some potentially suitable habitat for a small number of ecosystem credit threatened fauna species known to occur in the locality, it does not contain habitat for any species credit threatened species (flora or fauna) known or predicted to occur in the locality.

Given the vegetation on site does not comprise a native PCT, is not a local occurrence of a TEC and does not contain habitat for species credit threatened species, there is no requirement for the calculation of offsets under the FBA. The credit calculator does not allow for the generation of predicted threatened species if no native vegetation occurs on the site. For this reason, assessment of species credit species as predicted by the credit calculator was not undertaken.

The potential for a significant impact on those threatened fauna species (ecosystem credit species) that may possibly occur on site at least on occasion has been assessed using the 7-part test of significance and mitigation measures recommended to avoid or minimise potential impacts on these species, as a result of the proposed works, should they occur (see Section 5.4).

3.3.1 Likelihood of occurrence of threatened biota

Following collation of database records and species and community profiles, a 'likelihood of occurrence' assessment was prepared with reference to the broad habitats contained within the disturbance footprint. This was further refined following field surveys, as described below. The likelihood of threatened and migratory biota occurring in the disturbance footprint was assessed based on presence of records from the locality since 1980, species distribution and habitat preferences, and the suitability of potential habitat present in the disturbance footprint. The results of this assessment are provided in Appendix A. Table 3-1 provides a key to the likelihood of occurrence in the disturbance footprint of threatened biota known or likely to occur in the locality.

Table 3-1 Key to likelihood of occurrence for threatened species

Likelihood	Definition
Known	Recorded in the Project area during current surveys.
High	Species previously recorded within a 10 kilometre radius of the Project area and suitable habitat occurs within the Project area.
Moderate	Species previously recorded within a 10 kilometre radius of the Project area and only marginal or limited habitat occurs within the Project area. Species with potential habitat within the Project area, but no records from the locality in the last 30 years.
Low	Species previously recorded within a 10 kilometre radius of the Project area but no suitable habitat recorded. Species not recorded within a 10 kilometre radius of the Project area and only marginal or limited habitat occurs within the Project area.
Unlikely	Species not previously recorded within a 10 kilometre radius of the Project area and suitable habitat not recorded within the Project area, and/or Project area outside species known distribution.

3.4 Staff qualifications

Qualifications of staff involved in preparing this report are provided in Table 3-2. The FBA assessment was performed by Arien Quin an accredited BioBanking Assessor (assessor accreditation number 0120).

Table 3-2 Staff qualifications

Name	Position / Project Role	Qualifications	Relevant Experience
Arien Quin	Senior Ecologist	BSc Accredited BioBanking Assessor	10 years
Gilbert Whyte	Senior Ecologist	BSc, PhD	15 years
Kimberly Baker	Ecologist	BSc	6 years
Jayne Tipping	Principal Ecologist/Technical Review	BSc (Ecology), MEnvLaw	23+ years

4. Existing environment

4.1 Landscape values

4.1.1 Landscape features

The FBA requires the assessment of landscape features to help describe the biodiversity values of the study area and assess the impacts of the Project. Landscape features relevant to the FBA calculations are shown on Figure 4-1 and associated information is provided in Table 4-1.

Table 4-1 Landscape features

Landscape feature	Project area
Interim Biogeographic regionalisation of Australia (IBRA) bioregion and IBRA subregions	The Project area is located entirely within the Sydney Basin IBRA bioregion and Hunter IBRA subregion.
Mitchell landscapes	The Project area is located on the Newcastle Barriers and Beaches landscape (DECC 2008a).
Rivers, streams and estuaries	The Project area does not contain any rivers, streams or estuaries. Styx Creek is a concrete channelised and highly modified second order stream, which occurs adjacent to the eastern boundary of the site.
Wetlands	The Project area does not contain any important or local wetlands as defined in the FBA (OEH, 2014a).
% Native vegetation cover	The outer assessment circle is 1000 hectares in area and the inner assessment circle is 100 hectares.
• Current percent native vegetation cover in the outer assessment circle	No native vegetation is mapped within the outer assessment circle (1000 hectares)
• Future percent native vegetation cover in the outer assessment circle	No native vegetation is mapped within the outer assessment circle (1000 hectares)
• Current percent native vegetation cover in the inner assessment circle	No native vegetation is mapped within the inner assessment circle (100 hectares)
• The future percent native vegetation cover in the inner assessment circle	No native vegetation is mapped within the inner assessment circle (100 hectares)
Connectivity value - class	The Project would not affect any State or regional biodiversity links. The Project area is bound by either road ways (western and north-western boundary, a concrete channel (on the southern and eastern boundary) and a railway line (on the north-eastern boundary).
Connectivity value - width	There are no connectivity links within the Project site, nor are any links present within the landscape due to a lack of native vegetation.
Connectivity value - condition	The projective foliage cover (PFC) of over storey and mid storey is well below benchmark values and is inconsistent with any PCT.
	After development (assuming the removal of all vegetation on site) there would be no native over-storey.
Patch size	The patch size is 0 given that no native vegetation is mapped within the Project site or within the 100 hectare or 100 hectare circles.

LEGEND

- Project area
- 100 ha landscape assessment circle
- 1000 ha landscape assessment circle

Paper Size A4

0 120 240 480 720 960

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Jemena Gas Networks (NSW) Ltd
Former Newcastle Gasworks (Clyde Street)
Remediation Project: Biodiversity Assessment Report

Job Number 22-17312
Revision 0
Date 13 Jul 2018

Landscape assessment

Figure 4-1

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\17312\GIS\Maps\Deliverables\Biodiversity\2217312_B004_Landscape_Assessment_0.mxd

Data source: LPI: DCDB & DTDB 2012\Aerial Imagery, 2017. Created by: fmackay, tmorton

4.2 Native vegetation

4.2.1 Flora Species

A total of 72 flora species were recorded at the site, including 52 exotic and 20 native species. A full list of flora identified at the site is included in Appendix C. One species *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) which is listed as vulnerable under the TSC Act was identified within the Project area. This tree is likely to be planted given that the Project area is well outside the natural distribution of the species. Narrow-leaved Black Peppermints are also a commonly planted street tree throughout Newcastle.

The extremely low diversity of native species within the Project area demonstrates that the site is significantly degraded and is unlikely to support species of conservation significance.

4.2.2 Plant community types

The Project area has previously been cleared of native vegetation and is slashed on an as required basis to manage grass and weed growth. It is characterised by exotic vegetation, planted trees, shrubs, and hardstand areas. Many of the native species are non-indigenous to the LGA or are garden cultivars. A list of species recorded on site is provided in Appendix C.

Much of the site is dominated by exotic grasses (denoted with an asterix), including *Melinis repens** (Red Natal Grass), *Hyparrhenia hirta** (Coolatai Grass), *Hyparrhenia rufa**, *Sporobolus africanus** (Parramatta Grass) and *Paspalum dilatatum** (Paspalum). Other common groundcover species include *Cynodon dactylon* (Couch), *Bidens pilosa** (Cobblers Pegs), *Arctotheca calendula** (Capeweed), *Verbascum virgatum** (Twiggy Mullein), *Paronychia brasiliana** (Brazilian Whitlow) and *Rapistrum rugosum** (Turnip Weed) (refer to Plate 1).

The majority of the trees present at the site have been planted. Species include *Lophostemon confertus* (Brush Box), *Cinnamomum camphora** (Camphor Laurel), *Erythrina sykesii** (Coral Tree), *Grevillea robusta* (Silky Oak), *Jacaranda mimosifolia** (Jacaranda), Moreton Bay Fig (*Ficus macrophylla*), *Pinus radiata** (Radiata Pine) and *Phoenix canariensis* (Canary Island Date Palm). The majority of these trees occur along the southern and western fence line and as landscape plants surrounding site buildings (refer to Plate 2).

The shrub layer, where present, consists of patches of *Lantana camara** (Lantana) and *Ricinus communis** (Castor Oil Plant) with scattered *Acacia longifolia* subsp*. sophorae* (Coastal Wattle), *Acacia saligna* (Golden Wreath Wattle), *Grevillea* spp. (Grevillea hybrids) and *Melaleuca armillaris* (Bracelet Honey-myrtle). Many of these species, in particular invasive exotic species such as Lantana, have self-recruited on site. The *Grevillea* spp. and probably also the Honey-myrtle have been planted in previous garden beds.

The vegetation in the Project area clearly does not comprise native vegetation (PCTs) or threatened species habitat according to the FBA and so were not sampled with plot/transects. The species list for the site was compared with diagnostic species lists for PCTs that were likely to have formerly occurred in the area and other native vegetation types and there was not a positive diagnostic match with any native vegetation types. Given the dominance of exotic and planted non-indigenous native species and the absence of a natural vegetation structure, the vegetation on site would clearly have a site value score of less than 17, which is the minimum condition that requires biodiversity offsets in the FBA (OEH, 2014a).

Plate 1 Exotic grassland within the Project area

Plate 2 Planted trees on the corner of Chatham Road and Styx Creek

4.2.3 Priority weeds

The site contains numerous exotic flora species, of which the following three species are listed as priority weeds in the Newcastle LGA:

- *Rubus anglocandicans* (Blackberry)
- *Cortaderia selloana* (Pampas Grass)
- *Senecio madagascariensis* (Fireweed)

These weeds would require management in accordance with DPI requirements.

The Project area also contains numerous environmental weeds such as large patches *of Lantana camara* (Lantana), *Bidens pilosa* (Cobblers Pegs), *Hyparrhenia hirta* (*Coolatai Grass*), *Melinis repens* (Red Natal Grass), *Ricinus communis* (Castor Oil Plant), *Arctotheca calendula* (Capeweed), *Rapistrum rugosum* (Turnip Weed) and *Conyza bonariensis* (Fleabane).

4.2.4 Threatened ecological communities

The desktop assessment indicates 20 threatened ecological communities (TEC) listed under the NSW TSC Act, known or predicted to occur within the Hunter CMA subregion (OEH 2017a) (Appendix A). No threatened ecological communities listed under the TSC Act occur within the Project area.

4.2.5 Endangered populations

Five endangered plant populations listed under the TSC Act have previously been recorded within the Hunter CMA subregion (OEH 2017a) (see Appendix A).

No endangered populations were identified within the Project area during surveys and none are expected to occur given the geology, history of past clearing and disturbance and landscape context of the site.

4.2.6 Protected marine vegetation

No protected marine vegetation (including seagrass, mangroves and saltmarsh) or threatened aquatic ecological communities listed under the FM Act occurs within the Project area.

4.2.7 Groundwater dependent ecosystems

The Atlas of Groundwater Dependent Ecosystems (GDEs) (BOM 2016) maps known groundwater dependent ecosystems and ecosystems that potentially use groundwater. It shows ecosystems that interact with the subsurface expression of groundwater (including vegetation ecosystems) or the surface expression of groundwater (such as rivers and wetlands). The Atlas also shows the likelihood that landscapes are accessing water in addition to rainfall, such as soil water, surface water or groundwater. The Project area does not contain any vegetation types reliant upon groundwater, or mapped as having a high potential for being reliant on subsurface groundwater. No creeks in the immediate area are mapped as being reliant on the surface expression of groundwater. The nearest mapped potential GDE is a small patch of Grey mangrove low closed forest located approximately two kilometres to the east of the site in Throsby Creek.

4.3 Fauna species and habitat

4.3.1 Fauna species

During the field assessment, 14 fauna species were observed, comprising one amphibian (Eastern Dwarf Tree Frog), 12 birds and one introduced mammal (European Rabbit) (Appendix C).

The Project area is highly modified and contains exotic grassland, planted trees and shrubs, and areas of hardstand. Two distinct fauna habitat types were identified within the Project area:

- Exotic grassland and planted vegetation (groundcover and scattered shrubs/ trees)
- Derelict buildings

No native remnant vegetation, hollow-bearing trees, freshwater wetlands, creek lines or permanent ponds occur within the Project area.

All of the bird species identified were species that are widespread and commonly found in urban environments, including the Australian Magpie (*Cracticus tibiceri*), Eastern Rosella (*Platycercus eximius*) and Rainbow Lorikeet (*Trichoglossus moluccanus*). No reptiles were observed but piles of rubble may provide potential refuge and basking habitat for reptiles including small common garden skinks and possibly grassland snakes typical of disturbed urban sites (eg Red-Bellied Black Snake (*Pseudichis porphyriacus*), Eastern Brown Snake (*Pseudonaja textilis*). No evidence of ground-dwelling or arboreal mammals was recorded within the Project area. The Project area may provide habitat for the Brushtail Possum (*Trichosurus vulpecula*), although foraging and refuge habitat is limited.

Microchiropteran bats may occur in the Project area on occasion, including the following threatened species previously recorded in the locality:

- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing Bat)
- *Mormopterus norfolkensis* (Eastern Free-tailed Bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

Foraging habitat for these species is limited to exotic grassland with small areas of planted trees and shrubs. There are no obvious hollow-bearing trees but peeling bark and crevices on several stags and larger, older trees in the Project area may provide roost sites for tree-roosting species. It is likely however, that any microbats utilising habitat within the Project area, do so on a transient basis as part of a wider area of occupation.

The former residence building on-site in the south-west of the Project area would be removed. The listed local heritage items (Newcastle Gas Co. Office, and Pump house and fence) would be retained on-site. These derelict buildings within the Project area may provide diurnal roosting habitat for cave-dwelling species that also roost in buildings and other fabricated structures, but are unlikely to represent breeding habitat for these species.

Planted trees (such as *Morton Bay Figs, Brush Box and Eucalyptus* spp.) within the Project site may also provide a small amount of foraging habitat for the Grey-headed Flying-fox which is also commonly found in urban environments. The site does not however provide breeding habitat for this species and no roosts were observed during the field survey.

It is highly unlikely the site provides potential habitat for threatened amphibians, birds, reptiles arboreal or ground-dwelling mammals given the industrial setting of the area, historical clearing and disturbance and the lack of important fauna habitat features such as remnant native vegetation, creeklines, wetlands and hollow-bearing trees.

Exotic grassland and planted vegetation

Exotic vegetation dominates the Project area and is characterised by exotic grasses, noxious and environmental weeds, and scattered landscape plantings as described in Section 3.3.1 (Plate 3) and Figure 5-1. These areas provide marginal potential foraging habitat for common mobile fauna such as birds and sheltering habitat for common reptile species (Plate 4).

Two stags (dead trees) were identified within the Project area. These stags each had loose bark that may provide potential microbat roosting habitat (Plate 5) and Figure 5-1.

Plate 3 The Project area is dominated by exotic grasses, weeds and scattered landscape plantings.

Plate 4 Stockpiled debris within the disturbance footprint that may provide potential basking and refuge habitat for common reptiles

Plate 5 Stag within the disturbance footprint

Derelict buildings

Three derelict buildings occur within the Project area, which have been predominantly boarded up. There appear to be minimal gaps in the eaves or roofs of the two buildings in the northern portion of the site and these are therefore unlikely to provide potential microbat roosting habitat, with the Newcastle Gas Co. Office having been subject to restoration works in 2015. The former residence building closest to Styx Creek (on the south-western boundary) has also been boarded up, but there are gaps in the eaves and roof that may provide potential microbat roosting habitat (Figure 5-1 and Plate 7). This building is proposed for demolition as part of the Project.

When viewed in context of the urban and industrial nature of the site and surrounding area, and marginal foraging habitat in the surrounding area, there is a moderate potential for microbats to be utilising the site. In particular microbats may be utilising Styx Creek as a flyway to connect to other areas of more optimal foraging resources. Derelict buildings at the site may also be opportunistically used for roosting habitat, but are unlikely to be utilised for breeding.

Plate 6 Roofing of the derelict building fronting Clyde Street

Plate 7 Eves of the derelict former residence building on the south-western boundary (proposed for demolition)

4.4 Aquatic habitat

No freshwater wetlands, creek lines or permanent water bodies occur within the Project area.

Styx Creek occurs east of the Project area. The creek has been lined with concrete and forms part of the stormwater drainage system. This highly modified aquatic environment has very limited aquatic habitat values, does not constitute key fish habitat and wound not provide any habitat for threatened species listed under the FM Act (see Plate 8).

Plate 8 Styx Creek channel east of the Project area.

4.5 Conservation significance

4.5.1 Identification of candidate threatened species under the FBA

Ecosystem Credit Species

The credit calculator reports the suite of threatened fauna species that are predicted to be associated with ecosystem credits generated for the project. That is, the threatened fauna species that are predicted to use habitat within the vegetation types at the project site. As no native PCTs occur in the Project area, the credit calculator has not been applied to generate ecosystem credits for the project. Consequently, associated ecosystem credit threatened species have not been identified by the calculator and there is no offset requirement for ecosystem credit species in accordance with the FBA.

The desktop assessment identified 52 threatened fauna species (35 bird, two amphibians, one reptile and 14 mammal species) listed under the TSC Act previously recorded in the locality (OEH 2017a) (Appendix A). Based on the nature and condition of habitats within the Project area, the known habitat associations of species predicted to occur within the locality, and proximity of previous records, there is a moderate potential for five threatened microbats listed under the TSC Act to forage and/or roost at the site:

- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing Bat)
- *Mormopterus norfolkensis* (Eastern Free-tailed Bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

The site would not provide breeding habitat for any of these species.

The Grey-headed Flying-fox may also forage at the site when trees are flowering or fruiting but is unlikely to roost at the site. No other threatened fauna species are likely to occur due to the highly disturbed nature of the site and the absence of suitable habitat.

The Project is unlikely to have a significant impact on these threatened fauna species as discussed in Section 5.4.

4.5.2 Species credit species

Threatened species that cannot reliably be predicted to occur on a development site based on PCT, distribution and habitat criteria are identified by the Threatened Species Profile Database as species credit species. The credit calculator references geographic, vegetation and habitat data for the project site to generate a list of the species credit-type threatened species predicted to occur and requiring targeted survey.

A candidate species is not considered to be present on the development site where:

- After carrying out an assessment of the habitat components the assessor determines that the habitat is substantially degraded such that the particular species is unlikely to utilise the development site, or
- An expert report states that the species is unlikely to be present at the development site, or
- The species is a vagrant species and unlikely to use habitat on the development site, or
- Records of the species presence in relation to the location of the development site are at least 20 years old or, in the opinion of the assessor, have doubtful authenticity (OEH 2014)

As there is no Plant Community Types (PCTs) present on the site, no vegetation zones can be created for the site within the credit calculator and consequently no species credit species have been identified for the site.

Threatened bat species that have been identified as having potential to occur within the site are all eco-system predicted species and as no breeding habitat for any of these species is present within the site no species credits need to be generated for these species. No other species credit fauna species are considered likely to occur within the Project site.

Based on the nature and condition of habitats within the Project area, and the known habitat associations of species previously recorded or predicted to occur within the locality, no threatened flora are considered likely to occur naturally in the Project area due to the highly disturbed nature of the site and the absence of suitable habitat.

A single specimen of *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) which is listed as a vulnerable species under the TSC Act was identified within the Project area (refer Figure 5-1). This tree is likely to have been planted on site given that the Project area is well outside the natural distribution of the species and that Narrow-leaved Black Peppermints are a commonly planted street tree throughout the Newcastle LGA. As the specimen has been planted and is not part of a naturally occurring local population an offset in the form of species credits is not required.

4.5.3 Matters of national environmental significance

Desktop assessment

The following ecological matters protected by the EPBC Act (DEE 2017a) are known or predicted to occur in the locality:

- Flora species: 14

- Threated birds: five
- Threatened amphibians: two
- Threatened mammals: seven
- Threatened ecological communities: six
- Ramsar wetland: one

No world heritage properties occur within the locality.

A number of marine species (such as whales, sharks, dolphins and albatross) appear on the PMST search results (DEE 2017a). These species are not relevant to this assessment as marine habitats does not occur within or adjacent to the site or would be adversely impacted by the Project. Marine species are therefore not considered further in this report.

Threatened biota

No threatened ecological communities or threatened flora species listed under the EPBC Act occur or are likely to occur at the Project site. One threatened fauna species listed under the EPBC Act, the Grey-headed Flying-fox may forage at the site on occasion when trees are flowering/fruiting. The small number of planted trees that provide potential foraging habitat for the Grey-headed Flying-fox are unlikely to be important habitat for a local population of the species and the Project area does not provide suitable breeding or roosting habitat for this species.

Migratory species

The database searches identified 35 migratory fauna species (not including marine species such as whales, dolphins, turtles, sharks and albatross) listed under the EPBC Act as potentially occurring in the locality (DEE 2017a) (Appendix A).

Based on the nature and condition of habitats within the Project area, and the known habitat associations of species predicted to occur within the locality, no migratory species are likely to occur within the Project area.

Wetlands of international significance

The Project area is located approximately three kilometres downstream of the Hunter Estuary Wetlands Ramsar site. The Project will not have any direct or indirect impact on the Hunter Estuary Wetlands Ramsar site.

5. Impact assessment

5.1 Avoid and minimise impacts

The site is already highly modified with very limited habitat for most native biota. There is limited scope to avoid impacts due to site remediation requirements. Measures to minimise impacts on native fauna that may be utilising the site would be implemented such as inspections of the buildings in the project area for roosting microbats before works commence, focussing particularly on the former residence building prior to demolition. If microbats were found to be inhabiting these structures, a bat management plan would be prepared and implemented to minimise the potential for adverse impacts.

5.2 Overview of impacts

This section provides a description of the direct and indirect impacts of the Project, followed by an assessment of impacts on relevant threatened species and communities listed under the TSC Act, FM Act and EPBC Act.

5.2.1 Direct impacts

The Project would result in the loss of 5.8 ha of primarily exotic and planted vegetation that does not provide habitat for any naturally-occurring threatened flora species. A single planted specimen of *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) a vulnerable species listed under the TSC Act would be removed.

The vegetation in the Project area offers very limited foraging opportunities for fauna and in the context of the urban and industrialised nature of the site and surrounding area, the loss of this marginal foraging habitat is unlikely to substantially impact any local fauna populations which may opportunistically forage at the site as part of a wider network of habitats.

The Project would involve the removal of possible roost sites for microbats, including two stags (dead trees) with loose bark and trunk crevices and one of the three derelict buildings in the Project area. Two listed local heritage items (Newcastle Gas Co. Office, and Pump house and fence – both on the north-western boundary of the Project area) would be retained on-site, but are likely to be subject to at least some temporary indirect impacts such as noise and vibration during site remediation.

A number of planted trees would also be removed that when flower/fruit would provide potential foraging habitat for the Grey-headed Flying-fox.

Mitigation measures to minimise potential impact on roosting bats (if present) would include completion of a pre-demolition survey at the former residence building for microbats and if detected a bat management plan would be developed and implemented (refer to section 6.2).

5.2.2 Indirect impacts

Indirect impacts are likely to include the following:

- **Noise and vibration:** Noise and vibration impacts associated with the proposed remediation works may temporarily displace microbats if they are roosting in the retained derelict buildings within the Project area. Inspections of these buildings will be undertaken prior to works commencing in the Project area. If evidence of roosting microbats is detected, then measures would be incorporated into a bat management plan to minimise the potential for adverse impacts.

- **Sedimentation and erosion:** the Project has the potential to result in sedimentation and erosion within the Project area and adjoining areas through soil disturbance and construction activities. Sediment laden runoff to waterways can alter water quality and adversely affect aquatic life. Given the modified nature of drainage lines in adjacent areas and limited native vegetation, any potential impacts would be negligible. Regardless erosion and sedimentation controls would be implemented to prevent and site run off.
- **Pollution:** The Project has the potential to result in pollution and contaminated runoff, in particular as a result of hydrocarbon leaks or spills from vehicles or equipment used in construction as well as seepage of contaminates from contaminated soils excavated from site. This can reduce habitat condition and quality in adjacent vegetation or waterways. Given the modified nature of drainage lines in adjacent areas and limited native vegetation, the potential for impacts is negligible. Standard erosion and sedimentation controls would be implemented to manage any potential impacts from pollutants. A soil management plan would also be developed and implemented to manage contaminated soils within the site during the remediation process.
- **Introduction or spread of weeds:** Exotic flora species are already present within the Project area. The Project has the potential to increase the spread of exotic plants by introducing propagules into the nearby creek. Increased weed invasion can lead to decreased diversity of native flora, compromised structural integrity of native vegetation communities and a decrease in habitat quality for native fauna. Given the limited native vegetation in adjacent areas, and presence of weeds throughout the surrounding area, the potential for introduction or increases in weeds is low.

A construction environmental management plan (CEMP) would be prepared at the development stage and would contain measures to be implemented to avoid or minimise impacts arising from construction activities.

5.2.3 Key threatening processes

A key threatening process (KTP) is defined in the TSC Act (DEC 2005) as an action, activity or proposal that:

- Adversely affects two or more threatened species, populations or ecological communities
- Could cause species, populations or ecological communities that are not currently threatened to become threatened

Those potentially relevant to this Project are outlined in Table 5-1 below. Mitigation measures to limit the impacts of these KTPs are also provided.

LEGEND

- Project area
- Cleared / disturbed area
- *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) (Vulnerable under BC Act)
- Exotic grassland
- Planted woody vegetation/native shrubby regrowth
- Derelict building
- Stag

Paper Size A4

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Jemena Gas Networks (NSW) Ltd
Former Newcastle Gasworks (Clyde Street)
Remediation Project: Biodiversity Assessment Report

Job Number 22-17312
Revision 0
Date 13 Jul 2018

Vegetation and habitat resources

Figure 5-1

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

G:\22\17312\GIS\Maps\Deliverables\Biodiversity\2217312_B003_Vegetation_0.mxd

Data source: LPI: DCDB & DTDB 2012\Aerial Imagery, 2017. Created by: fmackay, tmorton

Table 5-1 Key threatening processes

KTP	Status	Comment
Invasion, establishment and spread of *Lantana camara*	TSC Act	*Lantana camara* is present in low abundance within the Project area. Remediation activities have the potential to spread *Lantana camara* within and surrounding the site, which could lead to further invasion of this species into surrounding areas. Weed control measures including decontamination of personnel and plant equipment prior to entering construction areas and establishment of appropriate sedimentation controls that would be developed as a sub plan to the CEMP. Appropriate measures to manage and dispose of *Lantana camara* would also be provided. Following the implementation of these measures, the Project would be unlikely to cause an increase the operation of this KTP.
Invasion of native plant communities by exotic perennial grasses	TSC Act	Exotic perennial grasses are present in high abundance within the Project area. Remediation activities have the potential to spread exotic perennial grasses within and surrounding the Project area. This could lead to the further invasion of this species into native plant communities. Weed control measures including decontamination of personnel and plant equipment prior to entering construction areas and the establishment of appropriate sedimentation controls would be developed as part of the CEMP. Following the implementation of these measures, the Project would be unlikely to cause an increase the operation of this KTP, with the Project area to be rehabilitated with a bitumen spray seal, surface skin only, across the entirety of the Project area and would not provide suitable habitat for weeds or other vegetation.
Removal of dead wood and dead trees	TSC Act	Two stags (dead trees) were identified within the Project area and would be removed by the Project. These stags do not contain hollows but do have loose bark that may potentially be utilised by microbats for roosting. The proposed remediation activities would require the removal of the stags.

5.3 Assessment of impacts with regards to the FBA

5.3.1 Areas not requiring assessment

An assessor is not required to assess areas of land on a development site without native vegetation unless the SEARs issued for the Project specifically require an assessment.

The Project area has been previously cleared of native vegetation and contains exotic grassland, planted trees and shrubs that do not comprise native vegetation within the meaning of the FBA. These areas are dominated by exotic species and comprise ‘cleared land’ according to the FBA and the BioBanking methodology (DECC, 2009).

These areas do not comprise native vegetation or a local occurrence of a TEC according to the FBA and so were not sampled with plot/transects and are not required to be assessed or offset under the FBA. A more detailed description of this vegetation and justification for the decision for no further assessment under the FBA is provided in Section 4.2.2.

The Project site also includes hardstand areas and three derelict buildings that clearly do not comprise native vegetation within the meaning of the FBA and do not require assessment.

5.3.2 Areas requiring assessment under the FBA

Areas of land that do not contain native vegetation must still be assessed for threatened species in accordance with Chapter 6 of the FBA.

As discussed in Section 4.2.1, a single specimen of the threatened flora species *Eucalyptus nicholii* has been planted in the Project area. This specimen occurs well outside of the species natural distribution and is not part of a naturally-occurring local population. Based on these considerations, this specimen is not of local conservation significance and its removal does not require offset. No other threatened flora species are likely to occur at the site (see Section 4.2.1). The Project would therefore have no impact on threatened flora species or their habitat.

As discussed in Section 4.2.2, no threatened fauna species that are species credit type species are likely to occur at the site. While several ecosystem credit species, including a number of threatened microchiropteran bats and the Grey-headed Flying-fox may occur in the disturbance footprint on occasion they are not associated with a native PCT and credits are not required to offset impacts on the exotic grassland and planted vegetation and derelict building in the Project area that provide possible habitat for these species. Furthermore as no breeding habitat exists for any of these species within the site then no species credits would be required.

An assessment of the likely significance of impacts of the Project has concluded that the Project is unlikely to have a significant adverse impact on any of the threatened species that occur or that could possibly occur in the Project area (see Section 5.4).

5.3.3 Impacts requiring further consideration under the FBA

Certain impacts on biodiversity values of a major project require further consideration by the consent or approval authority. These are impacts that are particularly complicated or severe. A decision will be made by the consent or approval authority on whether it is appropriate for these impacts to occur or whether modifications to the major project are required to avoid or minimise the impact.

Impacts that require further consideration include:

- Significant impacts on landscape features.
- Impacts on CEECs or impacts on EECs that are likely to significantly affect the persistence or viability of an EEC.
- Impacts on critical habitat or on threatened species that are likely to significantly affect the persistence or viability of a population of a threatened species.

If a major project includes an impact on biodiversity that requires further consideration it is recommended that a proponent discuss the impact with the NSW Department of Planning and Environment (DP&E) prior to lodging the EIS to avoid uncertainty and potential delays to project approval (OEH, 2014a).

The Project area comprises a highly modified and disturbed site and the Project would not have an impact on any landscape features or EECs/CEECs.

The Project would not affect any critical habitat and would result in the loss of a very small area of marginal habitat for a number of threatened microbats that may potentially occur. It would not threaten the persistence or viability of any local population of any threatened species. An assessment of the likely significance of impacts of the Project on threatened flora and fauna species known to occur or that may possibly occur on site on occasion has concluded that there is unlikely to be a significant impact on any threatened species (see Section 5.4 below).

5.3.4 Biodiversity credits

Due to the site containing exotic vegetation, planted trees and shrubs, and hardstand areas there are no biodiversity offsetting or species credit requirements under the FBA for this Project.

5.4 Assessments of significance pursuant to section 5A of the EP&A Act

Assessments of significance pursuant to section 5A of the EP&A Act (seven part tests) have been prepared for threatened microchiropteran bat species that may possibly occur in the Project area on occasion, including:

- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)
- *Mormopterus norfolkensis* (Eastern Free-tailed Bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

These assessments are presented in Appendix D. The Project was determined unlikely to have a significant effect on any of these microbat species as:

- The Project area contains only a small area of marginal potential foraging habitat for these species, largely comprising exotic grassland and planted landscape trees.
- The planted trees to be removed do not contain obvious hollows likely to be used as roost sites by microbats, the two isolated stags with cracking bark that will be removed are unlikely to provide important roosting habitat for a local microbat populations and only one of the three derelict buildings that may possibly be used as temporary roost sites will be removed.
- The Project would not act as a barrier to movement of microbats through the locality.
- The Project would not further fragment or isolate habitat for microbats.

An assessment of the likely significance of impacts of removing the individual *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) in the Project area has also been prepared (see Appendix D). The Project is unlikely to have a significant impact on a viable local population of this vulnerable species given:

- The Project area is outside the natural distribution of the species and no naturally occurring population occurs in the locality.
- This specimen in the disturbance footprint is likely to be planted as this species is a commonly planted street tree throughout the Newcastle LGA.

5.5 Matters of national environmental significance

No threatened ecological communities or threatened species listed under the EPBC Act are likely to occur in the Project area or be impacted by the Project. The Project would not have a significant impact on any threatened biota listed under the EPBC Act.

No migratory species listed under the EPBC Act (see Appendix A) are considered likely to be reliant on the Project area. No individual assessments of significance pursuant to the EPBC Act Significant Impact Guidelines (DotE 2013) have been prepared for migratory species as:

- The habitats recorded within the Project area do not qualify as ‘important habitat’ for migratory species as defined under the guidelines.

- There is no real chance or possibility that the Project will substantially modify, destroy or isolate an area of important habitat for migratory species.
- The Project would not result in an invasive species (that is harmful to the migratory species) becoming established in an area of important habitat for migratory species.
- The Project is not likely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

Based on the above considerations the Project is unlikely to impose a significant effect on any of the listed migratory fauna species predicted to occur within the locality.

6. Mitigation of Impacts

6.1 Overview

The Project would result in minimal direct impacts on native biota and their habitats within the Project area. There is limited potential for impacts on habitat in the study area during the longer-term operation of the Project as the site will remain vacant after capping with periodic monitoring to assess effectiveness of the remediation and ongoing stormwater management. Specific mitigation measures are recommended in Section 6.2 to minimise impacts on the natural environment and biodiversity values.

6.2 Mitigation measures

The Project will include the preparation of a Construction Environment Management Plan (CEMP), which will include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures, including the environmental impact mitigation measures outlined below. While some of these mitigation measures are relevant to other assessments completed as part of this EIS (e.g. Surface and Groundwater Assessment), they are included here as they are relevant to maintaining existing levels of habitat and biodiversity values associated with the Project area and adjacent areas.

In order to address the potential impacts of the Project on biodiversity, the mitigation measures outlined in Table 6-1 should be incorporated into the CEMP.

Table 6-1 Mitigation measures

Timing	Mitigation measures	Responsible party
Pre-remediation works	Ensure all workers are provided with an environmental induction prior to starting work on site. This would include information on the ecological values of the Project area and measures to be implemented to protect biodiversity, particularly focussing on potential microbat roosting habitat structures. A fauna management plan should be prepared prior to construction. This would detail fauna management protocols, including management of tree and stag removal and fauna handling. Inspection of the former residence building to be demolished in the south-west of the Project area and the two other buildings to be retained within the project area for signs of roosting bats, including nocturnal observations and anabat surveys to identify any bats emerging from the buildings to forage at dusk. If roosting bats are found to be present, a bat management plan, including in particular protocols for the demolition of the former residence building and to minimise indirect impacts on any microbats roosting in the two retained buildings (as applicable), would need to be incorporated into the CEMP.	Remediation contractor/ Site ecologist
Remediation Phase	Water should be applied to stockpile areas during windy conditions	Remediation contractor
	A Sediment and Erosion Control Plan will be incorporated in the CEMP and should contain detailed mitigation measures to reduce soil erosion and pollutant run-off into Styx Creek during all construction activities. These should include: • Installation of erosion and sediment control measures prior to any works • Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality • Stockpile management measures which minimise the potential for erosion and surface water runoff • Construction and maintenance of silt fences to capture and isolate any surface water runoff • Immediate removal offsite of excavated materials.	Remediation contractor
	Specific measures will be incorporated into the CEMP to minimise the potential for chemical spills and associated impacts on the adjacent Styx Creek These should include: • All chemicals must be kept in clearly marked and bunded areas • Regularly inspect vehicles and mechanical plant for leakage of fuel or oil • No re-fuelling of vehicles, washing of vehicles or maintenance of vehicles and plant to be undertaken within 20 metres of Styx creek	Remediation contractor

Timing	Mitigation measures	Responsible party
	A weed management sub-plan would be included within the CEMP, and would include a description of the following: • Mapping showing the type and location of weeds of concern (including priority weeds) within the Project area • A description of sensitive receivers (Styx Creek) adjacent to the Project area • Measures to prevent the spread of weeds, including hygiene procedures for equipment, footwear and clothing • Weed disposal protocols	Remediation contractor
Post remediation activities	Reinstatement of stabilised surfaces as quickly as practicable after construction	Remediation contractor

7. Biodiversity offset strategy

7.1 Areas requiring offset under the FBA

As discussed in Sections 3.3 and 5.3, vegetation at the Project area is not commensurate with a native Plant Community Type (PCT) nor a threatened ecological community, and does not contain species credit type threatened species or their habitats. As such, a biodiversity offset strategy prepared in accordance with the FBA is not required for the Project.

7.2 Offsetting requirements of the EPBC Act

The Project would not result in any significant impacts on any threatened or migratory biota listed under the EPBC Act and so there is no requirement for biodiversity offsets under the EPBC Act and associated offset policy (DSEWPaC, 2012).

8. Conclusion

This Biodiversity Assessment Report addresses the Secretary's Environmental Assessment Requirements and has been prepared in accordance with the Framework for Biodiversity Assessment (FBA) and NSW Offsets Policy for Major Projects to describe the biodiversity values present within the Project area, assess impacts of the Project and determine the requirement or otherwise for biodiversity credits to offset impacts of the Project.

The Project involves the remediation of the former Newcastle Gas Works site to reduce the risk to human health. The Project is located within land that has been historically cleared for industrial purposes.

The Project area is highly disturbed and dominated by exotic grassland with small areas of planted and native trees, hardstand areas and derelict buildings.

No threatened ecological communities listed under the TSC Act or the EPBC Act were identified within the Project area and the site does not provide suitable habitat for threatened flora species. One specimen of *Eucalyptus nicholii* (Narrow-leaved Black Peppermint) listed as vulnerable under the TSC Act was identified within the Project area and will be removed by the Project. This tree is likely to have been planted given that the Project area is well outside the natural distribution of the species and that Narrow-leaved Black Peppermints are a commonly planted street tree throughout the Newcastle LGA. Consequently, the single Narrow-leaved Black Peppermint is considered to have little to no conservation value.

The Project will involve the removal of 5.8 hectares of exotic and planted vegetation, which represent a small area of low quality foraging habitat for five threatened microbat species known to occur in the locality and for the Grey-headed Flying Fox. Two stags with peeling bark and derelict buildings also offer potential roosting habitat for threatened microbat species in the Project area. Only one of the buildings will be demolished. Pre-clearance surveys would be completed and if detected a bat management plan would be developed and implemented to minimise impacts to microbats.

The Project has been assessed in accordance with the FBA. The vegetation at the Project area is not commensurate with a native plant community type (PCT) nor a threatened ecological community, and does not contain species credit type threatened species or their habitats. As such, a biodiversity offset strategy prepared in accordance with the FBA is not required for the Project.

The unavoidable small-scale residual impacts imposed upon elements of the natural environment are not expected to impose a significant negative impact on threatened species, populations, communities (or their habitats) listed under the TSC Act. Assessments of significance pursuant to s5A of the EP&A Act have been prepared for threatened species listed under the TSC Act that occur or that may occur on occasion in the Project area. Given the modified nature of the Project area and the limited extent of marginal habitat to be removed, the Project is unlikely to have a significant impact on any threatened biota listed under the TSC Act.

The Project will not result in any significant impacts on any threatened or migratory biota listed under the EPBC Act and so there is no requirement for biodiversity offsets under the EPBC Act and associated offset policy (DSEWPaC, 2012).

The Project includes mitigation measures that will be implemented under a CEMP to reduce the potential for any adverse indirect impacts on proximate sensitive receiving environments as a result of changes to hydrology, water quality, weeds, pathogens and/or potential impacts to microbats.

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Appendices

Appendix A – Desktop Assessment of Threatened Biota

Databases Searched

- Office of Environment and Heritage (OEH) (2017a) Threatened species profiles- threatened ecological communities known or predicted to occur within the Hunter CMA subregion.
- Department of the Environment and Energy (DoEE) (2017a) EPBC PMST Online Search including a 10 km buffer.
- NSW Department of Primary Industries (DPI) (2016) 'Fish communities and threatened species distributions of NSW'
- Office of Environment and Heritage (OEH) (2017b) NSW Wildlife Atlas Search - threatened species results within a 10 km buffer
- Note: Marine species which are restricted to marine environments only (such as whales, dolphins, sharks and seabirds) are excluded from the Likelihood of Occurrence Table as there is no marine habitat in the Project area.

Likelihood of Occurrence

Matters considered in determining the likelihood of occurrence include:

- Known natural distributions including prior records (database searches) and site survey results.
- Geological/ soil preferences.
- Specific habitat requirements (e.g. aquatic environs, seasonal nectar resources, tree hollows etc.).
- Climatic considerations (e.g. wet summers; snow fall).
- Home range size and habitat dependence.
- Topographical preferences (e.g. coastal headlands, ridgetops, midslopes, gilgai, wetlands).

The likelihood of occurrence scale is defined in Table A-1.

Table A-1 Likelihood of occurrence scale

Scale	Description
Known	Species known to occur within the site (e.g. breeding and foraging habitat; foraging habitat; movement corridors). Detected on or immediately adjacent to the site.
High	Presence of high value suitable habitat (e.g. breeding and foraging habitat; important movement corridors). Not detected.
Moderate	Presence of medium value suitable habitat (e.g. disturbed breeding conditions; constrained foraging habitat; movement corridors). Not detected.
Low/Unlikely	Presence of low value suitable habitat (e.g. disturbed conditions; isolated small habitat area; fragmented movement corridors). Not detected.
None	No suitable habitat or corridors linking suitable habitat present. Not detected.

Table A-2 Threatened biota known or predicted from the locality, habitat association and likelihood of occurring within the site

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Threatened Ecological Communities						
Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions		EEC	CE	Occurs on Permian sediments in the Hunter Valley. Typically forms a woodland dominated by *Eucalyptus crebra*, *Brachychiton populneus subsp. populneus* and *Eucalyptus moluccana*. A shrub layer may also be present and common shrub species include *Notelaea microcarpa var. microcarpa*, *Breynia oblongifolia, Bursaria spinosa subsp. spinosa, Cassinia quinquefaria* and *Dodonaea viscosa*. Ground cover can be moderately dense to dense, and consist of numerous forbs and grass species, and a small number of ferns, sedges and twiners.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Central Hunter Ironbark - Spotted Gum - Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions		EEC	CE	Generally occurs on Permian sediments in the Hunter Valley. Typically forms an open forest to woodland *dominated by Eucalyptus crebra, Corymbia maculata* and *Eucalyptus moluccana*. A sparse layer of small trees may be present in some areas, typically including *Allocasuarina luehmannii* or *Acacia parvipinnula*. The shrub layer is typically sparse or absent in some cases, through to moderately dense. Ground cover can be sparse to moderately dense, and consists of numerous forbs, a few grass species, and a limited number of ferns, sedges or other herbs.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		EEC	VEC	Coastal Saltmarsh occurs on the landward side of mangrove stands in intertidal zones along the shores of estuaries and lagoons that are permanently or intermittently open to the sea. This community is characterised by *Baumea juncea, Juncus kraussii, Sarcocornia quinqueflora, Sporobolus virginicus, Triglochin striata, Isolepis nodosa, Samolus repens, Selliera radicans, Suaeda australis* and *Zoysia macrantha*, with occasional scattered mangroves occurring throughout the saltmarsh. Saltpans and tall reeds may also occur. This community occurs in the intertidal zone along the NSW coast.	Predicted to occur within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.		EEC	-	Freshwater Wetlands on Coastal Floodplains occur in coastal areas subject to periodic flooding in which standing fresh water persists for at least part of the year in most years. Typically occurring on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes, it may also occur in backbarrier landforms where floodplains adjoin coastal sandplains, generally below 20 m elevation on level areas. Structure and composition of the community varies spatially and temporally depending on the water regime, though is usually dominated by herbaceous plants and has few woody species.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions		EEC	-	Generally occurs on floodplains and associated floodplain rises on alluvial soils along the Hunter River and tributaries. The community typically forms a tall woodland. It has been recorded from the local government areas of Maitland, Muswellbrook, Singleton, and Upper Hunter but may occur elsewhere within the Sydney and NSW North Coast Bioregions. Typically forms a tall to very tall (18-35 m) woodland. Stands on major floodplains are generally dominated by Eucalyptus camaldulensis (River Red Gum), often as a sole dominant canopy species. Shrubs are generally very sparse or absent. There are many dominant groundcover species, such as *Cynodon dactylon, Alternanthera denticulata, Austrostipa verticillata, Dichondra repens,* and *Glycine tabacina*. This EEC is known to contain an endangered population of *Eucalyptus camaldulensis.*	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions		EEC	-	Hunter Lowland Redgum Forest is an open structure forest. Characteristic canopy species include *Eucalyptus tereticornis* and *E. punctata*. Frequently occurring species include *Angophora costata, Corymbia maculata, E. crebra and E. moluccana*. Mid-storey stratum is open and sparse, characterised by species such as *Breynia oblongifolia, Leucopogon juniperinus, Daviesia ulicifolia* and *Jacksonia scoparia*. The ground cover comprises grasses and herbs. Occurring from Muswellbrook to the Lower Hunter in the Sydney Basin and North Coast bioregions, it has been recorded from the Maitland, Cessnock, Port Stephens, Muswellbrook and Singleton LGAs, though may occur elsewhere in these bioregions.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion		VEC		Hunter Valley Footslopes Slaty Gum Woodland mainly occurs on the southern side of the Hunter Valley from near Bulga to the Bylong/Goulburn River National Park area. It occurs on colluvial soils on exposed footslopes associated with the interface between Triassic Narrabeen sandstones and Permian sediments. Hunter Valley Footslopes Slaty Gum Woodland is known to occur in Singleton, Muswellbrook and Upper Hunter LGAs, and may occur in the Mid-western Regional LGA.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions		EEC	-	Hunter Valley Vine Thicket has a highly restricted geographic distribution in the central Hunter Valley. The community occurs mostly as patches of less than 10 ha, with a few larger patches exceeding 100 ha. Approximately 85% of the pre-European distribution of the community remains. The largest occurrence is at Brushy Hill adjacent to Glenbawn Dam, north east of Scone. The only stand known to occur in a conservation reserve is at Mt Dangar within the Goulburn River National Park. Hunter Valley Vine Thicket has been recorded from the local government areas of Muswellbrook, Singleton, and Upper Hunter but may occur elsewhere within the Sydney Basin Bioregion and NSW North Coast Bioregion.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Hunter Valley Weeping Myall Woodland of the Sydney Basin Bioregion		EEC	CEEC	This Woodland community ranges from a dense to open tree canopy to about 15 m tall, depending on disturbance and regrowth history. This woodland is dominated by *Acacia pendula*, with *Eucalyptus crebra*, *A. salicina* and/or trees within the *A. homalophylla A. melvillei* complex also occurring. Understorey species may or may not be present, and can include *Canthium buxifolium*, Dodonaea viscosa, *Geijera parviflora*, *Notelaea microphylla var. microphylla* and *Senna zygophylla* as well as a dense to sparse ground-layer comprised of grasses and herbs. This community only occurs in the Muswellbrook and Singleton LGAs, however may occur elsewhere in the Upper Hunter LGA within the Brigalow Belt South bioregion. A section of this community occurring in the brown clay soil at Jerry's Plains in the Hunter Valley is listed as Critically Endangered under the Commonwealth listing.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Kurri Sand Swamp Woodland in the Sydney Basin Bioregion		EEC	-	Known to occur within the Kurri Kurri- Cessnock area of the lower Hunter, on soils derived from poorly-drained Tertiary sand deposits. It is a low woodland or heathland rarely higher than 15 m with a shrubby understorey. Dominant canopy species include *Eucalyptus parramattensis subsp decadens* and *Angophora bakeri*.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Lower Hunter Valley Dry Rainforest in the Sydney Basin and NSW North Coast bioregions		VEC	-	Lower Hunter Valley Dry Rainforest mainly occurs on the Barrington footslopes along the northern rim of the Hunter Valley Floor, where it occupies gullies and steep hillslopes with south facing aspects. It is also known from south of the Hunter River at Mt Bright and Mt View. Lower Hunter Valley Dry Rainforest has been recorded from the local government areas of Cessnock, Maitland and Port Stephens, and likely to occur or have occurred in Muswellbrook, Singleton, Upper Hunter and Dungog LGAs.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Littoral Rainforest in the NSW North Coast, Sydney Basin and SE Corner Bioregions		EEC	CEEC	Littoral Rainforest is generally a closed forest, the structure and composition of which is strongly influenced by its proximity to the ocean. Plant species of this community are predominantly rainforest species, with vines potentially comprising a major component of the canopy. The canopy layer is dominated by rainforest species, with scattered emergent individuals of sclerophyll species, such as *Angophora costata, Banksia integrifolia, Eucalyptus botryoides* and *Eucalyptus tereticornis* also occurring in many stands. There is considerable floristic variation between stands with localised variants occurring in some regions. Littoral Rainforest occurs only on the coast and is found in the NSW North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion.	Predicted to occur within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion		EEC	-	Restricted to an 52eolian. 65 x 35 km area centred on Cessnock-Beresford in the central and lower Hunter Valley. Occurs on Permian geology and is strongly associated with yellow podsolic and solodic soils of the Lower Hunter Aberdare, Branxton and Neath landscapes. Undisturbed remnants are typically open forests, but may occur as woodland or dense sapling thickets if disturbed. The canopy is dominated by *Corymbia maculata* and *Eucalyptus fibrosa*, with a shrub layer marked by *Acacia parvipinnula*, *Daviesia ulicifolia, Bursaria spinosa, Melaleuca nodosa* and *Lissanthe strigosa* and a diverse understorey.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Lowland Rainforest of Subtropical Australia		EEC	CEEC	Occurs from Maryborough in Queensland to the Clarence River (near Grafton) in New South Wales (NSW) (DSEWPAC 2011). Occurs on basalt and alluvial soils, including sand and old or elevated alluvial soils as well as floodplain alluvia (DSEWPAC 2011). Typically there is a relatively low abundance of species from the genera Eucalyptus, Melaleuca and Casuarina. Buttresses are common as is an abundance and diversity of vines. (DSEWPAC 2011).	Community may occur within 10 km (DEE 2017)	Does not occur. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions		EEC	-	This community is found on the river flats of the coastal floodplains and is characterised by a tall open canopy layer of eucalypts, up to or exceeding 40 m in height. Though composition varies considerably, characteristic tree species include *Eucalyptus tereticornis, E. amplifolia, Angophora floribunda* and *A. subvelutina. Eucalyptus baueriana and E. botryoides. E. saligna* and *E. grandis* may occur north of Sydney. *Melaleuca decora, M. styphelioides, Backhousia myrtifolia, Melia azaderach, Casuarina cunninghamiana* and *C. glauca* may also occur.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Swamp Oak Floodplain forest of the NSW North Coast, Sydney basin and South East Corner Bioregions		EEC	-	Swamp Oak Floodplain is found on coastal floodplains of NSW. It has a dense to sparse tree layer dominated by Swamp Oak. Lilly Pilly (*Acmena smithii*), Cheese Trees (*Glochidion* spp.) and Paperbarks (*Melaleuca* spp.) may be present. Tree diversity decreases with latitude, and Melaleuca ericifolia is the only abundant tree in this community south of Bermagui. The understorey is characterised by frequent occurrences of vines, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. Varying salinity levels alter groundcover species	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Swamp Sclerophyll forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions		EEC	-	Swamp Sclerophyll Forest on Coastal Floodplains is characterised by an open to dense tree layer of eucalypts and paperbarks, with trees up to or higher than 25 m. This community includes areas of fern land and tall reed or sedge land, where trees are sparse or absent	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
Sydney Freshwater Wetlands in the Sydney Basin Bioregion		EEC	-	Occurs on sand dunes and low-nutrient sandplains along coastal areas in the Sydney Basin bioregion. It is known from the Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Woollahra, Waverley, Botany, Rockdale, Randwick, Sutherland and Wollongong local government areas, but is likely to occur elsewhere within the bioregion. Has been extensively cleared and filled and remnants are often small and disturbed. Largely restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplains such as those of the Warriewood and Tuggerah soil landscapes.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Warkworth Sands Woodland of the Sydney Basin Bioregion		CEEC	-	Warkworth Sand Woodland occurs on Aeolian sand deposits south of Singleton in the Hunter Valley and is confined to a small area near Warkworth, about 15 km south-west of Singleton in the Hunter Valley. Only approximately 800 hectares of Warkworth Sands Woodland remains, none of which occurs within a conservation reserve. It is currently known to occur only in the Singleton LGA, but may occur elsewhere in the Sydney Basin Bioregion.	Occurs within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland		EEC	-	White Box Yellow Box Blakely's Red Gum Woodland is an open woodland or forest community, and is characterized by White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*). Intact sites contain a high diversity of plant species, including dominant and additional tree species, shrubs, climbers, grass species and a high diversity of herbs. Intact stands that contain diverse upper and mid-storeys and groundlayers are rare. Modified sites include the following areas where the main tree species are present ranging from an open woodland formation to a forest structure, with the groundlayer predominantly being composed of exotic species. On sites where the trees have been removed, only the grassy groundlayer and some herbs remain. The Commonwealth listing of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland differs slightly from the NSW listing. Areas that are part of the listed ecological community must have either an intact tree layer and predominately native ground layer or an intact native ground layer with a high diversity of native plant species but no remaining tree layer. Box-Gum Woodland is found from the Queensland border in the north, to the Victorian border in the south. It occurs in the tablelands and western slopes of NSW.	**Occurs** within Hunter CMA subregion (OEH 2017)	Does not occur. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Endangered Populations						
Acacia pendula – endangered population	Weeping Myall population in the Hunter catchment	EP	-	Within the Hunter catchment the species typically occurs on heavy soils, sometimes on the margins of small floodplains, but also in more undulating locations.	Occurs within Hunter CMA subregion (OEH 2017)	Unlikely. No suitable habitat present within site.
Dromaius novaehollandiae – endangered population	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	EP	-	On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. The population is now isolated and largely restricted to coastal and near-coastal areas between Ballina – Evans Head and Red Rock. There have also been some recent records from the Port Stephens area. The population of Emus in the NSW North Coast Bioregion and Port Stephens LGA is of significant conservation value as the last known population in northern coastal NSW.	Occurs within Hunter CMA subregion (OEH 2017)	Unlikely. No suitable habitat present within site.
Eucalyptus camaldulensis – endangered population	River Red Gum population in the Hunter Catchment	EP	-	May occur with *Eucalyptus tereticornis*, *Eucalyptus melliodora*, *Casuarina Cunninghamiana subsp. Cunninghamiana* and *Angophora floribunda.* Most of the occurrences are on private land and there are no known occurrences in conservation reserves. Prior to European settlement, it is likely that the species formed extensive stands of woodland and open woodland on the major floodplains of the Hunter and Goulburn rivers, especially in areas where water impoundment occurs after flood. Since settlement, most of the floodplains have been cleared of woody vegetation. Flood mitigation works now prevent most minor floods from inundating floodplains. These flow changes, coupled with the clearing of native vegetation, have greatly reduced the extent of habitat favourable to the River Red Gum in the Hunter catchment.	Occurs within Hunter CMA subregion (OEH 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Leionema lamprophyllum subsp. *obovatum* – endangered population	*Leionema lamprophyllum* subsp. *obovatum* – endangered population in the Hunter catchment	EP	-	*Leionema lamprophyllum subsp. obovatum* occurs in dry eucalypt forest on exposed rocky terrain. The Hunter Catchment population is considered to be highly genetically isolated due to the distance to the nearest recorded occurrence of this taxon, and the lack of specialised mechanisms for long distance dispersal of seed or pollen. The total number of mature individuals of *L. lamprophyllum subsp. obovatum* in the Hunter Catchment population is estimated to be very low with only 4 individuals currently known. The Hunter Catchment population occurs near Pokolbin, where it is found on a rocky cliff line in a dry eucalypt forest.	Occurs within Hunter CMA subregion (OEH 2017)	Unlikely. No suitable habitat present within site.
Cymbidium canaliculatum population in the Hunter Catchment	*Cymbidium canaliculatum* population in the Hunter Catchment	EP	-	The *Cymbidium canaliculatum* population typically grows in the hollows, fissures, trunks and forks of trees in dry sclerophyll forest or woodland. It usually occurs singly or as a single clump, which can form large colonies on trees, between two and six metres from the ground. Within the Hunter Catchment, *Cymbidium canaliculatum* is most commonly found in *Eucalyptus albens* (White Box) dominated woodlands, much of which may constitute the EEC 'White Box Yellow Box Blakely's Red Gum Woodland'. In NSW the species is restricted to the north-eastern quarter of the State, occurring chiefly in inland districts and north of the Hunter River, through the north western slopes, northern tablelands and north coast into south-eastern Queensland.	Occurs within Hunter CMA subregion (OEH 2017)	Unlikely. No suitable habitat present within site.
Diuris tricolor – endangered population	Pine Donkey Orchid population in the Muswellbrook local government area	EP	-	*Diuris tricolor* is found in sclerophyll woodland and derived grassland on flats or small rises, on a range of substrates including sandy or loamy soils. The population of *Diuris tricolor* in the Muswellbrook Local Government Area, in the upper Hunter Valley, comprises a number of occurrences, ranging from a few scattered individuals to a few thousand plants. The area of occupancy of the population is less than 50 km^2. Therefore, the geographic distribution of the population is estimated to be highly restricted.	Occurs within Hunter CMA subregion (OEH 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Threatened plants						
Allocasuarina defungens	Dwarf Heath Casuarina	E	E	Occurs only in NSW, from the Nabiac area, north-west Forster to Byron Bay, NSW. Grows mainly in tall heath on sand but can also occur on clay soils/sandstone (OEH 2012)	Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	Occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences not well defined. Grows mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with *Cryptostylis subulata* and *Cryptostylis erecta*. Soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. Flowers November-February.	Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.
Diuris praecox	Rough Double Tail	V	V	This species is known to occur on hills and slopes of near-coastal districts in open forests that have a grassy to fairly dense understorey. This species flowers during winter and is only detectable during the flowering season. It has a restricted distribution between Ourimbah to Nelson Bay.	Recorded within 10 km (OEH 2017). Nearest records occur within 10 km to the north west in New Lambton. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Eucalyptus camfieldii	Camfield's Stringybark	V	V	This species occurs on poor coastal country in shallow sandy soils overlying Hawkesbury sandstone often in coastal heath, mostly on exposed sandy ridges. Stands usually occur near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of Narrow-leaved Stringybark (*E. oblonga*), Brown Stringybark (*E. capitellata*) and Scribbly Gum (*E. haemastoma*).	Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally in conservation reserves. Planted as urban trees, windbreaks and corridors.	Recorded within the site	One planted individual recorded within the site

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Eucalyptus parramattensis subsp *decadens*	Earp's Gum	V	V	This woodland tree generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey and also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant. There are two separate meta-populations of the tree: The Kurri Kurri meta-population is bordered by Cessnock—Kurri Kurri in the north and Mulbring—Abedare in the south. Large aggregations of the sub-species are located in the Tomalpin area. The Tomago Sandbeds meta-population is bounded by Salt Ash and Tanilba Bay in the north and Williamtown and Tomago in the south. In the Kurri Kurri area, Very little is known about the biology or ecology of this species, apart from the flowering period which is from November to January. Propagation mechanisms are currently poorly known while seed dispersal is likely to be effected by wind and animals.	Predicted within 10 km (DEE 2017). Nearest records occur 5 km to the north east near Fern Bay.	Unlikely. No suitable habitat present within site.
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V	V	The habitat for this species are broad, and are known to occur in areas supporting heath, shrubby woodland and forest on light clay or sandy soils, and often in disturbed areas such as on the fringes of tracks. It has been known to flower over two periods throughout the year, July to December and April to May.	Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.
Grevillea shiressii		V	-	Known from only 2 populations near Gosford (at Mooney Mooney Creek and Mullet Creek). Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils.	Recorded within 10 km (OEH 2017). Nearest records occur within 2 km to the south in Mereweather.	Unlikely. No suitable habitat present within site.
Melaleuca biconvexa	Biconvex Paperbark	V	V	Scattered, disjunct populations in coastal areas from Jervis Bay to Port Macquarie, with most populations in the Gosford-Wyong areas. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Recorded within 10 km (OEH 2017). Nearest records occur 4 km to the south west near Adamstown Heights.	Unlikely. No suitable habitat present within site.
Muehlenbeckia costata	Scrambling Lignum	V	-	This species is mainly found in Mostly in rocky, higher-altitude sites following disturbance such as fire or clearing for power lines.	Recorded within 10 km (OEH 2017). Nearest records occur within 4 km to the south west in Glenrock State Conservation Area.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Phaius australis	Southern Swamp Orchid	E	E	Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Grows in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Pterostylis gibbosa	Illawarra Greenhood	E	E	Known from a small number of populations in the Illawarra, Nowra and Hunter regions. First collected in western Sydney. Only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth. Grows in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by *Eucalyptus tereticornis, E. longifolia* and *Melaleuca decora*. Near Nowra, the species grows in an open forest of *Corymbia maculata, E. tereticornis* and *E. paniculata*. In the Hunter region, the species grows in open woodland dominated by *E. crebra, E. tereticornis* and *Callitris endlicheri*.	Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.
Pultenaea maritima	Coast Headland Pea	V	-	Occurs in New South Wales and Queensland. Within NSW, the species has been recorded from Newcastle north to Byron Bay on 16 headlands. The species occurs in grasslands, shrublands and heath on exposed coastal headlands.	Recorded within 10 km (OEH 2017). Nearest records occur 2 km to the east in Carrington.	Unlikely. No suitable habitat present within site.
Rulingia prostrata	Dwarf Kerrawang	E	E	In NSW occurs as individual plants at Penrose State Forest, Rose Lagoon and Tallong, and small populations near the Corang River, and at the Tomago sand beds near Newcastle. Grows on sandy, sometimes peaty soils in a variety of habitats.	Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.
Rutidosis heterogama	Heath Wrinklewort	V	V	Recorded from near Cessnock to Kurri Kurri with an outlying occurrence at Howes Valley. On the Central Coast it is located north from Wyong to Newcastle. There are north coast populations between Wooli and Evans Head in Yuraygir and Bundjalung National Parks. It also occurs on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes (OEH, 2014). Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides (OEH, 2014).	Recorded within 10 km (OEH 2017). Nearest records occur 2 km to the west in Carrington.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Streblus pendulinus	Siah's Backbone	-	E	Siah's Backbone occurs from Cape York Peninsula to Milton, south-east New South Wales, as well as Norfolk Island. Siah's Backbone is found in warmer rainforests, chiefly along watercourses. The species grows in well-developed rainforest, gallery forest and drier, more seasonal rainforest.	Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Occurs in narrow coastal strip from Bulahdelah to Conjola State Forest. Grows in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas, often in remnant littoral or gallery rainforests.	Recorded within 10 km (OEH 2017). Nearest records occur 4 km to the south west near Adamstown Heights. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Tetratheca juncea	Black-eyed Susan	V	V	Regarded as extinct within the Sydney area, current range from Wyong north to Bulahdelah and inland 50 km to edge of Sugarloaf Range. Occurs predominately in areas of over 1000 mm annual rainfall, within dry sclerophyll forest, and sometimes heath and moist forest, with a preference for Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland.	Recorded within 10 km (OEH 2017). Nearest records occur 2 km to the east in Carrington.	Unlikely. No suitable habitat present within site.
Zannichellia palustris	Pond Weed	E	-	This species of semi-submerged aquatic plant occurs in fresh or slightly saline stationary or slowly flowing water in the lower Hunter region of NSW. In NSW the species behaves as an annual, dying back each summer. Flowering occurs during warm months.	Recorded within 10 km (OEH 2017). Nearest records occur 2 km to the east in Carrington.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Threatened and Migratory fauna species						
Birds						
Actitis hypoleucos	Common Sandpiper	-	M	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. Generally the species forages in shallow water and on bare soft mud at the edges of wetlands. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves or on artificial structures.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Anseranas semipalmata	Magpie Goose	V	-	This species of water bird is found in shallow wetlands containing dense rushes or sedges, and nearby dry land used for grazing. It occurs across most of NSW. It feeds on grasses, bulbs and rhizomes and roosts in tall vegetation within wetland areas. Breeding is strongly influenced by rainfall and water levels, and occurs predominately in monsoonal areas. Nests are formed in trees over deep water.	Recorded within 10 km (OEH 2017). Nearest records occur 4 km north on the northern side of the Hunter River (Ash Island).	Unlikely. No suitable habitat present within site.
Anthochaera phrygia	Regent Honeyeater	CE	E, M	This species inhabits dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes. This species breeds in only three known key areas: the Capertee Valley and the Bundarra-Barraba region in NSW and Chiltern-Albury in Victoria. In NSW they are confined to the two main breeding areas and surrounding fragmented regions. Non-breeding flocks are sporadically seen in coastal areas, foraging in flowering Spotted Gum and Swamp Mahogany forests, presumably in response to drought or resource availability.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Apus pacificus	Fork-tailed Swift	-	M	Non- breeding, and almost exclusively aerial while in Australia. Occurs over urban and rural areas as well as areas of native vegetation. Recorded in all regions in NSW. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide.	Predicted within 10 km (DEE 2017)	Low. Suitable aerial habitat present within site and species may occasionally fly over site as part of a wider area of occupation.
Ardea alba	Great Egret	-	M	This species of wetland bird occurs in a variety of habitats including marshes, swamps, river margins, lake shorelines, flooded grasslands, sea-grass flats, mangrove swamps, coastal lagoons, and offshore coral reefs. Feeds in shallow to moderately deep water, on shore next to the water, or on dry ground primarily on fish, insects and shrimp.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Ardea ibis	Cattle Egret	-	M	Occurs across NSW. Principal breeding sites are the central east coast from Newcastle to Bundaberg. Also breeds in major inland wetlands in north NSW (notably the Macquarie Marshes). Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. Uses predominately shallow, open and fresh wetlands with low emergent vegetation and abundant aquatic flora. Sometimes observed in swamps with tall emergent vegetation and commonly use areas of tall pasture in moist, low-lying areas.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Arenaria interpres	Ruddy Turnstone	-	M	In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. Mainly forages between lower supralittoral and lower littoral zones of foreshores, from strand-line to wave-zone. Roosts on beaches, above the tideline, among rocks, shells, beachcast seaweed or other debris. They have also been observed roosting on rocky islets among grassy tussocks, and on mudflats and sandflats.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Botaurus poiciloptilus	Australasian Bittern	E	E	This species favours permanent freshwater wetlands with tall dense reedbeds particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.) with adjacent shallow, open water for foraging. It is widespread but uncommon and may be found over most of NSW except the far north-west. It hides during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails.	Recorded within 10 km (OEH 2017). Nearest records occur within 4 km to the north on Ash Island. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Burhinus grallarius	Bush Stone-curlew	E	-	This species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber and general lack of shrubby understorey, or in structurally similar tidal and estuarine habitats near the coast. Generally, the species is not found on the escarpments but at lower elevations on the coast or west of the Great Divide, typically in areas of above 300 mm annual rainfall. Largely nocturnal, being especially active on moonlit nights, it feeds on insects and small vertebrates, such as frogs, lizards and snakes and will forage in a range of habitats including irrigated/pasture improved paddocks, playing fields, waste disposal facilities, mangroves, saltmarsh, mudflats, swamps and woodland remnants. Nests are on the ground in a scrape or small bare patch, often in cleared or disturbed areas without native vegetation	Recorded within 10 km (OEH 2017). Nearest record occurs within 2 km to the east near Cooks Hill.	Unlikely. No suitable habitat present within site.
Calidris acuminata	Sharp-tailed Sandpiper	-	M	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in salt works and sewage farms. They use flooded paddocks, sedge lands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Calidris canutus	Red Knot	-	M	The Red Knot is common in all the main suitable habitats around the coast of Australia (Barrett et al. 2002b). Not found in significant numbers on coast on NSW. In Australasia, the Red Knot mainly inhabits intertidal mudflats, sand flats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. Occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and salt works, but rarely use swamps or inland lakes.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Calidris ferruginea	Curlew Sandpiper	E	M	This species mainly occurs on intertidal mudflats in sheltered coastal areas. It forages on mudflats and nearby shallow water. Widespread east of the Great Divide, especially in coastal regions of NSW.	Recorded within 10 km (OEH 2017). Nearest record occurs within 3 km north east near Carrington. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Calidris ruficollis	Red-necked Stint	-	M	It is distributed along most of the Australian coastline with large densities on the Victorian and Tasmanian coasts. The Red-necked Stint has been recorded in all coastal regions, and found inland in all states when conditions are suitable. In Australasia, the Red-necked Stint is mostly found in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats. Occasionally they have been recorded on exposed or ocean beaches. They also occur in salt works and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland. They sometimes use flooded paddocks or damp grasslands.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Calidris tenuirostris	Great Knot	V	M	This species breeds in Siberia. In Australia, it occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats where individuals forage for invertebrates.	Recorded within 10 km (OEH 2017). Nearest record occurs within 4 km to the east at Newcastle East.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Charadrius bicinctus	Double-banded Plover	-	M	Found in both coastal and inland areas. During the non-breeding season, it is common in eastern and southern Australia. Found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Charadrius leschenaultii	Greater sand-plover	V	M	This species is almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. It roosts during high tide on sandy beaches and rocky shores; begins foraging activity on wet ground at low tide, usually away from the edge of the water.	Recorded within 10 km (OEH 2017). Nearest records occur within 3 km to the east at Newcastle East. Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.
Charadrius mongolus	Lesser Sand-plover	V	M	This species breeds in central and north-eastern Asia and migrates south in Winter. In Australia it is found on the entire coastline but is most common in the Gulf of Carpentaria and along the east coast of Qld and northern NSW. Rarely recorded south of the Shoalhaven, and internationally important sites in NSW include the Hunter River estuary, Tuggerah Lakes and the Clarence River estuary. Nationally important sites in NSW include the Richmond River estuary, Shoalhaven River estuary and Botany Bay. In NSW the species is almost entirely coastal and favours the beaches of sheltered bays, mudflats, harbours and lagoons. It forages for crustaceans, molluscs and worms on wet ground at low tide, usually away from the water's edge.	Recorded within 10 km (OEH 2017). Nearest records occur within 3 km to the east at Newcastle East. Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Circus assimilis	Spotted Harrier	V	-	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. The Spotted Harrier occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods). It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. The species builds a stick nest in a tree and lays eggs in spring (or sometimes autumn).	Recorded within 10 km (OEH 2017). Nearest records occur within 4 km to the north on Ash Island.	Unlikely. No suitable habitat present within site.
Daphoenositta chrysoptera	Varied Sittella	V	-	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands, with a nearly continuous distribution in NSW from the coast to the far west. It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. It builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	Recorded within 10 km (OEH 2017). Nearest records occur within 1 km to the east at Newcastle West.	Unlikely. No suitable habitat present within site.
Dasyornis brachypterus	Eastern Bristlebird	E	E	Inhabits low dense vegetation in a broad range of habitat types including sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland, and rainforest. It occurs near the coast, on tablelands and in ranges. Found in habitats with a variety of species compositions, but are defined by a similar structure of low, dense, ground or understorey vegetation.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Primarily inhabits permanent freshwater wetlands and surrounding vegetation including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters. Will also forage in inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water. This species breeds during summer, nesting in or near a freshwater swamp.	Recorded within 10 km (OEH 2017). Nearest records occur within 3 km to the south east near Mereweather Heights.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Epthianura albifrons	White-fronted Chat	V	-	This species occurs from southern Queensland to Western Australia and down to Tasmania, mostly in temperate to arid climates and very rarely in sub-tropical areas. It is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands. Along the coast they are found in estuarine and marshy habitats with vegetation <1 m tall, and in open grasslands and areas bordering wetlands. Inland, they are often observed in grassy plains, saltlakes and saltpans along waterway margins.	Recorded within 10 km (OEH 2017). Nearest records occur 2 km to the north east at Stockton.	Unlikely. No suitable habitat present within site.
Gallinago hardwickii	Latham's Snipe	-	M	Occurs along the coast and west of the great dividing range. Non breeding visitor to Australia. Inhabit permanent and ephemeral wetlands up to 2000 m ASL. Typically in open, freshwater wetlands with low, dense vegetation (incl. swamps, flooded grasslands and heathlands). Can also occur in saline/brackish habitats and in modified or artificial habitats close to human activity.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Glossopsitta pusilla	Little Lorikeet	V	-	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.	Recorded within 10 km (OEH 2017). Nearest records occur within 4 km to the south at Mereweather.	Unlikely. No suitable habitat present within site.
Haematopus fuliginosus	Sooty Oystercatcher	V	-	Evenly distributed along NSW coast, including offshore islands. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide. Breeds almost exclusively on offshore islands, and occasionally on isolated promontories.	Recorded within 10 km (OEH 2017). Nearest records occur within 3 km to the south at Mereweather.	Unlikely. No suitable habitat present within site.
Haematopus longirostris	Pied Oystercatcher	E	-	Primarily a coastal species, favouring intertidal flats of inlets and bays, open beaches and sandbanks. It nests on the ground just above the tideline in the littoral zone of beaches and estuaries.	Recorded within 10 km (OEH 2017). Nearest records occur within 4 km to the east at Stockton.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Haliaeetus leucogaster	White-bellied Sea-eagle	-	M	Primarily coastal but may extend inland over major river systems. Breeds close to water, mainly in tall open forest/woodland but also in dense forest, rainforest, closed scrub or remnant trees. Usually forages over large expanses of open water, but also over open terrestrial habitats (e.g. grasslands).	Recorded within 10 km (OEH 2017). Nearest records occur within 3 km to the south east near Bar Beach. Predicted within 10 km (DEE 2017).	Unlikely. No suitable habitat present within site.
Heteroscelus brevipes	Grey-tailed Tattler	-	M	In NSW the Grey-tailed Tattler is distributed along most of the coast from the Queensland border, south to Tilba Lake (near Narooma). It is more heavily distributed along coastal regions north of Sydney. The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It is occasionally found around near-coastal wetlands, such as lagoons and lakes and ponds in sewage farms and saltworks. The Grey-tailed Tattler usually forages in shallow water, on hard intertidal substrates, such as reefs and rock platforms, in rock pools and among rocks and coral rubble, over which water may surge.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Hieraaetus morphnoides	Little Eagle	V	-	The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. The Little Eagle is distributed throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment.	Recorded within 10 km (OEH 2017). Nearest record occurs within 4 km to the north at Ash Island.	Unlikely. No suitable habitat present within site.
Hirundapus caudacutus	White-throated Needletail	-	M	This species migrates from Siberia, the Himalayas, and Japan to Australia in Summer, arriving mid-October and departing mid-April. It is known to inhabit a variety of habitats including forests, woodlands, farmlands, plains, lakes, coasts and towns (Pizzey and Knight 1999). Nests in tree hollows and feeds on insects during flight, chiefly ahead of weather changes.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Irediparra gallinacea	Comb-crested Jacana	V	-	This species of bird occurs throughout coastal Australia and well inland in the north from the Kimberley to Sydney. Vagrants occasionally appear further south, possibly in response to unfavourable conditions further north in NSW. Inhabits permanent wetlands with a good surface cover of floating vegetation, especially water-lilies. Pairs and family groups forage across floating vegetation, feeding primarily on insects and other invertebrates, as well as some seeds and other vegetation. Breeds in spring and summer in NSW, in a nest of floating vegetation.	Recorded within 10 km (OEH 2017). Nearest record occurs within 3 km to the north west near Waratah West.	Unlikely. No suitable habitat present within site.
Lathamus discolor	Swift Parrot	E	E	The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box. Commonly used lerp infested trees include Grey Box, Inland Grey Box and Blackbutt and Swift Parrots will return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum.	Recorded within 10 km (OEH 2017). Nearest record occurs within 3 km to the north. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Limicola falcinellus	Broad-billed Sandpiper	V	M	This species favours sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, salt marshes, and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow fresh-water lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches.	Recorded within 10 km (OEH 2017). Nearest record occurs within 5 km to the north at Ash Island. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Limosa lapponica	Bar-tailed Godwit	-	M	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. The Bar-tailed Godwit usually forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. Occasionally they have been known to forage among mangroves, or on coral reefs or rock platforms among rubble, crevices and holes.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Limosa limosa	Black-tailed Godwit	V	M	Primarily a coastal species, *L. limosa* is usually found in sheltered bays, lagoons and estuaries with large intertidal mudflats and/or sandflats where it is frequently recorded in mixed flocks with Bar-tailed Godwits. Inland, it can be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps. Individuals have also been recorded in wet fields and sewerage treatment works. This species feeds on a variety of insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles present in soft mud or shallow water. Roosting and loafing occurs on low banks of mud, sand and shell bars.	Recorded within 10 km (OEH 2017). Nearest record occurs within 5 km to the north at Ash Island. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Lophoictinia isura	Square-tailed Kite	V	-	Although this species shows a preference for timbered watercourses, they have been found in a variety of habitats including woodlands and open forests. It appears to occupy large hunting grounds and breeds from July - February with nests generally located along of near watercourses. It is a solitary bird, and a specialised predator, taking small passerines, especially honeyeaters and their eggs and nestlings as well as large insects in the tree canopy. It generally hunts low over open forest, woodlands and mallee communities, heaths, and other low scrubby habitats that are rich in passerines. This species prefers a structurally diverse landscape with a broad range of habitats and appears to utilise a large range greater than 100 km^2.	Recorded within 10 km (OEH 2017). Nearest record occurs within 3 km to the south at Mereweather.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Merops ornatus	Rainbow Bee-eater	-	M	This species of small bird occurs in a variety of habitat but seems to prefer open forests and woodlands, shrublands, and various cleared or semi-cleared habitats, including farmland and areas of human habitation often located close to permanent water. This species migrates north for the winter months within Australia after breeding has occurred.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Monarcha melanopsis	Black-faced Monarch	-	M	This species of bird usually inhabits dense gullies of rainforest, sclerophyll forests and eucalypt woodlands and coastal scrub long the coastal regions from Victoria to Cape York and is migratory over much of its range.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Monarcha trivirgatus	Spectacled Monarch	-	M	The Spectacled Monarch is found in coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. It is much less common in the south. It prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Myiagra cyanoleuca	Satin Flycatcher	-	M	This is a migratory species which breeds around the Calliope Ranges in QLD southward to Tasmania during September / October to January / February before migrating north to southern and eastern Papua New Guinea and adjacent islands over winter. Prefers heavily vegetated gullies in forests, tall woodlands and during migration, coastal forests, woodlands, mangroves, trees in open country, and even gardens (Pizzey & Knight 1998).	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Neophema pulchella	Turquoise Parrot	V	-	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December.	Recorded within 10 km (OEH 2017). Nearest record occurs within 4 km to the north east at Stockton.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Ninox strenua	Powerful Owl	V	-	This species is a nocturnal, solitary and sedentary species. They occur in a number of vegetation types ranging from woodland and open sclerophyll forest to tall open wet forest and rainforest. However, this species does prefer large tracts of vegetation. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old with breeding taking place from late summer to late autumn. Pairs of Powerful Owls are believed to have high fidelity to a small number of hollow-bearing nest trees and will defend a large home range of 400 - 1,450 ha. It forages within open and closed woodlands as well as open areas.	Recorded within 10 km (OEH 2017). Nearest record occurs within 2 km to the south near Adamstown.	Low. Marginally suitable foraging habitat present within site.
Numenius madagascariensis	Eastern Curlew	-	M	This species breeds in the northern hemisphere and occurs along the coast of Australia during the non-breeding season. It is primarily coastal and is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. The Eastern Curlew mainly forages on soft sheltered intertidal sandflats or mudflats and roosts on sandy spits or islands or in saltmarsh or mangroves.	Recorded within 10 km (OEH 2017). Nearest record occurs within 5 km to the north at Ash Island. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Numenius minutus	Little Curlew	-	M	The Little Curlew is widespread in the north of Australia and scattered elsewhere. It breeds in Siberia and is seen on passage through Mongolia, China, Japan, Indonesia and New Guinea. Little Curlews may gather in large flocks on coastal and inland grasslands and black soil plains in northern Australia, near swamps and flooded areas. They also feed on playing fields, paddocks and urban lawns.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Numenius phaeopus	Whimbrel	-	M	The Whimbrel is a regular migrant to Australia, with a primarily coastal distribution. It is found in all states but is more common in the north. Often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. It has been infrequently recorded using saline or brackish lakes near coastal areas. It also used saltflats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Pandion cristatus	Eastern Osprey	V	M	This species occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. It is mostly found in coastal areas but occasionally travel inland along major rivers. It requires extensive areas of open fresh, brackish or saline water for foraging. This species occurs in low numbers in NSW and the breeding population is small and fragmented.	Recorded within 10 km (OEH 2017). Nearest records occur with 1 k to the east in Wickham.	Unlikely. No suitable habitat present within site.
Pluvialis fulva	Pacific Golden Plover	-	M	Occurs along the east coast, especially along Queensland and New South Wales. Usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. They are less often recorded in terrestrial habitats, usually wetlands such as fresh, brackish or saline lakes, billabongs, pools, swamps and wet claypans, especially those with muddy margins and often with submerged vegetation or short emergent grass.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Pluvialis squatarola	Grey Plover	-	M	In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. The species is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes (Marchant & Higgins 1993 and references therein). On their breeding grounds they inhabit tundra (Dement'ev & Gladkov 1951).	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Pomatostomus temporalis temporalis	Grey-crowned Babbler	V	-	The Grey-crowned Babbler has two distinctive subspecies that intergrade to the south of the Gulf of Carpentaria. In the west the subspecies *rubeculus*, formerly considered a separate species (Red-breasted Babbler) is still widespread and common. The eastern subspecies (temporalis occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands.	Recorded within 10 km (OEH 2017). Nearest records occur within 1 km to the east in Newcastle West.	Unlikely. No suitable habitat present within site.
Ptilinopus magnificus	Wompoo Fruit-dove	V	-	This species is a large and dramatically beautiful rainforest pigeon, almost twice the size of other coloured fruit-doves. It occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests, feeding on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit; some of its feed trees rely on species such as this to distribute their seeds. The Wompoo fruit-dove is most often seen in mature forests, but also found in remnant and regenerating rainforest.	Recorded within 10 km (OEH 2017). Nearest records occur 4 km to the west in Lambton.	Unlikely. No suitable habitat present within site.
Ptilinopus superbus	Superb Fruit-dove	V	M	A small pigeon that inhabits rainforest and similar closed forests where it forages high in the canopy. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Occurs principally in NE Qld to NE NSW, becoming much less common further south and is largely confined to pockets of suitable habitat as far south as Moruya, with vagrants as far south as Tasmania.	Recorded within 10 km (OEH 2017). Nearest records occur within 1 km to the north in Islington.	Unlikely. No suitable habitat present within site.
Rhipidura rufifrons	Rufous Fantail	-	M	This species is a breeding migrant to southeast Australia during July to December, wintering in Papua New Guinea. It prefers wetter eucalypt forests, gullies, coastal scrub, watercourses, and rainforests where it feeds on insects. Occasional reports have this species utilising parks and gardens during migration (Pizzey & Knight 1998).	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Rostratula australis	Australian Painted Snipe	E	V	This species is found in permanent and temporary shallow inland and coastal wetlands (can be freshwater or brackish), particularly where there is a cover of vegetation. Individuals have been known to use artificial wetlands such as sewage ponds, dams and water-logged grasslands. This species is most common in eastern Australia, with records at scattered locations throughout much of NSW.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Stagonopleura guttata	Diamond Firetail	V	-	This species is known to occur in grassy eucalypt woodlands, including Box-Gum Woodlands, and Snow Gum (*Eucalyptus pauciflora*) Woodlands, riparian areas (rivers and creeks), and sometimes in lightly wooded farmland (DEC 2007).	Recorded within 10 km (OEH 2017). Nearest records occur 4 km north at Ash Island.	Unlikely. No suitable habitat present within site.
Sternula albifrons	Little Tern	E	M	Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records).Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.	Recorded within 10 km (OEH 2017). Nearest record occurs within 5 km to the east at Stockton. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Tyto longimembris	Eastern Grass Owl	V	-	Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. They rest by day in a 'form' - a trampled platform in a large tussock or other heavy vegetative growth. If disturbed they burst out of cover, flying low and slowly, before dropping straight down again into cover. The species always breeds on the ground. Nests are found in trodden grass, and often accessed by tunnels through vegetation.	Recorded within 10 km (OEH 2017). Nearest records occur 4 km to the north east in the Hunter Wetlands National Park.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Tyto novaehollandiae	Masked Owl	V	-	This species occurs in dry eucalypt woodlands at altitudes from sea level to 1100 m and roosts and breeds in hollows and sometime caves in moist eucalypt forested gullies. It hunts along the edges of forests and roadsides and has a home range covering between 500 ha and 1000 ha. Prey for this species are principally terrestrial mammals but arboreal species may also be taken. Masked Owls are sparsely distributed from southern QLD to SA and WA. It has also been recorded on the Nullarbor plain.	Recorded within 10 km (OEH 2017). Nearest records occur within 5 km to the north east near Fern Bay.	Unlikely. No suitable habitat present within site.
Tyto tenebricosa	Sooty Owl	V	-	Occurs in the coastal, escarpment and tablelands regions of NSW. More common in the north and absent from the western tablelands and further west. Inhabits tall, moist eucalypt forests and rainforests, and are strongly associated with sheltered gullies, particularly those with tall rainforest understorey. Roosts in tree hollows, amongst dense foliage in gullies or in caves, recesses or ledges of cliffs or banks. Nest in large (>40 cm wide, 100 cm deep) tree hollows in unlogged/unburnt gullies within 100 m of streams or in caves.	Recorded within 10 km (OEH 2017). Nearest records occur within 4 km to the south at Glenrock.	Unlikely. No suitable habitat present within site.
Xenus cinereus	Terek Sandpiper	V	M	This species is a medium sized migratory wader. It has been recorded on lagoons, creeks and estuaries throughout Australia, however tends to favours mud banks and sandbanks located near mangroves, but can also occur on rocky pools and reefs. Primarily a coastal species, this species is occasionally spotted around brackish pools up to 10 km inland. *X. cinereus* roosts communally amongst mangroves of dead trees, often with other wader species, breaking into smaller flocks or solitary birds when feeding.	Recorded within 10 km (OEH 2017). Nearest record occurs within 5 km to the north east at Ash Island. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Amphibians						
Litoria aurea	Green and Golden Bell Frog	E	V	This species inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and instream wetlands. It prefers sites containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. They are active by day and breed during the summer months (DEC 2006). Plague Minnow (*Gambusia holbrooki*) is a key threatening process as they feed on Green and Golden Bell Frog eggs and tadpoles. OEH have a recovery plan for this species.	Recorded within 10 km (OEH 2017). Nearest records occur 4 km north on the northern side of the Hunter River. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Litoria littlejohni	Littlejohns Treefrog	V	V	Littlejohn's Tree Frog 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. It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops, hunting either in shrubs or on the ground. Breeding is triggered by heavy rain and can occur from late winter to autumn, but is most likely to occur in spring when conditions are favourable. Males call from low vegetation close to slow flowing pools and eggs are laid in loose gelatinous masses attached to small submerged twigs. Eggs and tadpoles are mostly found in slow flowing pools that receive extended exposure to sunlight, but will also use temporary isolated pools.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Mammals						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	This species is distributed between south-eastern QLD to NSW from the coast to the western slopes of the divide. This species roosts in caves, rock crevices and mines and has been most commonly recorded from dry sclerophyll forests and woodlands. In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys (DEE 2017b). C. dwyeri is an insectivorous species that flies relatively slowly over the canopy or along creek beds (Churchill 2008).	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Dasyurus maculatus	Spotted-tailed Quoll	V	E	This species has a preference for mature wet forest habitats, particularly in areas of 600 mm rainfall p.a. , but has been recorded from a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den sites are found in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, which are usually traversed along densely vegetated creek lines.	Predicted to occur within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	This species of bat inhabits moist forest generally with trees larger than 20 m and roosts in eucalypt hollows, underneath bark or in buildings. Diet consists of moths, beetles and other insects, which it collects within or just below the tree canopy. This species hibernates during winter and breeding takes place in late spring.	Recorded within 10 km (OEH 2017). Nearest records occur within 5 km to the North at Ash Island.	Unlikely. Preferred habitat absent from site. Species is absent from small patches of remnant forest or urban areas.
Miniopterus australis	Little Bentwing-Bat	V	-	The Little Bentwing Bat occurs from Cape York to Sydney in NSW. This species congregates in maternal roost caves during summer. In NSW, there is only one known breeding colony which shares a cave with a colony of Eastern Bentwing-bats, and females will travel over 200 km to reach this site. Outside the breeding season, this bat will roost in caves, tunnels and mines and has been recorded in a tree hollow on one occasion. It forages for insects beneath the canopy of well-timbered habitats including rainforests, wet and dry sclerophyll forests, paperbark swamps and vine thickets (Churchill 2008, Hoye and Hall 2008).	Recorded within 10 km (OEH 2017). Nearest records occur within 5 km to the North at Ash Island.	**Moderate.** Limited foraging habitat. May potentially roost in derelict buildings on site. May roost in stags or trees, although no obvious tree-hollows were observed. No breeding habitat is present.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	This species occurs along the east coast from Cape York to Castlemaine in Victoria, generally east of the Great Dividing Range (Churchill 2008). It is known from a variety of habitats from open grasslands to woodlands, wet and dry sclerophyll forests and rainforest. It has a direct flight pattern and forages above the canopy in forested areas or close to the ground in open areas (Churchill 2008). It is essentially a cave bat but also utilises man-made habitats such as road culverts, storm-water tunnels and other man-made structures. Maternity caves have very specific humidity and temperature regimes and there are only 4 known maternity caves in NSW, near Wee Jasper, Bungonia, Kempsey and Texas. Breeding takes place in October and females may travel several hundred kilometres to the nearest maternal colony (Churchill 2008).	Recorded within 10 km (OEH 2017). Nearest records occur within 5 km to the North at Ash Island.	**Moderate.** Limited foraging habitat. May potentially roost in derelict buildings on site. May roost in stags or trees, although no obvious tree-hollows were observed.. No breeding habitat is present.
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	This species occurs from southern NSW to southern QLD in dry sclerophyll forest and woodland east of the Great Dividing Range. It forages in natural and artificial openings in the vegetation, typically within a few kilometres of its roost. The species roosts primarily in tree hollows but has also been recorded from man-made structures or under bark. Females give birth in late November/early December and lactation lasts until late January (Churchill 2008).	Recorded within 10 km (OEH 2017). Nearest records occur within 5 km to the North at Ash Island.	**Moderate.** Limited foraging habitat. May potentially roost in derelict buildings on site. May roost in stags or trees, although no obvious tree-hollows were observed.
Myotis macropus	Large-footed (southern) Myotis	V	-	Primarily a coastal species that forages over streams and watercourses feeding on fish and insects which it catches by raking its feet across the water surface, it will occur inland along large river systems. Breeding takes place during November or December, roosting in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage.	Recorded within 10 km (OEH 2017). Nearest records occur within 5 km to the North at Ash Island.	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Petaurus norfolcensis	Squirrel Glider	V	-	This species of glider is widely though sparsely distributed throughout eastern Australia. In NSW it inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. This species prefers a diversity of food supplies including acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein, and requires an abundant supply of tree-hollows for nesting and shelter.	Recorded within 10 km (OEH 2017). Nearest records occur within 4 km north east at Fern Bay.	Unlikely. No suitable habitat present within site.
Petrogale penicillata	Brush-tailed Rock Wallaby	E	V	In more recent years this rock-wallaby appears to have become restricted to rock outcrops containing suitable caves and tunnels or very dense undergrowth to provide shelter.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Phascolarctos cinereus	Koala	V	V	The Koala has a fragmented distribution throughout eastern Australia. It is limited to areas of preferred feed trees (includes any of over 70 eucalypt and 30 non-eucalypt species) in eucalypt woodlands and forests.	Recorded within 10 km (OEH 2017). Nearest records occur within 3 km west near Adamstown. Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Potorous tridactylus	Long-Nosed Potoroo	V	V	This species of small mammal is generally restricted to areas with high annual rainfall, inhabiting coastal heath and dry and wet sclerophyll forests. Its major habitat requirement is relatively thick ground cover with occasional open areas and may consist of grass trees, sedges, ferns or heath, or low shrubs of tea-trees and Melaleucas where soil is light and sandy. It feeds on the fruiting bodies of underground-fruiting fungi, roots, tubers, insects and their larvae, and other soft-bodied animals in the soil. Breeding occurs biannually in late winter / early spring and in late summer, with one young being reared (Johnston 1995). In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with a n annual rainfall exceeding 760 mm.	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Pseudomys novaehollandiae	New Holland Mouse	-	V	The New Holland Mouse occurs in disjunct, coastal populations in SE Australia from Tasmania to Queensland. In NSW it has been found in a variety of coastal habitats including heathland, woodland, dry sclerophyll forest with a dense shrub layer and vegetated sand dunes (Wilson and Bradtke 1999). It is commonly referred to as a 'disturbance enhanced' or early successional species as populations have demonstrated the capacity to recolonise and increase in size in areas of regenerating native vegetation after wildfire, clearing and sandmining. The species' presence has been strongly correlated with the density of understorey vegetation, and with a high floristic diversity in regenerating heath (Lock and Wilson 1999).	Predicted within 10 km (DEE 2017)	Unlikely. No suitable habitat present within site.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	This species roosts in camps generally located within 20 km of a regular food source and are commonly found in gullies, close to water and in vegetation with a dense canopy. This species is known to forage in areas supporting subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps on the nectar and pollen of native trees, in particular eucalypts, melaleucas and banksias, they are also known to forage in urban areas.. Grey-headed Flying-fox show a regular pattern of seasonal movement with much of the population moving to northern NSW and QLD during May and June to exploit winter flowering tree species (Eby and Law 2008). This species will also forage in urban gardens and cultivated fruit crops.	Recorded within 10 km (OEH 2017). Nearest records occur within 1 km to the east within Hamilton. Predicted within 10 km (DEE 2017)	Moderate. May forage in the disturbance footprint when trees are flowering/fruiting. No roosting habitat in the Project area.
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V	-	This species forages for insects, flying high and fast over the forest canopy, but lower in more open country. It forages in most habitats across its very wide range, with and without trees and appears to defend an aerial territory. It roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to use mammal burrows.	Recorded within 10 km (OEH 2017). Nearest records occur within 5 km to the north at Ash Island.	Moderate. May potentially roost in derelict buildings on site. May roost in stags or trees, although no obvious tree-hollows were observed.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Association	Nature of Record	Likelihood of Occurrence in Project area
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	This species occurs on the east coast and Great Dividing Range from the Atherton Tablelands in QLD to northern Victoria. It inhabits a variety of habitats from woodland to wet and dry sclerophyll forests and rainforest, as well as remnant paddock trees and timber-lined creeks, typically in areas below 500 m elevation (Hoye and Richards 2008, Churchill 2008). It has a direct flight pattern and forages for insects (and potentially other bats) in relatively uncluttered areas, using natural or man-made openings in denser habitats. It generally roosts in tree hollows or fissures but may also roost under exfoliating bark or in the roofs of old buildings. The young are born in January in communal maternal roosts in suitable hollow trees (Hoye and Richards 2008, Churchill 2008).	Recorded within 10 km (OEH 2017). Nearest records occur within 3 km to the west near Cooks Hill.	**Moderate.** Limited foraging habitat. May potentially roost in derelict buildings on site. May roost in stags or trees, although no obvious tree-hollows were observed..
Reptiles						
Hoplocephalus bungaroides	Broad-headed Snake	E	V	The broad-headed snake is largely confined to sandstone within the coast and ranges in an area within approximately 250 km of Sydney. This species is found in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. It moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer. This snake species feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. It produces live young from January to March.	Predicted within 10 km (DEE 2017)	Unlikely. Preferred habitat absent from site.

All information in this table is taken from NSW OEH and Commonwealth DoE Threatened Species profiles (OEH 2016 & DEE 2016) unless otherwise stated.

The codes used in this table are: CE – Critically Endangered; E – Endangered; V – Vulnerable; EP – Endangered Population; CEEC – Critically Endangered Ecological Community; EEC – Endangered Ecological Community; M – Migratory Specie; Prel. – subject to preliminary determination by the NSW Scientific Committee.

Appendix B – Database searches

Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Plants in selected area [North: -32.86 West: 151.7 East: 151.81 South: -32.97] returned a total of 262 records of 10 species.
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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Plantae	Flora	Asteraceae	1643	*Rutidosis heterogama*		Heath Wrinklewort	V,P	V	11	
Plantae	Flora	Elaeocarpaceae	6206	*Tetratheca juncea*		Black-eyed Susan	V,P	V	202	
Plantae	Flora	Fabaceae (Faboideae)	11644	*Pultenaea maritima*		Coast Headland Pea	V,P		4	
Plantae	Flora	Myrtaceae	9163	*Eucalyptus parramattensis subsp. decadens*			V,P	V	3	
Plantae	Flora	Myrtaceae	6809	*Melaleuca biconvexa*		Biconvex Paperbark	V,P	V	1	
Plantae	Flora	Myrtaceae	4293	*Syzygium paniculatum*		Magenta Lilly Pilly	E1,P	V	1	
Plantae	Flora	Orchidaceae	9027	*^Diuris praecox*		Rough Doubletail	V,P,2	V	14	
Plantae	Flora	Polygonaceae	9184	*Muehlenbeckia costata*		Scrambling Lignum	V,P		1	
Plantae	Flora	Proteaceae	5400	*Grevillea shiressii*			V,P	V	1	
Plantae	Flora	Zannichelliaceae	6339	*Zannichellia palustris*			E1,P		24	

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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

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

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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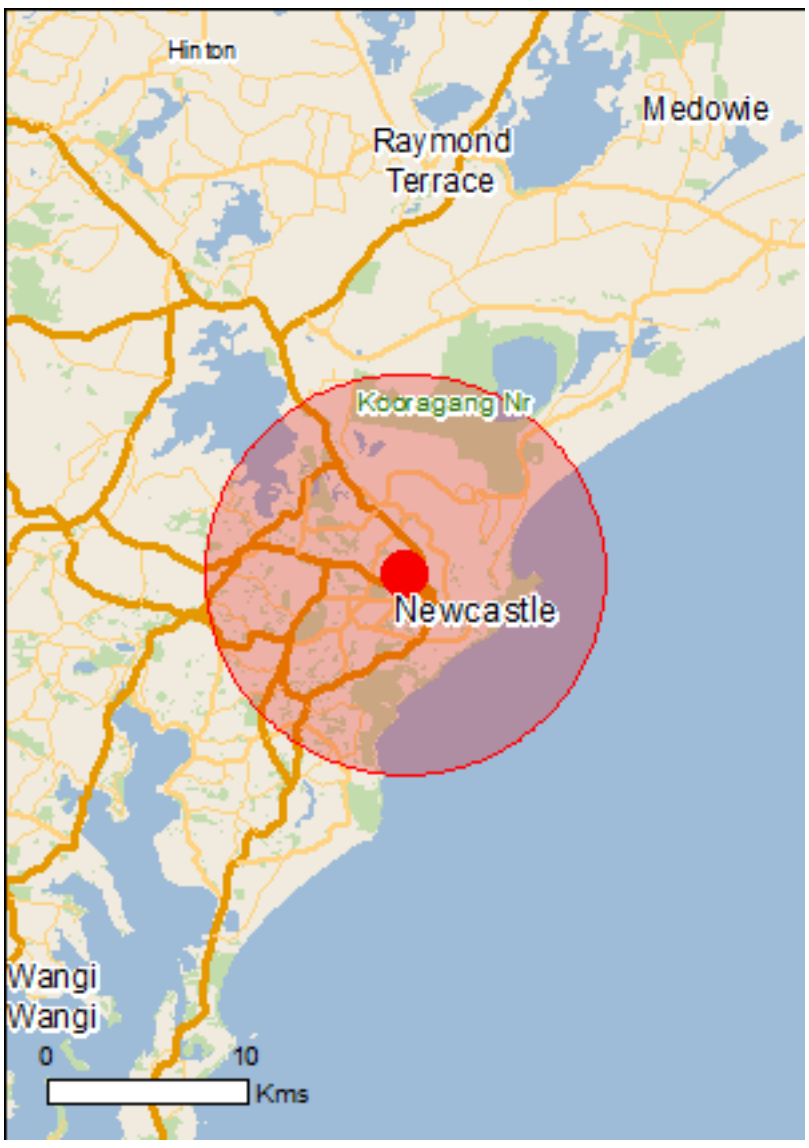

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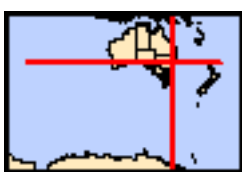

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	71
Listed Migratory Species:	68

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	16
Commonwealth Heritage Places:	2
Listed Marine Species:	101
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	47
Nationally Important Wetlands:	5
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Hunter estuary wetlands	Within Ramsar site

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community may occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely

Name	Status	Type of Presence
		to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Commersonia prostrata		
Dwarf Kerrawang [87152]	Endangered	Species or species habitat likely to occur within area
Cryptostylis hunteriana		
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Diuris praecox		
Newcastle Doubletail [55086]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus camfieldii		
Camfield's Stringybark [15460]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus parramattensis subsp. decadens		
Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat known to occur within area
Grevillea parviflora subsp. parviflora		
Small-flower Grevillea [64910]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca biconvexa		
Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area
Phaius australis		
Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269)		
a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Pterostylis gibbosa		
Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Rutidosis heterogama		
Heath Wrinklewort [13132]	Vulnerable	Species or species habitat known to occur within area
Syzygium paniculatum		
Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
Tetratheca juncea		
Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area

Name	Threatened	Type of Presence
Xenus cinereus		
Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -
Commonwealth Land - Australian & Overseas Telecommunications Corporation
Commonwealth Land - Australian Broadcasting Corporation
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Bank of Australia
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of War Service Homes
Commonwealth Land - Telstra Corporation Limited
Defence - ADF CAREERS REFERENCE CENTRE
Defence - OFFICES
Defence - STOCKTON RIFLE RANGE
Defence - TS TOBRUK

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Fort Wallace	NSW	Listed place
Nobbys Lighthouse	NSW	Listed place

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Breeding known to occur

Name	Threatened	Type of Presence
		within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish,		Species or species

Name	Threatened	Type of Presence
[66183]		habitat may occur within area
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stigmatopora olivacea a pipefish [74966]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Awabakal	NSW
Glenrock	NSW
Hexham Swamp	NSW
Hunter Wetlands	NSW
Worimi	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Hexham Swamp	NSW
Jewells Wetland	NSW
Kooragang Nature Reserve	NSW
Lake Macquarie	NSW
Shortland Wetlands Centre	NSW

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.91361 151.74072

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact Us page.

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Appendix C – Field survey data

Flora Species

Family	Exotic	Scientific Name	Common Name
Apiaceae	*	*Cyclospermum leptophyllous*	Slender Celery
Apocynaceae	*	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush
Arecaceae	*	*Phoenix canariensis*	Canary Island Date Palm
Asteraceae	*	*Ambrosia tenuifolia*	Lacy Ragweed
Asteraceae	*	*Arctotheca calendula*	Capeweed
Asteraceae	*	*Bidens pilosa*	Cobbler's Pegs
Asteraceae	*	*Cirsium vulgare*	Spear Thistle
Asteraceae	*	*Conyza bonariensis*	Flaxleaf Fleabane
Asteraceae	*	*Hypochaeris radicata*	Catsear
Asteraceae	*	*Senecio madagascariensis*	Fireweed
Asteraceae	*	*Senecio pinnatifolius*	Groundsel, Fireweed
Asteraceae	*	*Sonchus oleraceus*	Common Sowthistle
Asclepidaceae	*	*Araujia sericifera*	Moth Vine
Asparagaceae	*	*Asparagus plumosus*	Ferny Asparagus
Bignoniaceae	*	*Jacaranda mimosifolia*	Jacaranda
Brassicaceae	*	*Cardamine hirsuta*	Flick Weed
Brassicaceae	*	*Rapistrum rugosum*	Turnip Weed
Campanulaceae		*Wahlenbergia communis*	Tufted Bluebell
Caryophyllaceae	*	*Cerastium glomeratum*	Mouse-ear Chickweed
Caryophyllaceae	*	*Paronychia brasiliana*	Brazilian Whitlow
Caryophyllaceae	*	*Stellaria media*	Common Chickweed
Convolvulaceae		*Dichondra repens*	Kidney Weed
Dennstaedtiaceae		*Pteridium esculentum*	Bracken
Euphorbiaceae	*	*Ricinus communis*	Castor Oil Plant
Fabaceae (Faboideae)	*	*Erythrina sykesii*	Coral Tree
Fabaceae (Faboideae)		*Kennedia rubicunda*	Dusky Coral Pea
Fabaceae (Faboideae)	*	*Trifolium campestre*	Hop Clover
Fabaceae (Faboideae)	*	*Vicia sativa*	Common vetch
Fabaceae (Mimosoideae)		*Acacia longifolia* subsp. *sophorae*	Coastal Wattle
Fabaceae (Mimosoideae)	*	*Acacia saligna*	Golden Wreath Wattle
Lauraceae	*	*Cinnamomum camphora*	Camphor Laurel
Lomandraceae		*Lomandra longifolia*	Spiny-headed Mat-rush
Lomariopsidaceae	*	*Nephrolepis cordifolia*	Fishbone Fern
Malvaceae	*	*Modiola caroliniana*	Red-flowered Mallow
Malvaceae	*	*Sida rhombifolia*	Paddy's Lucerne
Moraceae		*Ficus macrophylla*	Moreton Bay Fig

Family	Exotic	Scientific Name	Common Name
Myrtaceae		*Eucalyptus siderophloia*	Grey Ironbark
Myrtaceae		*Eucalyptus nicholii*	Narrow-leaved Black Peppermint
Myrtaceae		*Lophostemon confertus*	Brush Box
Myrtaceae		*Melaleuca armillaris* subsp. *armillaris*	Bracelet Honey-myrtle
Myrtaceae		*Melaleuca styphelioides*	Prickly-leaved Teatree
Oleaceae	*	*Olea europaea* subsp. *cuspidata*	African Olive
Pinaceae	*	*Pinus radiata*	Radiata Pine
Phyllanthaceae		*Breynia oblongifolia*	Coffee Bush
Pittosporaceae		*Pittosporum undulatum*	Sweet Pittosporum
Plantaginaceae	*	*Plantago lanceolata*	Lamb's Tongues
Poaceae	*	*Briza minor*	Shivery Grass
Poaceae	*	*Cortaderia selloana*	Pampas Grass
Poaceae	*	*Chloris gayana*	Rhodes Grass
Poaceae		*Cynodon dactylon*	Common Couch
Poaceae	*	*Eragrostis curvula*	African Love Grass
Poaceae	*	*Ehrharta longiflora*	Annual Veldtgrass
Poaceae	*	*Hyparrhenia hirta*	Coolatai Grass
Poaceae	*	*Hyparrhenia rufa* subsp. *altissima*	
Poaceae	*	*Melinis repens*	Red Natal Grass
Poaceae	*	*Megathyrsus maxima*	Green Panic
Poaceae	*	*Paspalum dilatatum*	Paspalum
Poaceae	*	*Sporobolus africanus*	Parramatta Grass
Polygonaceae	*	*Acetosella vulgaris*	Sheep Sorrel
Proteaceae		*Banksia integrifolia*	Coastal Banksia
Proteaceae		*Banksia serrata*	Old-man Banksia
Proteaceae		*Grevillea robusta*	Silky Oak
Rosaceae	*	*Rubus anglocandicans*	Blackberry
Rubiaceae	*	*Galium aparine*	Goosegrass
Rubiaceae	*	*Richardia humistrata*	
Sapindaceae		*Cupaniopsis anacardioides*	Tuckeroo
Scrophulariaceae	*	*Verbascum virgatum*	Twiggy Mullein
Simaroubaceae	*	*Ailanthus altissima*	Tree of Heaven
Solanaceae	*	*Solanum nigrum*	Black-berry Nightshade
Typhaceae		*Typha orientalis*	Broad-leaved Cumbungi
Verbenaceae	*	*Lantana camara*	Lantana
Verbenaceae	*	*Verbena bonariensis*	Purpletop

Fauna Species

Family	Exotic	Scientific Name	Common Name
Amphibians			
Hylidae		*Litoria fallax*	Eastern Tree Frog
Birds			
Accipitridae		*Elanus axillaris*	Black-shouldered Kite
Artamidae		*Cracticus tibicen*	Australian Magpie
Hirundinidae		*Hirundo rustica*	Barn Swallow
Locustellidae		*Megalurus timoriensis*	Tawny Grassbird
Maluridae		*Malurus cyaneus*	Superb fairy Wren
Meliphagidae		*Caligavis chrysops*	Yellow-faced Honeyeater
Meliphagidae		*Manorina melanocephala*	Noisy Miner
Meliphagidae		*Philemon corniculatus*	Noisy Friarbird
Psittaculidae		*Platycercus eximius*	Eastern Rosella
Psittaculidae		*Trichoglossus moluccanus*	Rainbow Lorikeet
Sturnidae	*	*Acridotheres tristis*	Indian Miner
Zosteropidae		*Zosterops lateralis*	Silvereye
Mammals			
Leporidae	*	*Oryctolagus cuniculus*	European Rabbit

Appendix D – Assessments of Significance

Assessments of significance have been prepared in accordance with Section 5A of the EPA Act for threatened species and communities recorded or likely to occur in the Project area that have the potential to be impacted by the Project. Where possible, assessments have been grouped for species with similar habitat requirements.

***Eucalyptus nicholii* (Narrow-leaved Black Peppermint)**

Section 5A Assessment – Narrow-leaved Black Peppermint	
a)	in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,
No natural populations of Narrow-leaved Black Peppermint are known to occur within the locality, whoever this species is a street tree commonly planted in the Newcastle LGA. The Narrow-leaved Black Peppermint identified within the Project area consisted of a single tree that is likely to be planted. Removal of this tree would not result in an adverse effect on the lifecycle of this species such that a viable local population would be placed at risk of extinction.	
b)	in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,
Not applicable to this threatened species.	
c)	in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
(i)	is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
(ii)	is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,
Not applicable to this threatened species.	
d)	in relation to the habitat of a threatened species, population or ecological community:
(i)	the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
No natural populations of Narrow-leaved Black Peppermint are known to occur within the locality. Despite the occurrence of one planted individual, no suitable habitat for this species was identified within the Project area.	
(ii)	whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
No suitable habitat for the species was identified within the Project area, therefore the Project will not fragment or isolate habitat.	

Section 5A Assessment – Narrow-leaved Black Peppermint
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality
The Project area contains no habitat for the Narrow-leaved Black Peppermint.
e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)
No critical habitat has been listed for this species.
f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan
No recovery plan have been prepared for this species.
g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process
The proposed action would not contribute to a Key Threatening Process that is relevant to impacts to this species.
Conclusion of *Assessment of Significance*
The Project is unlikely to have a significant impact on the Narrow-leaved Black Peppermint, pursuant to section 5A of the EP&A Act, given that: • The Project area is outside the natural distribution of the species and no naturally occurring population occurs in the locality. • This specimen in the disturbance footprint is likely to be planted as this species is a commonly planted street tree throughout the Newcastle LGA. • The Project would not isolate or fragment any populations of this species.

Threatened Microbats

Foraging and roosting habitat was identified within the Project area for the following microbats:

- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)
- *Mormopterus norfolkensis* (Eastern Free-tailed Bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

This assessment has been prepared for removal of potential habitat for these microbat species.

Section 5A Assessment – Microbats
a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,
The Project would clear up to 5.8 hectares of exotic and planted vegetation that is unlikely to represent important foraging habitat for these species. The aquatic (channelized) corridor associated with Styx Creek may be used as a flyway and foraging resource for these threatened microbats, however the Project would not clear or alter Styx Creek. The Project would clear two dead trees (stags) with loose bark, which offer potential roosting habitat for microbats. Three derelict buildings were also identified within the Project one of which will be demolished as a result of the Project. This building may provide suitable diurnal roosting habitat for microbat species. The East Coast Freetail-bat, Greater Broad-nosed Bat and Yellow-bellied Sheathtail-bat primarily roost in tree hollows and buildings. The Little Bentwing-bat and Eastern Bentwing-bat mainly roost in culverts/ tunnels, caves, man-made structures and bridges, however the Little Bentwing-bat may occasionally roost in hollow trees and buildings. The Little Bentwing-bat, Eastern Bentwing-bat and Greater Broad-nosed Bat have specific maternity sites and/or habitat requirements for breeding which do not occur within the Project area. The Yellow-bellied Sheathtail-bat and East Coast Freetail-bat primarily roost in large trees hollows that do not occur within the Project area. Consequently, none of the identified species are considered likely to utilise the Project area for breeding. The proposed remediation works may cause noise and vibration impacts for microbats that are utilising the Project area. However, these microbats are likely to be somewhat habituated to low but constant noise and vibration from nearby roads and rail traffic. Daytime construction noise and vibration are unlikely to impact night-time foraging behaviour or diurnal roosting habitats (derelict buildings). The Project would not impact flyways nor involve the installation of structures that would pose a significant obstruction or hazard to the flight of microbats. The Project is therefore unlikely to have an adverse effect on the life cycle of these threatened microbat species.
b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,
Not applicable to these threatened species.

Section 5A Assessment – Microbats
c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,
Not applicable to these threatened species.
d) in relation to the habitat of a threatened species, population or ecological community:
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
The Project would clear up to 5.8 hectares of exotic and planted vegetation that is unlikely to represent important foraging habitat for these species, The Project would clear two dead trees (stags) with loose bark, which may represent low quality roosting habitat for microbats. One derelict building that may provide potential roosting habitat for some of these species will be demolished as a result of the Project.
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
The Project would not fragment or isolate any areas of microbat foraging, roosting or breeding habitat.
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality
The Project would clear up to 5.8 hectares of exotic and planted vegetation that is unlikely to represent important foraging habitat for these species, as no native remnant bushland or aquatic habitats occur within the Project area. The Project would clear two dead trees (stags) with loose bark, which offer potential roosting habitat for microbats. The Project would result in the removal of one derelict building with potential microbat roosting habitat; however, no microbat breeding habitat will be cleared or altered by the Project.
e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)
No critical habitat has been listed for these species.
f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan
No recovery plans have been prepared for these microbat species. Priority actions for microbat species mainly relate to research and habitat management and protection. The Project would modify potential habitat for these species and is therefore not consistent with recovery actions. The small area of potential foraging and roosting habitat that would be cleared is unlikely to interfere with the recovery of these species.

Section 5A Assessment – Microbats
g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process
The proposed action would contribute to the operation of two KTPs of relevance to these species as follows: • Invasion, establishment and spread of *Lantana camara* • Invasion and spread of perennial grasses • Clearing of dead wood and trees The Project may increase the occurrence of *Lantana camara* and perennial grasses, which are present at the site. The spread of these species are known to cause habitat degradation that may indirectly impact microbat species. The implementation of suitable weed controls, as set out in the Construction Environmental Management Plan (CEMP), would prevent the proposed works exacerbating this threatening process. This includes hygiene procedures for equipment, footwear and clothing, and weed disposal protocols. Two dead stags will be removed by the Project. No hollow-bearing trees will be removed by the Project.
Conclusion of *Assessment of Significance*
The Project is unlikely to have a significant impact on the Eastern Bentwing Bat, Little Bentwing Bat, Eastern Free-tailed Bat, Yellow-bellied Sheath-tailed Bat and the Greater Broad-nosed Bat, pursuant to section 5A of the EP&A Act, given that: • The Project area contains only a small area of marginal potential foraging habitat for these species, largely comprising exotic grassland and planted landscape trees. • The planted trees to be removed do not contain obvious hollows likely to be used as roost sites by microbats, the two isolated stags with cracking bark that will be removed are unlikely to provide important roosting habitat for a local microbat populations and only one of the three derelict buildings that may possibly be used as temporary roost sites will be removed. • No known or potential breeding habitat would be removed or altered by the Project. • The Project would not act as a barrier to movement of microbats through the locality. • The Project would not further fragment or isolate habitat for microbats. If roosting bats are found to be using the derelict buildings as diurnal roost sites during pre-activity inspections, a bat management plan, including in particular protocols for the demolition of the former residence building and to minimise possible indirect impacts on microbats (if roosting in the two retained buildings), would to be incorporated into the CEMP.

Grey-headed Flying-Fox

Planted trees within the Project area may provide foraging habitat for the Grey-headed Flying-fox which is listed as a vulnerable species under the TSC Act.

The Grey-headed Flying-fox is a highly mobile, migratory species which exploits irregular sources of food throughout its range. Grey-headed Flying-foxes require a continuous sequence of productive foraging habitats, the migration corridors or stopover habitats that link them, and suitable roosting habitat within nightly commuting distance of foraging areas. Adults will make nightly foraging movements of up to 50 km, and roost communally in camps. The locations of these camps are typically stable through time, though individual Flying-foxes will make regular movements between camps.

This assessment has been prepared for removal of potential foraging habitat for this species

Section 5A Assessment – Grey-headed Flying-fox
a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,
The Project would clear a number of planted trees that may provide foraging habitat for the Grey-headed Flying-fox. No roosting or breeding habitat would be affected, and the removal of this small patch of vegetation would not represent a barrier to movement for this highly mobile species. This highly mobile species would have large areas of similar foraging habitat within the Newcastle Area The removal of this small area of potential foraging habitat is therefore not likely to impact the life cycle of the species such that a viable local population of Grey-headed Flying-fox is likely to be placed at risk of extinction
b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,
Not applicable to these threatened species.
c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,
Not applicable to these threatened species.
d) in relation to the habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
A small amount of planted native and exotic trees which when in flower/fruit would provide potential foraging habitat for the Grey-headed Flying-fox

Section 5A Assessment – Grey-headed Flying-fox
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
Habitat in the study area is already fragmented and isolated from surrounding areas of habitat by roads, railway lines, urban development, and open space. The Project would not further fragment habitat for this highly mobile, wide-ranging species which may fly up to 50 km in a night to forage.
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality
Habitat to be removed by the Project is located within a block of land with a relatively small number of planted native and exotic trees, which may represent potential foraging habitat for the species. Similar and better foraging habitat is scattered throughout the locality. The habitat to be removed is not considered to be important to the long-term survival of the Grey-headed Flying-fox in the locality.
e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)
No critical habitat has been listed for these species.
f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan
The draft National recovery Plan (DECCW 2009) for this species has identified 13 specific recovery objectives to help recover this species, of which the following are of relevance: • Objective 1. To identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range • Objective 2. To protect and increase the extent of key winter and spring foraging habitat of Grey-headed Flying-foxes The Project is inconsistent with these objectives as it involves the removal of a small area of foraging habitat qualifying as habitat critical to the survival of the species, including a small number of winter flowering species. However as stated before the removal of this small area of habitat is unlikely to seriously reduce the available foraging resources for local populations and would be unlikely to interfere with the recovery of the species.
g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process
The proposed action would contribute to the operation of one KTP of relevance to these species (clearing of native vegetation) The Project would remove a small number of planted native trees.
Conclusion of Assessment of Significance
The Project is unlikely to have a significant impact on the Grey-headed Flying-fox pursuant to section 5A of the EP&A Act, given that: • The Project area contains only a small area of potential foraging habitat for these species, comprising planted landscape trees. • No known or potential breeding habitat would be removed or altered by the Project. • The Project would not act as a barrier to movement of for Grey-headed Flying-fox through the locality. • The Project would not further fragment or isolate habitat for this species

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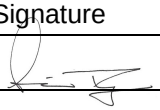
0	A. Quinn	J. Tipping		S. Page		16/07/2018

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