APPENDIX C

Ecological Assessment Report, RPS Australia East Pty Ltd, June 2010

Ecological Assessment Report

Lot 32, DP 1014864 Masonite Road, Heatherbrae

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Disclaimers

Executive Summary

RPS Australia East Pty Ltd (RPS) has been commissioned by Sandvik Mining and Construction Australia Pty Ltd to undertake an Ecological Assessment Report (EAR) in relation to a "Major Development" lodged under the Major Development SEPP (and Part 3A of the EP&A Act, 1979) for Lot 32 DP 1014864 Masonite Road, Heatherbrae.

The Director General's Environmental Assessment Requirements (DGEARs) for the project have been issued (19 May 2010) and this report has been written to address these requirements in relation to biodiversity issues.

Two previous ecological assessments have been undertaken for the site, to support slightly different development layouts, in the past three years being:

- GHD (2007) *Heatherbrae Industrial Concept Plan, Ecological Assessment,* Port Stephens Council; and
- Orogen (2009) *Addendum Ecological Assessment Lot 32 DP 1014864, Masonite Road, Heatherbrae*, ATB Morton.

Due to the detailed ecological information that exists for the site, this report has been prepared at a desktop level relying on information presented within these previous reports to update and discuss the potential for threatened species, populations and ecological communities to occur and assess the ecological impacts of the revised proposal.

The site was found to contain known or potential habitat for two threatened flora species and 19 threatened fauna species. No EECs or endangered populations were found to occur or have habitat within the site.

Potential impacts associated with the proposal are related to the removal of approx 13.5ha of native vegetation within the site which provides foraging and some breeding habitat to a number of threatened species. However, the proposal design has been modified to include the retention of approx 1ha of habitat and two out of the three hollow-bearing trees within the south-east of the site to minimise potential impacts to hollow-dependent fauna species.

The proposal was found unlikely to have a substantial adverse impact on a local population of any threatened species due to all or a combination of the following factors:

- Small relative size of the area to be cleared;
- The mobile nature of the species under consideration;
- No severance of connectivity, fragmentation or isolation of species;
- Large patch of suitable adjacent habitat likely to support local populations of these species in similar habitats; and
- Retention of some native vegetation and two out of three hollow-bearing trees within the site.

Furthermore, recommendations have been made within this report to minimise potential ecological impacts associated with the proposal including an Offsets Strategy as follows:

- Retain the two hollow-bearing trees identified in site plans;
- Retain native vegetation as identified on site plans;
- Ensure an erosion and sediment control plan has been developed and appropriate controls are in place prior to commencement of vegetation clearing within the site;
- Implement the following clearing protocol:
    - Ensure that vegetation to be retained is accurately marked out and fenced prior to the commencement of vegetation clearing (using temporary fencing such as barrier tape) to ensure that vehicles and machinery do not accidently damage this area;
    - All hollow-bearing trees to be removed within the site is to be located and marked by a qualified ecologist, prior to the commencement of vegetation clearing;
    - The removal of hollow-bearing trees is to be supervised by a qualified ecologist to minimise potential impacts on resident fauna (including visual inspection, tapping tree trunk gently with machinery and observing, inspection after felling and fauna recovery);
- Nestboxes should be installed at a 1:1 ratio for each hollow removed. Nestboxes should reflect the range of sizes removed.
- Hollows from removed hollow-bearing trees should be placed on the ground within retained habitat under the supervision of a qualified ecologist to provide terrestrial shelter habitat for fauna;
- Ongoing weed management should occur within retained vegetation on site.

Terms and Abbreviations

Abbreviation	Meaning
AHD	Australian Height Datum
API	Aerial Photograph Interpretation
CRZ	Core Riparian Zone
DECCW	Department of Environment, Climate Change and Water
DEWHA	Department of Environment, Water, Heritage and Arts
DGEARs	Director Generals Environmental Assessment Requirements
DII	Department of Industry & Investment NSW (includes the formally known Department of Primary Industries)
EEC	Endangered Ecological Communities
EP&A Act 1979	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act 1999	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
FM Act 1994	*Fisheries Management Act 1994*
KTP	Key Threatening Process
LGA	Local Government Act
NES	National Environmental Significance
POM	Plan Of Management
RAMSAR Wetlands	The Convention on Wetlands of International Importance signed in 1971 in the Iranian town of Ramsar
ROTAP	Rare or Threatened Australian Plants
SEPP	State Environmental Planning Policy
TSC ACT 1995	*Threatened Species Conservation Act 1995*
WM Act 2000	*Water Management Act 2000*

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1 Introduction

RPS Australia East Pty Ltd (RPS) has been commissioned by Sandvik Mining and Construction Australia Pty Ltd to undertake an Ecological Assessment Report (EAR) in relation to a "Major Development" lodged under the Major Development SEPP (and Part 3A of the EP&A Act, 1979) for Lot 32 DP 1014864 Masonite Road, Heatherbrae. This report has been prepared at a desktop level, based on existing ecological information drawn from two previous flora and fauna assessments completed for the site in the past 3 years and the revised site concept plan. The Director General's Environmental Assessment Requirements (DGEARs) for the project have been issued (19 May 2010) and this report has been written to address these requirements in relation to biodiversity issues.

1.1 Site Particulars

Locality – Masonite Road, Heatherbrae, NSW.

LGA – Port Stephens.

Area – The area to be affected by the proposal is approximately 16 ha.

Zoning – The area is currently zoned as 4(a) industrial.

Current La nd Use – The site is currently unused with most covered by relatively undisturbed native vegetation, with the exception of vehicle tracks. Land within the north east corner of the site has been disturbed by previous agricultural/commercial disturbances and building activity relating to an old disused shed and mulch storage facilities. Native vegetation occurs to the south of the site and industrial / commercial development to the north, east and west of the site.

Topography – The site low lying and relatively flat with a minor depression in the south-east of the site.

Watercourses – A drainage line is mapped as occurring within the south-east corner of the site on topographic maps; however, according to field surveys, no defined channel exists in this area.

Vegetation – Vegetation within the site is dominated by Blackbutt (*Eucalyptus pilularis*) - Smooth-barked Apple (*Angophora costata*) Dry Sclerophyll Dune Forest (Orogen, 2009).

Figure 1-1 shows the general location of the site within the local region.

TITLE:	FIGURE 1-1 SITE LOCATION	LOCATION:	MASONITE ROAD	DATUM:	DATUM	DATE:	2/6/2010
				PROJECTION:	MGA ZONE 56 (GDA 94)	PURPOSE:	ECOLOGY

LAYOUT REF: J:\JOBS\PR\104k\104099 Masonite Rd\10 ...g\104099 Figure 1-1 Site Location B A4
VERSION (PLAN BY): B A4 (NW)

CLIENT: SANDVIK MINING AND CONSTRUCTION AUSTRALIA PTY LTD
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1.2 Background

RPS Australia East Pty Ltd has been commissioned by Sandvik Mining and Construction Australia Pty Ltd Pty Ltd to prepare an EAR to accompany a Part 3A application for the current development proposal (shown in Figure 1-2). Two previous ecological assessments have been undertaken for the site, to support slightly different development layouts, in the past three years being:

- GHD (2007) *Heatherbrae Industrial Concept Plan, Ecological Assessment,* Port Stephens Council; and
- Orogen (2009) *Addendum Ecological Assessment Lot 32 DP 1014864, Masonite Road, Heatherbrae*, ATB Morton.

GHD (2007) undertook detailed flora and fauna surveys across the site on behalf of Port Stephens Council, which were then ground-truthed and updated by Orogen (2009) into an Addendum Ecological Assessment Report to support a development application lodged under Part 4 of the EP& A Act 1979 for a like development to that now proposed. This application was approved by Port Stephens Council (PSC) on 15th September 2009 but not acted upon. Further changes have been made to the proposal concept plan and as such this report assesses the current reduced development footprint.

In relation to the DA approval report, the council found that environmental impacts associated with the proposal were of a nature and/or mitigated such that the ESD benefits to the local community and Hunter economy were on balance. To this end the current proposal has 'in principle' support from PSC.

Due to the detailed ecological information that exists for the site, this report has been prepared at a desktop level relying on information presented within these previous reports to update and discuss the potential for threatened species, populations and ecological communities to occur and assess the ecological impacts of the revised proposal.

TITLE:	FIGURE 1-2 DEVELOPMENT PROPOSAL LAYOUT
LOCATION:	HEATHERBRAE
DATUM:	DATUM
PROJECTION:	MGA ZONE 56 (GDA 94)
DATE:	20/6/2010
PURPOSE:	ECOLOGICAL REPORT FIGURE
LAYOUT REF:	104099 FIGURE 1-2 DEVELOPMENT LAYOUT A-A3
VERSION (PLAN BY):	A-A3 (S.C)
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1.3 Description of the Proposal

The site is proposed to be developed by Sandvik Mining and Construction Australia Pty Ltd. The proposal consists of a manufacturing, assembly, fabrication, warehouse and aftermarket industrial buildings with associated infrastructure such as office, carparks, guard station and amenities. The current concept plan for the site is shown in Figure 1-2.

The proposed development will require the removal of up to 13.5ha of native vegetation and 1.5ha of predominantly cleared land. Approximately 1ha of vegetation will be retained in the south-east of the site.

1.3.1 Consideration of Alternative Designs

The development plans approved under the approved Part 4 DA proposed the removal of all hollow-bearing trees and minimal vegetation retention within the site. However, in order to minimise potential ecological impacts in line with the original ecological report recommendations (GHD, 2007), this design has been subsequently modified.

The original ecological report (GHD, 2007) recommended that the site design incorporate a 50m retained vegetated buffer along the eastern boundary of the site, in addition to all three hollow-bearing trees to minimise impacts associated with the proposal. Whilst not strictly adhering to these recommendations, the current design aims to reflect the intention of these provisions and can be seen as making improvements to some aspects.

In particular, the current development design provides vegetation retention of approx 1 ha in the south-east of the site. From a review of recent aerial photography of the site and surrounds and the hollow-bearing tree mapping for the site it becomes apparent that this is a favourable ecological outcome in comparison to the approved Part 4 DA relating to the site. The current design allows the retention of two out of the three hollow-bearing trees within a patch (rather than linear which reduces edge effects) of retained vegetation. This retained vegetation patch has connectivity to the south that is wider than would have occurred with the original 50m buffer at this important boundary. Connectivity is also maintained to vegetation to the east across Masonite Road for mobile species able to cross the existing road. This connectivity of retained vegetation patch allows fauna species that may utilise the hollow-bearing trees to move into surrounding areas of habitat to forage.

1.4 Scope of the Study

The scope of this ecological assessment report is to:

- review existing ecological data for the site;
- identify existing habitat types on the site and assess the habitat potential for threatened species, populations, or ecological communities known from the proximate area;

- assess the potential of the proposal to have a significant impact on any threatened species, populations or ecological communities identified during field surveys or as having potential habitat on the site; and
- Address the DGEARs provided for the project.

1.5 DGEARs

The following DGEARs have been issued on 19 May 2010 for this project in relation to biodiversity:

- Accurate estimates of any vegetation clearing associated with the project **(Section 5);**
- A detailed assessment of the potential impacts of the project on any threatened species, populations (including Koalas), ecological communities or their habitats **(Section 5)**;
- Justification for the proposed site layout and access, and alternatives considered to minimise impacts **(Section 1.3.1)**;
- A detailed description of the measures that would be implemented to avoid or mitigate impacts on biodiversity **(Section 7)**;
- An offset strategy to ensure the project maintains or improves the biodiversity values of the region in the medium to long term (in accordance with NSW and Commonwealth policies) **(Section 7.1)**; and
- Details of the objectives, ownership and maintenance regime for any offset areas **(being developed as part of the Offsets Strategy see Section 7.1)**.

2 Methodology

This report has been prepared at a desktop level relying on the information collected during previous ecological surveys undertaken within the site. As such, no field surveys have been conducted as part of this report. However, the two previous surveys were undertaken recently (within the last 3 years) and include initial detailed flora and fauna surveys and a subsequent ground-truthing and verification survey. As such, the previous level of documentation is considered to be adequate to discuss the potential for threatened species, populations and ecological communities to occur and any potential impacts on these species as a result of the proposal.

Therefore, this section provides the details of the literature review undertaken for this report in addition to providing an overview of the methods employed by previous surveys undertaken over the site.

2.1 Literature Review

The literature review undertaken for this report included the following information sources:

- Previous reports prepared for the site:
  - GHD (2007) Heatherbrae Industrial Concept Plan, Ecological Assessment, Port Stephens Council;
  - Orogen (2009) Addendum Ecological Assessment Lot 32 DP 1014864, Masonite Road, Heatherbrae, ATB Morton;
  - Port Stephens Council (2009) Development Application for a Maintenance, Manufacturing and Testing facility for Sandvik Mining Equipment and Machinery at No 431 Masonite Rd, Heatherbrae, Extra-ordinary Council Meeting, Item No 1, File No:16-2009-481-1;
  - Port Stephens Council (2009) Notice of Determination of Modified Development Consent S96, ATB Morton; and
  - Sandvik Mining and Construction Pty Ltd (2010) Preliminary Environmental Assessment, Property Lot 32 DP 1014864, 431 Masonite Road, Heatherbrae.
- Review of recent threatened species, populations and ecological community listings;
- Department of Environment Climate Change and Water (DECCW) Atlas of NSW Wildlife, threatened species records within 10km radius of the site, accessed 17 June 2010;
- EPBC Protected Matters Search (accessed 17 June 2010) for threatened species and EECs recorded or with habitat within 10km radius of the site;
- Port Stephens Council (2002) Comprehensive Koala Plan of Management; and
- DGEARs for the project (19 May 2010).

2.2 Flora and Fauna Surveys

A suite of ecological survey methods have been used to sample the flora and fauna species present within the site and to define the vegetation communities and habitats present. The most comprehensive survey was undertaken by GHD in 2007 and was updated by Orogen in 2009 with a smaller range of methods utilised. A summary of the survey effort undertaken within the site previously is presented in Table 2-1 and each aspect is discussed further below. Full details can be obtained from the original reports.

2.2.1 Vegetation Communities

The original vegetation mapping prepared for the site by GHD (2007) was prepared using 20m x 20m quadrats and walking transects with reference to regional vegetation mapping prepared by LHCCREMS (House, 2003). Orogen (2009) updated the vegetation community mapping as a result of detailed flora surveys including six 20m x 20m quadrats and six 50m transects.

2.2.2 BioBanking Assessment

Orogen (2009) undertook detailed flora surveys which followed the DECCW BioBanking Assessment Methodology and were used to calculate a BioBanking credit report for the site.

2.2.3 Threatened Flora Surveys

Targeted threatened flora surveys were undertaken by both GHD (2007) and Orogen (2009); however, these were focused on species which are detectable all year round or at the time of surveys. As such, some species which are only detectable during flowering, such as cryptic orchid species, would not have been targeted.

2.2.4 Fauna Surveys

Fauna surveys undertaken within the site by GHD (2007) include the following survey methods:

- Habitat assessment and fauna transect searches;
- Hollow-bearing tree survey;
- Koala habitat assessment;
- Nocturnal surveys (spotlighting, stag watching and call playback);
- Terrestrial Elliott Trapping;
- Arboreal Elliott Trapping;
- Bat Call Recording (ANABAT);
- Harp Trapping; and
- Avifauna, amphibian and reptile searches.

Additionally, Orogen (2009) undertook the following fauna surveys during their investigation:

- Habitat assessment and fauna transect searches;
- Hollow-bearing tree survey (survey accurate GPS location);
- Nocturnal surveys (spotlighting, stag watching and call playback);

Table 2-1: Survey Effort

Author	Survey Dates	Vegetation Mapping	Biobanking Assessment	Targeted Threatened Flora Survey	Habitat Assessment	Mammal Trapping	Hollow-bearing Tree Survey	Koala Habitat Assessment	Spotlighting and Stagwatching	Call Playback	Bat Call Recording
GHD (2007)	15-19 and 25 October 2007	√ Quadrats and Transects	X	√ Non-cryptic species only	√	√ Terrestrial and Arboreal Elliott Trapping, Harp Trapping	√	√	√ 4 nights	√ 4 nights	√ 4 nights
Orogen (2009)	9-10 June 2009	√ 6 Quadrats and 6 Transects	√	√ Non-cryptic species only	√	X	√ Survey Accurate location	X	√ 2 nights	√ 2 nights	X

3 Results

The findings of previous ecological surveys within the site are discussed below and the location of key ecological features within the site are shown in Figure 3-1.

3.1 Vegetation Communities

The site was found to consist of two vegetation communities being:

- *Eucalyptus pilularis* (Blackbutt) – *Angophora costata* (Smooth-barked Apple) Dry Sclerophyll Dune Forest; and
- Cleared Land.

The original vegetation mapping (GHD, 2007) mapped three vegetation communities as occurring within the site, being Smooth-barked Apple / Blackbutt Forest, Blackbutt Moist Forest and Cleared/Disturbed Lands. However, further flora surveys by Orogen (2007) indicated that the more moist habitats within the site did not warrant consideration as a separate vegetation community.

The vegetation communities present within the site are not considered to be consistent with any EECs listed under TSC Act 1995 or EPBC Act 1999 as verified by a review of recent listings as part of this report.

3.2 Threatened Flora Species

No threatened flora species were recorded within the site during surveys. However, marginal habitat for two threatened flora species (*Diuris praecox* and *D. arenaria*) was considered to be present along tracks within the site. The Newcastle Doubletail (*Diuris praecox*) is listed as Vulnerable under the TSC Act 1995 and EPBC Act 1999 and the Sand Doubletail (*Diuris arenaria*) is listed as Endangered under the TSC Act 1995.

3.3 Fauna Species

Previous flora and fauna surveys recorded a range of fauna species using the site at the time of survey. GHD (2009) recorded 118 fauna species, consisting of 72 bird, 32 mammal, seven reptile and seven amphibian species. No additional species were detected during subsequent surveys. Full details can be obtained from the previous reports.

3.3.1 Threatened Fauna Species

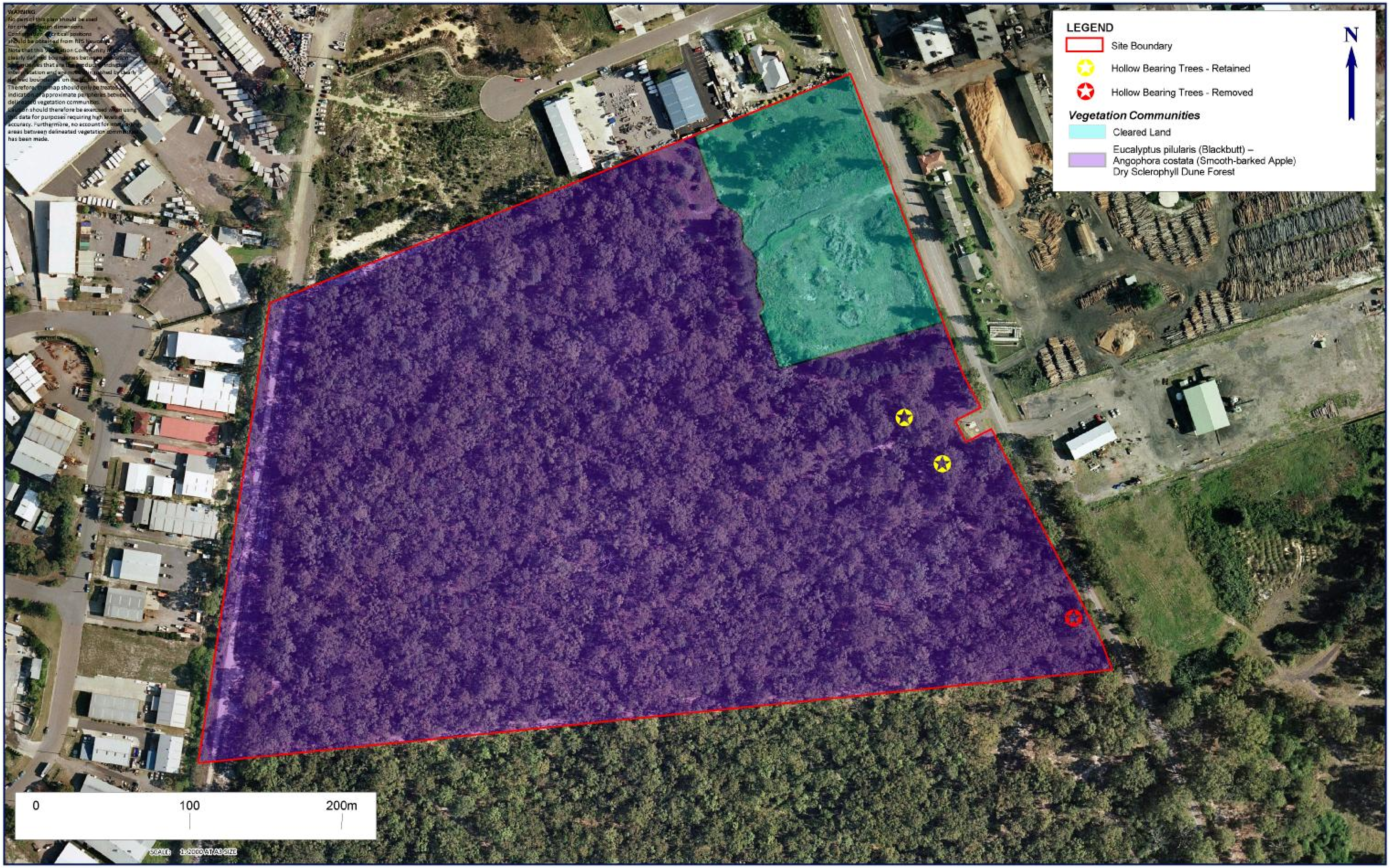
Of the 118 fauna species recorded within or immediately adjacent to the site during previous investigations, a total of eight fauna species are listed under TSC Act 1995 and/or EPBC Act 1999.

A revised assessment of likelihood of occurrence of threatened species has been undertaken as part of this report and is presented within Appendix 1. This assessment has been prepared using the ecological information contained within previous flora and fauna surveys undertaken within the site, local knowledge of RPS Ecologists and an updated review of threatened species records in the locality. This revised assessment has found that in addition to the eight threatened fauna species recorded within or immediately adjacent to the site previously, a further 10 are considered likely to occur within the site.

The following threatened species have been recorded within (in **bold**), or immediately adjacent (marked in **bold w ith** *) or considered likely to occur within the site (see Appendix 1):

- **Squirrel Glider (*Petaurus norfolkensis*)** – listed as Vulnerable under TSC Act 1995;
- **Grey-headed Flying Fox (*Pteropus poliocephalus*)** – listed as Vulnerable under TSC Act 1995 and EPBC Act 1999;
- **Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)** – listed as Vulnerable under TSC Act 1995;
- **Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)** – listed as Vulnerable under TSC Act 1995;
- **Greater Broad-nosed Bat (*Scoteanax rueppellii*)** – listed as Vulnerable under TSC Act 1995;
- **East Coast Freetail Bat (*Mormopterus norfolkensis*)** – listed as Vulnerable under TSC Act 1995;
- **Powerful Owl (*Ninox strenua*) *** – listed as Vulnerable under TSC Act 1995;
- **Glossy Black-Cockatoo (*Calyptorhynchus lathami*) *** – listed as Vulnerable under TSC Act 1995;
- Square-tailed Kite (*Lophoicitinia isura*) – listed as Vulnerable under TSC Act 1995;
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) – listed as Vulnerable under TSC Act 1995;
- Swift Parrot (*Lathamus discolor*) – listed as Vulnerable under TSC Act 1995;
- Little Lorikeet (*Glossopsitta pursilla*) – listed as Vulnerable under TSC Act 1995;
- Masked Owl (*Tyto novaehollandiae*) – listed as Vulnerable under TSC Act 1995;
- Brush-tailed Phascogale (*Phascogale tapoatafa*) – listed as Vulnerable under TSC Act 1995;
- Long-nosed Potoroo (*Potorous tridactylus*) – listed as Vulnerable under TSC Act 1995 and EPBC Act 1999;
- Koala (*Phascolarctos cinereus*) – listed as Vulnerable under TSC Act 1995;
- Little Bentwing Bat (*Miniopterus australis*) – listed as Vulnerable under TSC Act 1995; and
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*) – listed as Vulnerable under TSC Act 1995.

- Additionally, the Varied Sittella (*Daphoenositta chrysoptera*), of which marginal habitat exists within the site is currently a preliminary determination for listing as Vulnerable under TSC Act 1995.



TITLE: FIGURE 3-1 KEY ECOLOGICAL FEATURES | LOCATION: HEATHERBRAE | DATUM: DATUM | PROJECTION: MGA ZONE 56 (GDA 94) | DATE: 20/6/2010 | PURPOSE: ECOLOGICAL REPORT FIGURE | LAYOUT REF: 104099 FIGURE 3-1 VEGETATION MAP A-A3 | VERSION (PLAN BY): A-A3 (S.C)

CLIENT: SANDVIK MINING AND CONSTRUCTION AUSTRALIA PTY LTD
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4 Key Threatening Processes

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act 1995. There are seven KTPs that have the potential to affect the site as a consequence of the proposal, being:

- Clearing of native vegetation;
- Removal of dead wood and dead trees;
- Removal of hollow-bearing trees;
- Human-caused climate change;
- Invasion of native plant communities by exotic perennial grasses;
- *Lantana camara*; and
- Invasion and establishment of exotic vines and scramblers.

Clearing of Native Vegetation
The proposed development will require the removal of native vegetation and as such could contribute to the KTP "Clearing of Native Vegetation". The proposal will require the clearing of approx 13.5ha of native vegetation which is considered to be a small cumulative contribution to this KTP.

Removal of Dead Wood and Dead Trees
The proposed development will require the removal of ground debris and as such could contribute to the Key Threatening Process "Removal of Dead Wood and Dead Trees". Due to the use of dead wood debris on the ground for foraging, removal has the potential to impact any local population of dependant species. Therefore, retention of dead standing trees, trees with hollows and fallen wood debris wherever possible would aid to mitigate any impact.

Removal of Hollow-bearing Trees
The proposed development will require the removal of one hollow-bearing tree and as such will contribute to the KTP "Removal of Hollow-bearing Trees". Due to the use of hollow-bearing trees by threatened fauna, particularly arboreal fauna, birds and Microchiropteran bats, removal of these resources has the potential to impact any local population of dependant species.

Human Caused Climate Change
The proposal is likely to contribute to the KTP "Human Caused Climate Change" as a result of clearing vegetation. The proposal could only be considered to have a small cumulative contribution of this KTP.

Invasion of native plant communities by exotic perennial grasses
The proposal is likely to contribute to the KTP "Invasion of native plant communities by exotic perennial grasses" as a result of understorey removal and the creation of expanses

of bear soil. The extent to which the proposal can be expected as contributing to this process is considered insignificant due to the diversity of exotic grasses currently occurring within the site (particularly north-east corner). Furthermore, weed control measures have been recommended to minimise the spread of weeds within the site.

Lantana camara

The proposal is likely to contribute to the KTP "*Lantana camara*" as a result of canopy thinning and understorey disturbance. However, those areas that will be modified during the process of development will be managed into the future, eliminating opportunities for *Lantana camara* to take hold.

Invasion and establishment of exotic vines and scramblers

The proposal can be considered as contributing to the KTP "Invasion and establishment of exotic vines and scramblers" by altering the nature of the environment and excluding native species including threatened species.

5 Potential Impacts

A total of approx 13.5ha of native vegetation (*Eucalyptus pilularis – Angophora costata* Dry Sclerophyll Dune Forest) and one hollow-bearing tree will be removed as a result of the proposal. Additionally, 1.5ha of Cleared / Disturbed land will also be developed. However, approx 1ha of vegetation and two hollow-bearing trees will be retained within the site. (refer to Figure 1-2). It should be noted that the site is bounded to the north, west and majority of east by existing developed land used for industrial and commercial uses. The only vegetated connectivity occurs along the southern boundary of the site and to the south-east. Vegetation to be retained within the site occurs in the south-east corner of the site maintaining linkage for species that may utilise the onsite hollows for roosting and denning habitat and the larger offsite habitat patch for foraqing. However, it should be noted that surrounding areas are also zoned for future commercial / industrial development).

General direct and indirect potential impacts associated with the proposal include:

- Road mortality of fauna through increased vehicle movements;
- Short-term light, noise and dust disturbance to fauna species during construction;
- Erosion and sedimentation impacts on retained and adjacent vegetation/habitats during construction and long-term; and
- Weed invasion from the site into adjacent areas through machinery movements.

A discussion of the potential impacts of habitat removal for threatened species recorded or considered likely to occur within the site is presented below.

5.1 Corridors and Connectivity

The site is bounded to the north, west and most of the east by existing industrial / commercial development. With connectivity to native vegetation occurring along the southern boundary and in the south-east corner of the site. The site is connected to a large patch of vegetation to the south which extends to the east around Williamtown. However, since the site is located at the edge of this large patch of vegetation, the proposal is considered unlikely to sever any connectivity between vegetation patches for flora and fauna dispersal. Rather, the proposal will result in minor encroachment of development on native vegetation in the area.

Furthermore, the proposal will retain vegetation surrounding two hollow-bearing trees within the south-east corner of the site which will provide a link for fauna species which may utilise hollows within the site to other areas of native vegetation to the south and south-east.

Similarly, the proposal will not fragment or isolate habitat within or adjacent to the site.

5.2 Threatened Flora Species

No threatened flora species were recorded within the site during surveys; however, two species have potential habitat within the site, being Newcastle Doubletail (*Diuris praecox*) and Sand Doubletail (*Diuris arenaria*). These species are unable to be detected outside of their flowering period and may not flower every year. Previous flora surveys were not undertaken during the flowering period of these species (August – September) and as such no targeted surveys have been undertaken for these species. Therefore, it is unknown whether these species occur within the site.

On this basis the precautionary approach must be applied and as such assessment based on assumed presence has been applied. The site constitutes marginal habitat for the species and the proposed development would incrementally contribute to habitat loss in the locality. However, it's considered unlikely that the proposal would have a significant impact on a local population of this species.

5.3 Threatened Fauna Species

The following section discusses habitats for each species within the site, potential impacts and significance of such impacts.

5.3.1 Squirrel Glider

The Squirrel Glider (*Petaurus norfolcensis*) was recorded within the site during surveys by GHD (2007) and one den tree was also identified. Foraging habitat for this species occurs in the canopy and shrub layer of forested vegetation within the site. Hollow-bearing trees recorded within the site also provide denning habitat for the species.

The proposal will remove approx 13.5ha of foraging habitat for this species and one hollow-bearing tree which represents potential denning/breeding habitat. The proposal has been redesigned to retain two out of the three hollow-bearing trees within the site in addition to 1ha of foraging habitat.

The portion of habitat to be removed as a result of the proposal is likely to be used by at least one family group of Squirrel Gliders. The removal of this habitat (and potentially the resident family group) is considered unlikely to adversely impact the local population of Squirrel Glider due to the presence of extensive habitat to the south and east of the site. The large vegetation patch adjoining the site which is connected to Tomaree National park contains habitats that are known to be suitable for this species and it is likely that the individuals recorded within the site are a part of the broader Tomago / Williamtown local population. Whilst one hollow-bearing tree will be removed as a result of the proposal, two will be retained within an area of native vegetation. This retained area will also have connectivity to the south and south-east to provide gliders that may utilise these hollows with connectivity to foraging habitats outside of the site.

Recommendations have also been made to install and monitor nestboxes for each of the hollows within the hollow-bearing tree to be removed so that there will be opportunities for gliders to utilise these boxes in addition to retained hollow-bearing trees within the site.

5.3.2 Cave-roosting Microchiropteran Bat Species

One cave-roosting threatened microchiropteran bat species was recorded within the site during surveys, being the Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) and another, the Little Bentwing Bat (*Miniopterus australis*) is considered likely to occur based on the presence of suitable habitat within the site.

Foraging habitat for these species within the site consists of the open forest and forest edge areas. No potential roosting habitat exists within the site (caves or similar).

Direct potential impacts associated with the proposal are limited to the removal of approx 13.5ha of foraging habitat for these species. No roosting / breeding habitat would be impacted by the proposal.

The area of foraging habitat to be removed as a result of the proposal is considered to be a small portion of habitat available to these species within the locality. However, it should be noted that the proposal will incrementally contribute to habitat loss for these species within the locality.

5.3.3 Hollow-roosting Microchiropteran Bat Species

A total of three species of hollow-roosting threatened microchiropteran bats were recorded within the site, being Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), East Coast Freetail Bat (*Mormopterus norfolkensis*) and Greater Broad-nosed Bat (*Scoteanax rueppellii*). Additionally, the Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*) was considered likely to occur based on the presence of suitable habitat.

Foraging habitat for these species within the site consists of the open forest and forest edge areas. Potential roosting habitat exists within the three hollow-bearing trees recorded within the site.

The proposal will remove approx 13.5ha of foraging habitat for these species and one hollow-bearing tree which represents potential roosting/breeding habitat for these species. The proposal has been redesigned to retain two out of the three hollow-bearing trees within the site in addition to approx 1ha of foraging habitat.

The area of foraging habitat to be removed as a result of the proposal is considered to be a small portion of habitat available to these species within the locality and the removal of one hollow-bearing tree is unlikely to adversely impact local populations of these species alone. However, it should be noted that the proposal will incrementally contribute to habitat loss for these species within the locality, particularly in relation to loss of hollow-bearing trees.

5.3.4 Grey-headed Flying-fox and Swift Parrot

The Grey-headed Flying-fox (*Pteropus poliocephalus*) was recorded foraging within the site during surveys. The Swift Parrot (*Lathamus discolor*) was not recorded within the site; however, is considered likely to occur based on the presence of winter flowering foraging resources.

Foraging habitat for these species exists within flowering shrub and canopy species within the site. The Swift Parrot is a winter visitor to the region and the late flowering *Eucalyptus pilularis* (Blackbutt) within the site can offer foraging habitat in years where other more favoured resources fail. Flowering tree and shrub species within the site would provide foraging opportunities for the highly mobile Grey-headed Flying-fox throughout the year. No potential nesting / roosting / breeding habitat exists for either of these species within the site.

The proposal will remove approx 13.5ha of foraging habitat for these highly mobile species. The proposal has been redesigned to retain approx 1ha of foraging habitat.

The area of foraging habitat to be removed as a result of the proposal is considered to be a small portion of habitat available to these highly mobile species within the locality. It is considered unlikely that the proposal would adversely impact local populations of these species alone. However, it should be noted that the proposal will incrementally contribute to habitat loss for these species within the locality.

5.3.5 Large Forest Owls

The Powerful Owl (*Ninox strenua*) was recorded to the south of the site during surveys and an owl pellet thought to be from a Powerful Owl was also recovered from the site. Whilst the Masked Owl (*Tyto novaehollandiae*) was not recorded within the site during surveys, the presence of suitable foraging habitat within the site and the presence of local records indicates that is has the potential to occur within the site.

Foraging habitat for the Powerful Owl exists in the form of abundant arboreal mammal prey items such as Squirrel Gliders, Sugar Gliders and Brushtail Possums. Additionally, suitable terrestrial prey species for the Masked Owl were also recorded within the site. The Powerful Owl is likely to forage within the open forest habitats targeting arboreal prey; whereas the Masked Owl prefers to hunt along forest edges and openings where terrestrial prey can be detected. No hollows of sufficient size to offer breeding habitat to either of these species were found within the site.

The proposal will remove approx 13.5ha of foraging habitat for these species as part of a much larger home range. The area of foraging habitat to be removed as a result of the proposal is considered to be a small portion of habitat available to these highly mobile species within the locality. It is considered unlikely that the proposal would adversely impact local populations of these species alone. However, it should be noted that the proposal will incrementally contribute to habitat loss for these species within the locality.

5.3.6 Square-tailed Kite

The Square-tailed Kite (*Lophoicitinia isura*) was not recorded within the site during surveys. However, the presence of suitable foraging habitat within the site and the presence of local records indicates that is has the potential to occur within the site.

Foraging habitat for the Square-tailed Kite exists open forest habitats which have an abundance of passerine birds for prey. No nests that could be attributed to this species were observed during previous surveys and marginal opportunities exist for nesting/breeding habitat.

The proposal will remove approx 13.5ha of foraging habitat for this species as part of a much larger home range. The area of foraging habitat to be removed as a result of the proposal is considered to be a small portion of habitat available to this highly mobile species within the locality. It is considered unlikely that the proposal would adversely impact local populations of this species alone. However, it should be noted that the proposal will incrementally contribute to habitat loss for this species within the locality.

5.3.7 Long-nosed Potoroo

Previous surveys did not detect either the Long-nosed Potoroo (*Potorous tridactylus*) within the site. However, marginally suitable habitat for these species does occur for these species which are often difficult to detect. Therefore, as a precautionary approach these species have been considered as potentially occurring within the site.

The site offers marginal foraging habitat for the Long-nosed Potoroo, but lacks the dense shelter habitats preferred by the species. The proposal will remove approx 13.5ha of potential foraging habitat; however, the proposal has been redesigned to retain approx 1ha of foraging habitat and two hollow-bearing trees.

The area of foraging habitat to be removed as a result of the proposal is considered to be a small portion of habitat available to this species within the locality, particularly since the Long-hosed Potoroo has a large home range. It is considered unlikely that the proposal would adversely impact local populations of this species alone.

5.3.8 Brush-tailed Phascogale

Previous surveys did not detect either the Brush-tailed Phascogale (*Phascogale tapotafa*) within the site. However, suitable habitat for this species does occur within the site. Since this species is difficult to detect due to large home range size and as a precautionary approach this species has been considered as potentially occurring within the site.

Potential foraging habitat for the Brush-tailed Phascogale exists within the site open forest habitats within the site and potential denning / breeding habitat exists within hollow-bearing trees within the site. The proposal will remove approx 13.5ha of potential foraging habitat and one hollow-bearing tree which represents potential denning habitat for the Brush-tailed Phascogale. However, the proposal has been redesigned to retain approx 1ha of foraging habitat and two hollow-bearing trees.

The area of foraging habitat to be removed as a result of the proposal is considered to be a small portion of habitat available to this species within the locality. Additionally, habitat within the site is considered to be only marginally suitable for the Brush-tailed Phascogale. It is considered unlikely that the proposal would adversely impact local populations of this species alone. However, it should be noted that the proposal will incrementally contribute to habitat loss for this species within the locality.

5.3.9 Little Lorikeet

Previous surveys recorded the Little Lorikeet (*Glossopsitta pursilla*) within the site. The Little Lorikeet has been recently listed as Vulnerable under TSC Act 1995 and as such was not formally assessed within previous studies.

Foraging habitat for this species exists within flowering shrub and canopy species within the site and potential nesting / breeding habitat occurs within hollow-bearing trees recorded within the site.

The proposal will remove approx 13.5ha of foraging habitat and one hollow-bearing tree representing potential nesting / breeding habitat for this mobile species. However, the proposal has been redesigned to retain approx 1ha of foraging habitat and two hollow-bearing trees.

The area of foraging habitat to be removed as a result of the proposal is considered to be a small portion of habitat available to these species within the locality and the removal of one hollow-bearing tree is unlikely to adversely impact local populations of these species alone. However, it should be noted that the proposal will incrementally contribute to habitat loss for these species within the locality, particularly in relation to loss of hollow-bearing trees.

5.3.10 Glossy Black and Gang Gang Cockatoos

Previous surveys recorded Glossy Black Cockatoo (*Calyptorhynchus lathami*) immediately to the south of the site. Whilst the Gang Gang Cockatoo (*Callocephalon fimbriatum*) was not recorded during previous surveys, the site offers potential foraging habitat for the species during winter when it enters more coastal habitats.

Foraging habitat for the Glossy Black Cockatoo exists within open forest habitats that contain *Allocasuarina* species within the site. The Gang Gang Cockatoo forages on the fruit of eucalypt species which occur throughout the forested habitats within the site. No hollows of a suitable size exist to provide potential nesting / breeding habitat within the site.

The proposal will remove approx 13.5ha of foraging habitat for these mobile species and the proposal has been redesigned to retain approx 1ha of foraging habitat.

The area of foraging habitat to be removed as a result of the proposal is considered to be a small portion of habitat available to these mobile species within the locality. The

proposal is considered unlikely to adversely impact local populations of these species alone. However, it should be noted that the proposal will incrementally contribute to habitat loss for these species within the locality.

5.3.11 Koala

The Koala (*Phascolarctos cinereus*) was not recorded within the site during surveys despite targeted surveys including scat searches, spotlighting and call playback. However, the Koala has been recorded to the south of the site and is known from the locality. The site contains no Koala feed trees listed under SEPP 44 or preferred tree species listed by Port Stephens CKPoM (2002). Whilst preferred feed trees are absent from the site, due to the presence of known foraging habitat to the south of the site, the species cannot be entirely discounted from occurring within the site on occasion.

The proposal is considered unlikely to have an adverse impact on a local population of Koala since no preferred tree species will be removed and the proposal will not sever connectivity for the species as the site is not located within a movement corridor.

5.3.12 Summary

The proposal is not considered likely to have an adverse impact on the local populations or connectivity of any threatened species recorded or considered likely to occur within the site due to all or a combination of the following factors:

- Small relative size of the area to be cleared;
- The mobile nature of the species under consideration;
- No severance of connectivity, fragmentation or isolation of species;
- Large patch of suitable adjacent habitat likely to support local populations of these species in similar habitats; and
- Retention of some native vegetation and two out of three hollow-bearing trees within the site.

6 Key Thresholds Assessment

As required by the Draft Guidelines for Threatened Species Assessment for Part 3A applications (DEC / DPI 2005), the following assessment of Key Thresholds (four in total) is provided for the proposal.

1. Whether or not the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts, will maintain or improve biodiversity values.

The proposal will remove approx 13.5ha of native vegetation within the site which provides habitat for a number of threatened species. However, the proposal has been redesigned to include retention of approx 1ha of native vegetation which surrounds two out of three hollow-bearing trees recorded within the site. The retention of hollow-bearing trees within the site will provide ongoing opportunity for hollow-dependent species to persist in the area.

The recommendations discussed in Section 7 below have been designed to minimise potential impacts on threatened species recorded or considered likely to occur within the site. Furthermore, the proponent has committed to providing an offsets package to mitigate potential impacts arising from the proposal (See Section 7.1).

Therefore, providing that the recommended mitigation measures are applied, it is considered that the proposal will maintain or improve biodiversity values within the region.

2. Whether or not the proposal is likely to reduce the long-term viability of a local population of the species, population or ecological community.

As discussed above in Section 6, the proposal is considered unlikely to reduce the long-term viability of a local population of threatened species, population or ecological community due to all or a combination of the following factors:

- Small relative size of the area to be cleared;
- The mobile nature of the species under consideration;
- No severance of connectivity, fragmentation or isolation of species;
- Large patch of suitable adjacent habitat likely to support local populations of these species in similar habitats; and
- Retention of some native vegetation and two out of three hollow-bearing trees within the site.

3. Whether or not the proposal is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction.

Since the proposal will remove a relatively small portion of habitat for threatened species, with large expanses of similar habitats remaining adjacent to the site it is considered unlikely to accelerate the extinction of threatened fauna species within the site.

4. Whether or not the proposal will adversely affect critical habitat.

There is no declared “Critical Habitat” within 10km of the site.

7 Recommended Mitigation Measures

7.1 Offsets Strategy

An offsets strategy is currently being developed to minimise potential biodiversity impacts associated with the proposal. The offsets strategy will involve the dedication of land for the purposes of conservation in perpetuity and to ensure that the principle of maintain or improve biodiversity values is met.

The details of the Offsets Strategy will form part of the Statement of Commitments in relation to this project.

7.2 General Measures

In addition to the proposed Offsets strategy, the following measures are recommended to minimise the potential impacts of the proposal on threatened flora and fauna species and their habitats:

- Retain the two hollow-bearing trees identified in site plans;
- Retain native vegetation as identified on site plans (Figure 1-2);
- Ensure an erosion and sediment control plan has been developed and appropriate controls are in place prior to commencement of vegetation clearing within the site;
- Implement the following clearing protocol:
  - » Ensure that vegetation to be retained is accurately marked out and fenced prior to the commencement of vegetation clearing (using temporary fencing such as barrier tape) to ensure that vehicles and machinery do not accidently damage this area;
  - » All hollow-bearing trees to be removed within the site is to be located and marked by a qualified ecologist, prior to the commencement of vegetation clearing;
  - » The removal of hollow-bearing trees is to be supervised by a qualified ecologist to minimise potential impacts on resident fauna (including visual inspection, tapping tree trunk gently with machinery and observing, inspection after felling and fauna recovery);
- Nestboxes should be installed at a 1:1 ratio for each hollow removed. Nestboxes should reflect the range of sizes removed.
- Hollows from removed hollow-bearing trees should be placed on the ground within retained habitat under the supervision of a qualified ecologist to provide terrestrial shelter habitat for fauna;
- Ongoing weed management should occur within retained vegetation on site.

8 Conclusion

The site was found to contain known or potential habitat for two threatened flora species and 19 threatened fauna species. No EECs or endangered populations were found to occur or have habitat within the site.

Potential impacts associated with the proposal are related to the removal of approx 13.5ha of native vegetation within the site which provides foraging and some breeding habitat to a number of threatened species. However, the proposal design has been modified to include the retention of approx 1ha of habitat and two out of the three hollow-bearing trees within the south-east of the site to minimise potential impacts to hollow-dependent fauna species.

The proposal was found unlikely to have a substantial adverse impact on a local population of any threatened species due to all or a combination of the following factors:

- Small relative size of the area to be cleared;
- The mobile nature of the species under consideration;
- No severance of connectivity, fragmentation or isolation of species;
- Large patch of suitable adjacent habitat likely to support local populations of these species in similar habitats; and
- Retention of some native vegetation and two out of three hollow-bearing trees within the site.

Furthermore, recommendations have been made within this report to minimise potential ecological impacts associated with the proposal including an Offsets Strategy.

9 References

Atlas of NSW Wildlife (accessed June 2010). New South Wales National Parks and Wildlife Service – Flora and Fauna Database.

DECC (2009) Guidelines for Threatened Species Assessment.

DEC (2004) Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities Working Draft November 2004. Department of Environment and Conservation. NSW.

GHD (2007) Heatherbrae Industrial Concept Plan, Ecological Assessment, Port Stephens Council;

Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS) (2002). Lower Hunter and Central Coast Extant Vegetation 2002. Draft report.

NPWS – NSW National Parks and Wildlife Service (2000). Vegetation Survey, Classification and Mapping, Lower Hunter and Central Coast Region, Version 1.2. Lower Hunter and Central Coast Regional Environmental Management Strategy, Thornton, NSW.

Orogen (2009) Addendum Ecological Assessment Lot 32 DP 1014864, Masonite Road, Heatherbrae, ATB Morton;

Port Stephens Council (2009) Development Application for a Maintenance, Manufacturing and Testing facility for Sandvik Mining Equipment and Machinery at No 431 Masonite Rd, Heatherbrae, Extra-ordinary Council Meeting, Item No 1, File No:16-2009-481-1;

Port Stephens Council (2009) Notice of Determination of Modified Development Consent S96, ATB Morton; and

Port Stephens Council (2001) Port Stephens Council Comprehensive Koala Place of Management (CKPoM). Prepared by Port Stephens Council, the Australian Koala foundation and the NSW National Parks and Wildlife Service.

Sandvik Mining and Construction Pty Ltd (2010) Preliminary Environmental Assessment, Property Lot 32 DP 1014864, 431 Masonite Road, Heatherbrae.

APPENDIX 1

Threatened Species Likelihood of Occurrence

Threatened Species and Communities Likelihood of Occurrence Assessment

Following is an assessment of the likelihood of occurrence of each species within the subject site based on a comparison of the habitat requirements of each species/community and the habitat types present within the subject site.

Each species / community is considered for its potential to occur on the subject site and the likely level of impact as a result of the Proposal. This assessment deals with each species / community separately and identifies the ecological parameters of significance associated with the Proposal. This assessment deals with the following heads of consideration in tabulated form (refer to Table A):

'**Species / Community '** – Lists each threatened species / EEC known from the vicinity. The status of each threatened species under the TSC Act and the EPBC Act are also provided.

'Habitat De scription' – Provides a brief account of the species / community and the preferred habitat attributes required for the existence / survival of each species / community.

'Chance of Occurrence on Site' – Assesses the likelihood of each species / community to occur along or within the immediate vicinity of the subject site in terms of the aforementioned habitat description and taking into account local habitat preferences, results of current field investigations, data gained from various sources (such as DECCW Atlas of NSW Wildlife, herbariums, etc.) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Likely Level of Impac ts from Proposal' – Assesses the likely level / significance of impacts to each species / community that would result from the proposed development, taking into account direct and indirect short and long-term impacts.

Table A: Chance of Occurrence and Likely Level of Impact Assessments

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Plants			
Asperula asthenes Trailing Woodruff (V)	A decumbent perennial herb that occurs only in NSW, and is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area. It prefers damp sites often along riverbanks.	**Low** This species has been recorded within a 10 km radius of the site and whilst the vegetation contains some marginal habitat, no individuals were identified within the site during flora surveys. The moist habitats within the site are unlikely to provide the optimum habitat for this species.	**Low** Due to the lack of individuals and preferred habitat, observed on the site, this species is unlikely to be affected by the proposal.
Diuris arenaria Sand Doubletail (E)	A small terrestrial orchid known only from the Tomaree Peninsula where it occurs in coastal heathy dry sclerophyll forest. It produces 20-30mm wide light purple to mauve flowers during August and September and usually possesses two basal leaves measuring 15-50cm long by 2-6mm wide.	**Moderate** Marginal habitat for this species occurs within the site, particularly along tracks. Since the species is only able to be detected during flowering and targeted surveys have not been undertaken during the flowering period, the occurrence of this species cannot be discounted.	**Moderate** The proposal will remove marginal potential habitat for this species within the site. The amount of habitat to be removed within the site is relatively small and marginal compared to that which exists in the locality.
Diuris praecox Newcastle Doubletail (V, V*)	Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Exists as subterranean tubers most of the year. It produces leaves and flowering stems in winter.	**Moderate** Marginal habitat for this species occurs within the site, particularly along tracks. Since the species is only able to be detected during flowering and targeted surveys have not been undertaken during the flowering period, the occurrence of this species cannot be discounted.	**Moderate** The proposal will remove marginal potential habitat for this species within the site. The amount of habitat to be removed within the site is relatively small and marginal compared to that which exists in the locality.
Eucalyptus camfieldii Camfield's Stringybark (V, V*)	Tree or mallee to 10m high, but often less. Rare and localised, in coastal shrub heath on sandy soils on sandstone, often restricted drainage. Records from the Hunter Region largely in near coastal areas from the Port Stephens LGA to the Central Coast (DEC 2005).	**Low** This species has been recorded within a 10 km radius of the site, whilst the vegetation contains some marginal habitat, no stringybarks were identified within the dry sclerophyll habitats within the site.	**Low** Due to the lack of individuals and preferred habitat, observed on the site, this species is unlikely to be affected by the proposal.
Eucalyptus parramattensis ssp.	Red Gum species that grows in dry sclerophyll woodland on sandy soils, often in low damp sites.	**Low-Moderate Lo**	**w**

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
decadens Drooping Red Gum (V, V*)	This species has been recorded in the immediate vicinity, with records stretching west to the Cessnock area.	This species has been recorded within a 10 km radius of the site and whilst the vegetation contains some marginal habitat, this species was not recorded during surveys.	Due to the lack of individuals and preferred habitat, observed on the site, this species is unlikely to be affected by the proposal.
Maundia triglochinoides (V)	*M. triglochinoides* is a perennial species that grows in swamps or shallow fresh water on heavy clay with similar plants such as *Triglochin procerum* (Water Ribbons).	**Low** The site does not contain swamp or shallow fresh water habitat suitable for this species. Therefore, it is considered unlikely to occur within the site.	**Low** Due to the lack of individuals and preferred habitat, observed on the site, this species is unlikely to be affected by the proposal.
Persicaria elatior Knotweed (V, V*)	An erect herb to 90 cm tall, it is known in the locality from Raymond Terrace and 70 km to the south-west at Laguna This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	**Low** The site does not contain swamp or shallow fresh water habitat suitable for this species. Therefore, it is considered unlikely to occur within the site.	**Low** Due to the lack of individuals and preferred habitat, observed on the site, this species is unlikely to be affected by the proposal.
Rulingia prostrata Dwarf Kerrawang (E, E*)	A prostrate shrub forming mats greater than 1m in width and occurring within heath, dry sclerophyll forest and coastal sands areas around Tomago.	**Low-Moderate** This species has been recorded within 10 km of the site. Marginal habitat exists for this species within the dry sclerophyll forest; however, it was not recorded during previous surveys. Due to the presence of suitable habitat, its presence within the site cannot be entirely discounted..	**Low** Due to the lack of individuals and preferred habitat, observed on the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Zannichellia palustris (E)	A submerged monoecious weakly rhizomatous aquatic annual or perennial plant. Within Australia it is known only from the Murray River estuary in South Australia and the Lower Hunter region in NSW. This species occurs in fresh to brackish, still to slow moving waters. *Z. palustris* has been collected from Ironbark Creek (Shortland), Black Creek (Cessnock), Kooragang Island and from near Belmont. None of the known sites of this species are formally protected and none are managed in any way for the conservation of the species. This species is ROTAP-coded 3R+, indicating that the species occurs overseas.	**Low** No suitable wetland habitat exists within the site and as such it is considered unlikely to occur on site.	**Low** Due to the lack of individuals and preferred habitat, observed on the site, this species is unlikely to be affected by the proposal.
Amphibians			
Crinia tinnula Wallum Froglet (V)	Occurs in coastal, low-lying acid Paperbark forest, within the 'wallum country' (often on sandy soils). Regional records for this species are confined to three main areas; Lake Macquarie, Central Coast and Medowie and Port Stephens (DEC 2005). Within the Port Stephens LGA, this species has been recorded utilising large areas of flooded cleared paddocks which occur adjacent to sedge swamp and paperbark forest.	**Low** The site does not contain suitable sedge swamp habitat within or adjacent to the site and as such it is unlikely that this species would occur within the site.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Litoria aurea Green and Golden Bell Frog (E, V*)	Inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins. Thought to be displaced from more established sites by other frog species, thus explaining its existence on disturbed sites. Previously widespread within the region, but now sparsely distributed within the Lower Hunter and Central Coast areas. A relatively stable population occurs on Kooragang Island.	**Low** This species has been recorded within 10km of the site on Kooragang Island where a large population is present. No individuals have been recorded within 10km of the site to the north of the Hunter river. Futhermore, suitable waterbodies are absent from the site.	**Low** Due to the lack of individuals found within the site, the scarcity of records for this species in the vicinity and lack of optimal habitat, observed on the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Avifauna			
Stictonetta naevosa Freckled Duck (V)	Inhabits both open lakes and wetlands surrounded by thick vegetation, especially swamps in which lignum, Cumbungi or Paperbarks grow. Permanent or temporary wetlands of varying salinity are known to be used. It is thought to be a frequent visitor to inland districts and rare in coastal areas. Records in the Hunter Region exist from Ellalong Lagoon, Pambalong Nature Reserve, Hunter Wetland Centre and Grahamstown Reservoir (DEC 2005).	**Low** No suitable habitat (open lakes and wetlands) exists within the site for this species. This species usually occurs outside of the Hunter region although it may rarely use coastal wetlands during extended dry periods.	**Low** Due to the lack of individuals found within the site, the scarcity of records for this species in the vicinity and lack of optimal habitat, observed on the site, this species is unlikely to be affected by the proposal.
Oxyura australis Blue-billed Duck (V)	A frequenter of deep freshwater swamps with thick vegetation. In NSW mostly occurring within 300km of the Murray-Darling basin, but may occur in more coastal areas during dry inland conditions.	**Low** No suitable habitat (open lakes and wetlands) exists within the site for this species.	**Low** Due to the lack of individuals found within the site, the scarcity of records for this species in the vicinity and lack of optimal habitat observed on the site, this species is unlikely to be affected by the proposal.
Rostratula australis Australian Painted Snipe (E)	A small freshwater and estuarine wader, which prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. This species has been recorded in Pambalong N.R. and Ash Island (HBOC, 2004).	**Low** No preferred habitat (swamps, dams and marshy habitats) exists within the site for this species.	**Low** Due to the lack of individuals found within the site, the scarcity of records for this species in the vicinity and lack of optimal habitat observed on the site, this species is unlikely to be affected by the proposal.
Ixobrychus flavicollis Black Bittern (V)	Solitary species, living near water (estuarine to brackish) in mangroves and other trees which need to form only a narrow fringe of cover. A riparian species that occasionally ventures into the open within estuarine habitats.	**Low** No preferred habitat (estuarine to brackish wetlands) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Botaurus poiciloptilus Australasian Bittern (V)	A secretive species inhabiting permanent freshwater swamps possessing stands of tall rush species such as Bull Rushes (*Typha* sp.) and Spike Rushes (*Eleoacharis* sp.) (DEC 2005).	**Low** No preferred habitat (wetlands with tall reeds) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Pandion haliaetus Osprey (V, M*)	Requires water bodies for fishing in close proximity (usually <1km) to suitably tall nesting site such as dead tree, power pole etc. Recorded from various sites around Lake Macquarie, Port Stephens and the Hunter River Estuary.	**Low - Moderate** Whilst this species may fly over the site and is known to forage over the nearby Hunter Estuary, the site lacks suitable waterbodies for foraging habitat or suitable large trees for nesting. Therefore, it is considered unlikely that this species will occur within the site.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Charadrius mongolus Lesser Sand Plover (V, M*)	When in Australia, this migratory species inhabits sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats. Prey includes molluscs, worms, crustaceans and insects.	**Low** No preferred habitat (sandflats and mudflats) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Xenus cinereus Terek Sandpiper (V)	Recorded on coastal mudflats, lagoons, creeks and estuaries. It favours muddy beaches near mangroves but may also be observed on rocky pools and coral reefs occasionally up to 10km inland around brackish pools (NSW NPWS, 1999).	**Low** No preferred habitat (sandflats, mudflats or coastal lagoons) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Calidris tenuirostris Great Knot (V)	This species migrates south in winter to Australia from September to May. Whilst in Australia, C. tenuirostris inhabit beaches, coastal mudflats, bay shores, estuarine environments and sometimes, freshwater wetlands.	**Low** No preferred habitat (sandflats, mudflats or beaches) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Limicola falcinellus Broad-billed Sandpiper (V)	Is found around the majority of the Australian coast, except for Tasmania, during the Australian summer. Feeds on exposed flats of soft mud or wet sand at edges of coastal and near-coastal wetlands, often round channels on mudflats or in accumulated mud in swales between shell banks	**Low** No preferred habitat (sandflats, mudflats or coastal wetlands) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Limosa limosa Black-tailed Godwit (V)	Occurs around coastal Australia and occasionally far inland. Habitat utilised by this species includes tidal mudflats, river edges, sandy beaches, brackish swamps as well as the shallows of lakes, reservoirs and sewage farms	**Low** No preferred habitat (sandflats, mudflats or coastal lagoons) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Anseranas semipalmata Magpie Goose (V)	In Nsw, species has been recorded in Macquarie Marshes (central NSW) and in Seaham Swamp on the Williams River (Lower Hunter Valley).. Occupies shallow wetlands (especially those with a dense growth of rushes or sedges), drying ephemeral swamps, wet grasslands and floodplains, often roosting in fringing Paperbarks (*Melaleuca* spp.).	**Low** No preferred habitat (wetlands, wet grasslands etc) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Pterodroma leucoptera leucoptera Gould's Petrel (V)	A pelagic species, inhabits Cabbage Tree and Boondelbah Islands in Providence Bay, NSW. These islands are the only known breeding grounds for *P. leucoptera* in Australia.	**Low** This species is an oceanic species which only comes to land to breed. The site contains habitats that are highly unsuitable for breeding.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Ephippiorhynchus asiaticus Black-necked Stork (E)	Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds.	**Low** No preferred habitat (wetlands, wet grasslands etc) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Irediparra gallinacea Comb-crested Jacana (V)	Within Australia it is distributed from the northeast Kimberley Region through to the Hunter Region (NSW). It predominately inhabits mostly deep permanent freshwater wetland.	**Low** No preferred habitat (wetlands) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Haematopus longirostris Pied Oystercatcher (V)	This species prefers undisturbed sandy shell-grit or pebble beaches, sandspits and sandbars, tidal mudflats and estuaries, coastal islands. Occasionally rocky reefs, shores rock-stacks, brackish or saline wetlands. Also grassy paddocks, golf-courses or parks near coast. Forages for molluscs, crustaceans, and small fish, probes for worms in short wet grass.	**Low** No preferred habitat (beaches, mudflats, sandflats) exists within the site for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Haematopus fuliginosus Sooty Oystercatcher (V)	*Haematopus fuliginosus* (Sooty Oystercatcher) can be found on the whole of the Australian coastline. *H. fuliginosus* is less common than *Haematopus longirostris* (Australian Pied Oystercatcher). It prefers rocky intertidal shorelines with little foliose algae, coral reefs or sandy beaches near intertidal mud flats across which they forage for molluscs, crustaceans, polychaetes, ascidians, echinoderms and small fish.	**Low** No preferred habitat (rocky shorelines) exists within the site for this species	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Sterna albifrons Little Tern (E)	Migratory bird from eastern Asia, which occurs in sheltered coastal environments. This species has been recorded in Hexham Swamp, Stockton Bridge, Swansea and Newcastle Bars (HBOC, 1996).	**Low** No preferred habitat (beaches, mudflats, sandflats) exists within the site for this species	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Ptilinopus magnificus Wompoo Fruit-Dove (V)	Frugivorous bird favouring rainforest, occasionally straying to other forest types containing fruiting trees. A nomadic species that sometimes roosts in dry forest adjacent to rainforest habitats and is known to access small rainforest remnants.	**Low** No preferred habitat (rainforest or forests with abundant fruiting trees) exists within the site or adjacent areas for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Ptilinopus regina Rose-crowned Fruit Dove (V)	This species generally lives in rainforest, though it also frequents brushes of coastal districts as well as forests and mangroves.	**Low** No preferred habitat (rainforest or forests with abundant fruiting trees) exists within the site or adjacent areas for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Ptilinopus superbus Superb Fruit-dove (V)	Occurs in rainforest and similar closed forests including, monsoon forest, regrowth, lantana thickets, woodland adjoining rainforest at all altitudes.	**Low** No preferred habitat (rainforest or forests with abundant fruiting trees) exists within the site or adjacent areas for this species.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Circus assimilis Spotted Harrier (V)	Ranges across all of Australia except for Tasmania. Most commonly found inland to near coastal eastern and south eastern Australia. Found in open and wooded country in which it hunts over low vegetation or woodland where hunting at low levels is possible due to vegetation breaks.	**Low - Moderate** Marginal habitat is present for this species within the site that is only rarely recorded from the local area. However, its presence on occasion cannot be entirely discounted.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Hamirostra melanosternon Black-breasted Buzzard (V)	Distributed over inland areas of eastern Australia, through the centre and northern South Australia to western and north-western Australia. Generally inhabits woodland and pasture. Coastal records are rare, but variations in weather conditions or a lack of food in more arid habitats may be the cause of accidental occurrences outside of their normal range.	**Low - Moderate** Marginal habitat is present for this species within the site that is only rarely recorded from the local area. However, its presence on occasion cannot be entirely discounted.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Hieraaetus morphnoides Little Eagle (V)	Can be found across most of Australia, but more commonly found near coastal to inland regions in NSW and Victoria. Occurs in woodland and also open habitat, rarely found around dense forest.	**Low - Moderate** Marginal habitat is present for this species within the site that is only rarely recorded from the local area. However, its presence on occasion cannot be entirely discounted.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Lophoictinia isura Square-tailed Kite (V)	In Australia, widespread throughout the mainland (absent from Tasmania). It is recorded mainly in coastal and sub-coastal regions, although it has been observed inland. Typically inhabits open forests and woodlands, particularly those on fertile soils with abundant passerines but may also range in nearby open habitats but not into extensive treeless regions.	**Moderate** Marginal habitat is present for this species within site. The species has been recorded within the local area and it may utilise the site on occasion.	**Moderate** The proposal will remove potential foraging habitat for the species as part of a larger home range. Potential nesting habitat also occurs within the site; however, no nests that could be attributed to this species were observed within the site during surveys. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the species in the locality. *Despite this, as this species has moderate or greater chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*
Calyptorhynchus lathami Glossy Black-Cockatoo (V)	Occurs in forests and woodlands where it forages predominantly on *Allocasuarina* cones. Requires large Eucalypt tree hollows for nesting.	**High** This species was recorded immediately adjacent to the site. Suitable foraging and nesting habitat occurs within the site. However, no evidence of nesting has been found during previous surveys.	**Moderate** The proposal will remove foraging habitat for the species as part of a larger home range. No suitable nesting hollows for this species were found to occur onsite. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the species in the locality. *Despite this, as this species has been recorded immediately adjacent to the site, potential impacts of the proposal on this species are discussed further in the report.*
Callocephalon fimbriatum Gang-gang Cockatoo (V)	Occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, this species occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas	**Moderate** This species was not recorded during surveys. Suitable foraging habitat exists within Eucalypt canopy species within the site. It is a winter visitor to the region and its presence on occasion cannot be entirely discounted.	**Moderate** The proposal will remove potential foraging habitat for the species as part of a larger home range. No suitable nesting hollows for this species were found to occur onsite. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the species in the locality. *Despite this, as this species has moderate or greater chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Lathamus discolor Swift Parrot (E, E*)	On the mainland this species frequents Eucalypt forests and woodlands with large trees having high nectar production during winter. Mainland winter foraging sites often vary from year to year. Nests only in Tasmania.	**Moderate** This species was not recorded within the study area during fieldwork. This species utilises the region only during the winter periods outside of which it is absent. Potential seasonal foraging habitat is limited to *E. pilularis* that flowers occasionally in late winter. However, the species may utilise the site for foraging at times when the locality in general is undergoing a good flowering event.	**Low - Moderate** Whilst the proposal will remove foraging habitat for the species, the proposal is considered unlikely to substantially affect the species due to the small size of the habitat to be removed and the far ranging behaviour of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality. The species breeds in Tasmania so breeding habitat will not be affected by the proposal. *Despite this, as this species has moderate or greater chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*
Glossopsitta pusilla Little Lorikeet (V)	Widespread throughout the Hunter Valley. Habitat is mainly dry, open sclerophyll forests and woodlands, usually dominated by Eucalyptus.	**Recorded** This species was recorded within the study area during fieldwork (GHD, 2007). Suitable foraging and nesting habitat exists within the site. *As this species was recorded within the site, potential impacts of the proposal on this species are discussed further in the report.*	**Moderate** The proposal will remove known foraging habitat and potential nesting habitat (tree hollows) for the species as part of a larger home range. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the species in the locality. *Despite this, as this species was recorded within the site, potential impacts of the proposal on this species are discussed further in the report.*
Neophema pulchella Turquoise Parrot (V)	In NSW, N. pulchella is typically recorded west of the Great Divide on the tablelands and western slopes, extending to the coastal districts through the dry forest corridor of the Hunter Valley. *N. pulchella* occurs in eucalypt woodlands and open forests, with a ground cover of grasses and low understorey of shrubs	**Low - Moderate** The site contains marginal foraging and nesting habitat for this species which is rarely found within the locality and requires extensive grassy woodland habitats. However, its occurrence on occasion within the site cannot be entirely discounted.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Ninox strenua Powerful Owl (V)	Occurs in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals). Requires large hollows, usually in Eucalypt trees, for nesting. Roosts in dense vegetation within such areas.	**High** This species was recorded immediately adjacent to the site during previous surveys and owl pellets thought to be from this species were also recovered. Suitable foraging habitat and prey species exist within the site. However, no suitable nesting hollows (large hollows in large trees) were found within the site. *As this species has a greater than moderate chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*	**Moderate** The proposal will remove known foraging habitat for the species as part of a larger home range. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the local population of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality. No potential nesting hollows were found to occur within the site during surveys. *Despite this, as this species was recorded within the site, potential impacts of the proposal on this species are discussed further in the report.*
Tyto novaehollandiae Masked Owl (V)	Found in a range of habitats, locally within sclerophyll forests and woodlands where appropriate / preferred prey species occur (being predominantly terrestrial mammals). Requires large Eucalypt hollows for nesting and prefers to roost in these hollows as well.	**Moderate** This species was not recorded within the study area during fieldwork. However, suitable foraging habitat occurs within the site, with prey species being recorded during previous surveys. *As this species has a greater than moderate chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*	**Moderate** The proposal will remove potential foraging habitat for the species as part of a larger home range. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the local population of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality. No potential nesting hollows were found to occur within the site during *Despite this, as this species has moderate or greater chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*
Pomatostomus temporalis Grey-crowned Babbler (V)	Occupies open forests and woodlands, *Acacia* shrubland and adjoining farmland. They feed on terrestrial invertebrates and insects on lower trunks and branches They prefer wooded areas with an intact ground cover. Appears unable to persist in cleared and highly fragmented habitats. Locally common within some areas of the Hunter Valley.	**Low - Moderate** This species has been recorded within 10km of the site. However, it was not recorded during surveys and considering that it is a highly conspicuous species and typically sedentary in its habits it is readily detected if present. Therefore, it is considered unlikely to occur within the site, but its occurrence in the future cannot be entirely discounted.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Pyrrholaemus saggitatus Speckled Warbler (V)	Records of this species mostly from the western slopes and tablelands of the Great Dividing Range, and in the drier areas of coast. This species live in a wide range of Eucalypt dominated vegetation that has a grassy and shrubby understorey often on rocky ridges or gullies	**Low** This species rarely occurs in such coastal locations and preferred habitat is absent from the site (dry eucalypt woodland with a grassy understorey). Therefore, it is considered unlikely that this species would occur on site.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Epthianura albifrons White-fronted Chat Proposed V	This species is found in damp open habitats, particularly estuarine and marshy grounds, as well as wetlands containing Saltmarsh, bordered by open grasslands or lightly timbered lands. *This species is currently listed as a preliminary determination for Vulnerable status under TSC Act. Therefore, it has not been formally listed as threatened.*	**Low** This species was not recorded within the site during surveys. No preferred habitat including such as estuarine and marshy grounds is available within the site for this species. Therefore it is considered unlikely that this species would occur on site.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Daphoenositta chrysoptera Varied Sittella Proposed V	Can be found in a wide range of habitats. Open eucalypt forests and woodlands are the preferred habitat, but this species may also be found in mallee, coastal tea-tree scrubs, inland acacia communities, golf courses orchards and scrubby gardens. *This species is currently listed as a preliminary determination for Vulnerable status under TSC Act. Therefore, it has not been formally listed as threatened.*	**Moderate** Whilst the species is more commonly found in less coastal habitats, the site does contain marginal habitat for the species. There is some potential for this species to occur within the site on occasion.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Petroica boodang Scarlet Robin Proposed V	Habitat for this species varies during the year but generally are foothill forests, woodlands, watercourses, in autumn/winter more open habitats, river red gum woodlands, golf courses, parks, orchards and gardens *This species is currently listed as a preliminary determination for Vulnerable status under TSC Act. Therefore, it has not been formally listed as threatened.*	**Low** This species is very rarely recorded within the locality and prefers less coastal habitats of the Hunter Valley. The site is considered to contain marginal habitat at best and this western species is considered unlikely to occur.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Stagonopleura guttata Diamond Firetail (V)	Occurs in a wide range of Eucalypt-dominated vegetation communities that have a grassy understorey, including woodland, open forests and mallee. Most occur on the inland slopes of the Great Dividing range, with only small pockets near the coast	**Low** This species is very rarely recorded within the locality and prefers less coastal habitats of the Hunter Valley. Preferred habitat is absent from the site (grassy woodland). Therefore it is considered unlikely that this species would occur on site.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Xanthomyza phrygia Regent Honeyeater (E, E*)	Nomadic Honeyeater that disperses to non-breeding areas, including the coast, in winter, where flowering trees are sought. Within the region, mostly recorded in Box-Ironbark Eucalypt associations along creek flats, river valleys and foothills. Coastal swamp forests in Lower Hunter are used when more western resources fail. Nests mainly west of the divide, although local breeding attempts have occurred at Quorrobolong (Cessnock LGA).	**Low - Moderate** This species utilises the region only during the winter periods outside of which it is absent. Potential seasonal foraging habitat is limited to *E. pilularis* that flowers occasionally in late winter. However, it is considered unlikely that late winter flowering E. pilularis is sufficient to attract this species. Therefore, it is considered highly unlikely that the site would be utilised by the species, but it cannot be entirely discounted from occurring.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, this species is unlikely to be affected by the proposal.
Mammals			
Dasyurus maculatus Spotted-tailed Quoll (V, V*)	Found in a variety of forested habitats. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development.	**Low - Moderate** Whilst habitat within the site is marginally suitable for this species. The location of the site in close proximity to development is likely to preclude this species from occurring.	**Low** Due to the high level of adjacent development disturbance, lack of individuals and preferred habitat within or adjacent to the site this species is unlikely to be affected by the proposal.
Phascogale tapoatafa Brush-tailed Phascogale (V)	Inhabits dry open forest and woodlands, often in areas with sparse groundcover. It is one of the most arboreal Dasyurids and hunts mainly invertebrates, although some vertebrate prey is taken on occasion. Utilises small tree hollows for nesting and refuge sites. Within the Hunter Region, records south of the Hunter River are scarce. Other records in the region occur from Medowie (HSO pers. obs.) and Tomago (DEC 2005).	**Moderate** This species was not recorded within the study area during fieldwork. Potential habitat is available for this species within the forested habitats within the site. This species has been recorded within the Port Stephens Due to their large home range they are often difficult to detect and as such cannot be entirely discounted from occurring within the site.	**Moderate** The proposal will remove potential foraging and denning habitat for the species as part of a larger home range. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the local population of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality. *Despite this, as this species has moderate or greater chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*
Petaurus norfolcensis Squirrel Glider (V)	Occurs in Eucalypt Forests and Woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species. Widely distributed across the lower hunter region (DEC 2005).	**Recorded** This species was recorded within the site during fieldwork. Known foraging and denning habitat exists within the site.	**Moderate - High** The proposal will remove approx 13.5ha of known foraging and denning habitat for the species within the site. At least one family group is likely to occupy this area. However, two hollow-bearing trees and some vegetation will be retained within the site to provide some ongoing foraging and denning habitat within the site. *The potential impacts of the proposal on this species are discussed further in the report.*

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Potorous tridactylus Long-nosed Potoroo (V, V*)	Prefers cool rainforest, wet sclerophyll forest and heathland. Sleeps by day in a nest on the ground, and digs for succulent roots, tubers, fungi and subterranean insects. Some diggings seemingly attributable to this species may belong to Bandicoots. Records exist from the Karuah vicinity (Gunninah 1999) and the Gosford LGA (DEC 2005). Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5 ha (DEC 2005).	**Moderate** This species was not recorded within the study area during fieldwork. One record of this species occurs within the Port Stephens LGA in the Williamtown area which is tenuously connected to the site. Marginal potential foraging habitat is available for this species within the site. However, dense areas of wet sclerophyll for shelter are absent from the site.	**Low - Moderate** The proposal will remove marginal potential foraging habitat for the species as part of a larger home range. Due to the small size and marginal nature of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the local population of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality. Habitats within the site are not considered to offer the preferred shelter habitats of this species. *Despite this, as this species has moderate or greater chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*
Phascolarctos cinereus Koala (V)	Occurs in forests and woodlands where it requires suitable feed trees (particular *Eucalyptus* spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more 'Vulnerable' to predator attack and road mortality during these excursions. Records from the Lower Hunter Region are largely confined to the greater Port Stephens area, the Lake Macquarie hinterland and the Watagan Mountains, with a small number of records from Cessnock LGA (DEC 2005).	**Moderate** This species was not recorded within the site during fieldwork. No Koala feed trees are present within the site and no evidence of occupation was recorded during surveys. However, since the species is known from adjacent habitats where suitable feed trees exist, it cannot be entirely discounted from moving through the site on occasion.	**Low** The site does not contain any Koala feed tree species listed under SEPP 44. As such no potential foraging habitat would be removed as a result of the proposal. Additionally, the site is not considered to function as a corridor for this species as it is located adjacent to existing development and on the edge of a patch of native vegetation. Therefore, the proposal is considered unlikely to impact a local population of this species. *Despite this, as this species has moderate or greater chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*
Pteropus poliocephalus Grey-headed Flying-fox (V, V*)	Forages over a large area for nectar / fruits etc. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforest. Frequently observed to forage in flowering Eucalypts. May occur anywhere within the Hunter Region where food or roosting resources are available.	**Recorded** This species was recorded within the site during surveys. Foraging habitat exists in flowering canopy trees within forested habitats within the site. No potential camp/roost habitat exists within the site.	**Low - Moderate** Whilst the proposal will remove foraging habitat for the species, the proposal is considered unlikely to substantially affect the species due to the small size of the habitat to be removed and the far ranging behaviour of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality. No potential camp habitat occurs within the site. *Despite this, as this species has been recorded within the site, potential impacts of the proposal on this species are discussed further in the report.*

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Miniopterus schreibersii Eastern Bentwing-Bat (V)	This species utilises a range of habitats for foraging, including rainforest, wet and dry sclerophyll forests, woodlands and open grasslands. Requires caves or similar structures for roosting habitat. Widely distributed across the Lower Hunter Region (DEC 2005).	**Recorded** This species was recorded within the site during field surveys. Foraging habitat is available for this species within woodland areas and associated ecotones with cleared / managed areas. Preferred roosting habitat (caves and similar) is not available within the site.	**Low - Moderate** Whilst the proposal will remove foraging habitat for the species, the proposal is considered unlikely to substantially affect the species due to the small size of the habitat to be removed and the far ranging behaviour of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality. No potential roost habitat occurs within the site. *Despite this, as this species has been recorded within the site, potential impacts of the proposal on this species are discussed further in the report.*
Miniopterus australis Little Bentwing-bat (V)	Prefers to forage in well-vegetated areas, such as within wet and dry sclerophyll forests and rainforests. Requires caves or similar structures for roosting habitat. Largely confined to more coastal areas in the Lower Hunter Region (DEC 2005).	**Moderate** This species was not recorded during field surveys. However, suitable foraging habitat is available for this species within woodland areas and associated ecotones with cleared / managed areas. Due to the highly mobile nature of this species it cannot be discounted from occurring. Preferred roosting habitat is not available within the site.	**Low - Moderate** Whilst the proposal will remove foraging habitat for the species, the proposal is considered unlikely to substantially affect the species due to the small size of the habitat to be removed and the far ranging behaviour of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality. No potential roost habitat occurs within the site. *Despite this, as this species has moderate or greater chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*
Mormopterus norfolkensis Eastern Freetail-bat (V)	This species forages predominantly in dry forests and woodlands east of the divide. It roosts in tree hollows, under bark and within man-made structures. Widely distributed within across the Lower Hunter Region (DEC 2005).	**Recorded** This species was recorded within the site during field surveys. Foraging habitat is available for this species within woodland areas and associated ecotones with cleared / managed areas. Roosting habitat is also present within hollow-bearing trees within the site.	**Moderate** The proposal will remove known foraging and potential roosting habitat for the species as part of a larger home range. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the local population of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality, particularly loss of hollow-bearing trees. *Despite this, as this species was recorded within the site, potential impacts of the proposal on this species are discussed further in the report.*

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat (V)	Range of habitats from rainforest to arid shrubland, roosts in tree-hollows. Limited numbers of records occur on the central coast and the Lower Hunter Region (DEC 2003).	**Moderate** This species was not detected during field surveys. However, suitable foraging and roosting habitat is available for this species within the site and its occurrence cannot be discounted.	**Low - Moderate** The proposal will remove potential foraging and potential roosting habitat for the species as part of a larger home range. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the local population of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality, particularly loss of hollow-bearing trees. *Despite this, as this species has moderate or greater chance of occurrence within the site, potential impacts of the proposal on this species are discussed further in the report.*
Falsistrellus tasmaniensis Eastern False Pipistrelle (V)	This species is found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20m). This species roosts in tree hollows. Appears to locally favour upland habitats. A limited number of records occur on the central coast and the Lower Hunter Region (DEC 2005).	**Recorded** This species was recorded within the site during field surveys. Foraging habitat is available for this species within forested habitats. Roosting habitat is also present within hollow-bearing trees within the site.	**Moderate** The proposal will remove known foraging and potential roosting habitat for the species. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the local population of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality, particularly loss of hollow-bearing trees. *Despite this, as this species was recorded within the site, potential impacts of the proposal on this species are discussed further in the report.*
Myotis macropus Southern Myotis (V)	Usually found near bodies of water, including estuaries, lakes, reservoirs, rivers and large streams, often in close proximity to their roost site. Although usually recorded foraging over wet areas, it also utilises a variety of wooded habitats adjacent to such areas including rainforest, wet and dry sclerophyll forest, woodland, and swamp forest. Roosts in small colonies of between 15 and several hundred individuals in caves, mines and disused railway tunnels. A number of records from the Central Coast, with fewer numbers in the Lower Hunter Region (DEC 2005) and Central Hunter Region (HSO pers. obs.).	**Low - Moderate** This species was not detected during targeted field surveys. Suitable foraging habitat (open waterbodies) is absent from the site and no potential roosting habitat (caves or tree hollows in close proximity to water) is present. Therefore, whilst the species may fly over the site, it is considered unlikely to use the site for foraging or roosting.	**Low** Due to the lack of individuals and preferred habitat within or adjacent to the site, observed on the site, this species is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
Scoteanax rueppellii Greater Broad-nosed Bat (V)	Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces / ecotones. This species roosts in tree hollows and is relatively widespread within the Lower Hunter Region (DEC 2005).	**Recorded** This species was recorded within the site during field surveys. Foraging habitat is available for this species within forested habitats. Roosting habitat is also present within hollow-bearing trees within the site.	**Moderate** The proposal will remove known foraging and potential roosting habitat for the species as part of a larger home range. Due to the small size of the habitat to be removed as a result of the proposal, it is considered unlikely that this would have a significant impact on the local population of this species. However, it should be acknowledged that the removal of habitat within the site will contribute to cumulative habitat loss in the locality, particularly loss of hollow-bearing trees. *Despite this, as this species was recorded within the site, potential impacts of the proposal on this species are discussed further in the report.*
Endangered Ecological Communities			
Coastal Saltmarsh	Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South-East Corner occurs in the intertidal zone on the shores of estuaries and lagoons, including where they are intermittently closed along the NSW coast. Classified by the Lower Hunter Central Coast Regional Biodiversity Conservation Strategy (LHCCREMS) as Map Unit (MU) 47a.	**Low** The floristic composition and geomorphological characteristics of this Endangered Ecological Community are not present within the site.	**Low** Due to the lack of preferred habitat observed on the site, this community is unlikely to be affected by the proposal.
Freshwater Wetlands on Coastal Floodplains	Associated with periodic or semi-permanent inundation by freshwater, although there may be minor saline influences in some wetlands. They typically occur on silts, muds or humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains. Wetlands or parts of wetlands that lack standing water most of the time are usually dominated by dense grassland or sedgeland vegetation, often forming a turf less than 0.5 metre tall and dominated by amphibious plants including *Paspalum distichum*, *Leersia hexandra* and *Carex appressa*. Wetlands or parts of wetlands subject to regular inundation and drying may include large emergent sedges over 1 metre tall, such as *Baumea articulata, Eleocharis equisetina* and *Lepironia articulata*. Correlates with LHCCREMS Map Unit (MU) 46 – 'Freshwater Wetland Complex'.	**Low** The floristic composition and geomorphological characteristics of this Endangered Ecological Community are not present within the site.	**Low** Due to the lack of preferred habitat observed on the site, this community is unlikely to be affected by the proposal.

Species / Community	Habitat Description	Chance of Occurrence On Site	Likely Level of Impact
River-flat Eucalypt forest on coastal floodplains	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (Forest Red Gum), *E. amplifolia* (Cabbage Gum), *Angophora floribunda* (Rough-barked Apple) and *A. subvelutina* (Broad-leaved Apple). Correlates with LHCCREMS communities - 'Central Hunter Riparian Forest' Map Unit (MU) 13, 'Wollombi Redgum-River Oak Woodland' MU14 and 'Redgum Rough-barked Apple Swamp Forest' MU38.	**Low** The floristic composition and geomorphological characteristics of this Endangered Ecological Community are not present within the site.	**Low** Due to the lack of preferred habitat observed on the site, this community is unlikely to be affected by the proposal.
Swamp Oak Floodplain Forest	This community is associated with periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains, typically occurring on grey-black clay-loams and sandy loams. Usually occurring below 20 m altitude.	**Low** The floristic composition and geomorphological characteristics of this Endangered Ecological Community are not present within the site.	**Low** Due to the lack of preferred habitat observed on the site, this community is unlikely to be affected by the proposal.
Swamp Sclerophyll Forest on Coastal Floodplains	The community is associated with humic clay or sandy loams on waterlogged or episodically flooded alluvial flats and drainage lines within coastal floodplains. It is generally characterised by an open to dense canopy of eucalypts and / or paperbarks. Canopy heights generally vary from 8m to 25m depending on species composition. In the Hunter Region the canopy often contains *Eucalyptus robusta* and / or *Melaleuca quinquenervia* although other plant species, such as *Callistemon salignus*, *Casuarina glauca*, *Eucalyptus resinifera* subsp. *Hemilampra* or *Livistonia australis* may be present. Small trees and shrubs, including *Melaleuca* sp., *Glochidion ferdinandi*, *Acacia* sp. *Leptospermum polygalifolium* subsp. *polygalifolium* and *Dodanaea triquetra*, are often present in the lower strata.	**Low** The floristic composition and geomorphological characteristics of this Endangered Ecological Community are not present within the site.	**Low** Due to the lack of preferred habitat observed on the site, this community is unlikely to be affected by the proposal.

Notes:
V = Vulnerable Species listed under the TSC Act.
E = Endangered Species listed under the TSC Act.
CE = Critically Endangered Species listed under the TSC Act.
V* = Vulnerable Species listed under the EPBC Act.
E*= Endangered Species listed under the EPBC Act.
CE*= Critically Endangered Species listed under the EPBC Act.
M* = Migratory Species listed under the EPBC Act.
PD = Preliminary determination under the TSC Act.
E** = Endangered Species listed under the Fisheries Management Act 1994.