Preliminary Ecological Assessment

for a

Planning Proposal

Regarding

No. 792 Seaham Road, Seaham

Prepared by:

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Site Details:	No. 792 Seaham Rd, Seaham (Lot 100 DP 1064980)
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Prepared for:	**Le Mottee Group Pty Ltd**
Reference No.	No. 792 Seaham Rd, Seaham
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Abbreviations

Abbreviation	Meaning
API	Aerial Photograph Interpretation
BAM	Biodiversity Assessment Methodology
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
CKPoM	Comprehensive Koala Plan of Management
DCP	Development Control Plan
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DEE	Department of Environment and Energy
DoE	Department of Environment
DPE	Department of Planning and Environment
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Ha	Hectare
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
MU	Map Unit
NPWS	NSW National Parks and Wildlife Service
OEH	Office of Environment and Heritage
PCT	Plant Community Type
PFC	Projected Foliage Cover
PSC	Port Stephens Council
TEC	Threatened Ecological Community

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1 INTRODUCTION

Firebird ecoSultants Pty Ltd has been engaged by Le Mottee Group Pty Ltd to provide a preliminary ecological assessment for No. 792 Seaham Rd, Seaham (Lot 100 DP 1064980) (hereafter referred to as 'the site'). Gateway approval for a rezoning of RU1 to R5 has been received and as part pf the gateway approval the following information is to be provided:

> Preparation of the necessary Biodiversity Study(s) and consultation with Department of Planning, Industry and Environment – Biodiversity Conservation Division to address the proposals inconsistencies with section 9.1 Direction 2.1 Environmental Protection Zones and performance criteria (c) and (d) of Port Stephens Comprehensive Koala Plan of Management.

This report recognises the requirements of the relevant legislation (*Environmental Planning and Assessment Act 1979* (EP&A Act), *Biodiversity Conservation Act 2016* (BC Act), Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)) and the relevant planning strategies (the *Lower Hunter Regional Strategy 2006-31*, the *Port Stephens Planning Strategy 2011-2036* and the *Port Stephens Comprehensive Koala Plan of Management* (CKPoM)). A literature review and desktop research were combined with flora and fauna surveys and a habitat assessment. Commonwealth, state and local government policies and guidelines formed the basis of project surveying and assessment methodology.

1.1 Site Particulars

Locality:	No. 792 Seaham Rd, Seaham
LGA:	Port Stephens
Lot / DP:	Lot 100 DP 1064980
Zoning:	RU1 Primary Production (see Port Stephens Local Environment Plan (LEP) 2013 *Land Zoning Map Sheet LZN_001)*
Land size:	44.23 ha
Current Land Use:	Large lot residential and remnant vegetation
Minimum Lot Size:	40 ha (see Port Stephens LEP 2013 *Lot Size Map - Sheet LSZ_001*)
Bushfire Prone Land:	Vegetation Category 1, 2 & 0
Acid Sulfate Soils:	Class 5, Class 4, Class 3 & Class 2 (see Port Stephens LEP 2013 *Acid Sulfate Soils Map – Sheet ASS_001*)

Flood Planning Area:	Partially (Eastern and Western portions of site) (see Port Stephens LEP 2013 *Flood Planning Map – Sheet FLD_001*)

1.2 Site Description

The site contains an existing dwelling and a machinery shed within the northern end of the lot. The site is partially cleared. Some scattered native trees occur throughout the middle of the site and along the eastern boundary; the understorey in these areas is cleared and has been historically grazed by cattle. The eastern and western portions of the site are in a Flood Planning Area. The site is surrounded by a mix of residential development, cleared pasture lands and remnant patches of bushland. It is located approximately 25 m from an existing large lot residential settlement (1.5 ha lots) to the west.

Refer to Appendix A for the site location.

1.3 Description and Background of the Proposal

The subject land is located within the Port Stephens Council (PSC) Local Government Area (LGA) and comprises Lot 100 DP 1064980. For the purpose of this report, Lot 100 shall be referred to as 'the site'

The purpose of this planning proposal is to amend the current lot size map over the site from 40ha to 1ha, to permit the subdivision of the site into eighteen (18) large residential allotments.

The future subdivision of the site shall create lots capable of supporting a dwelling each and will be in keeping with the character of the area. These large residential lots proposed are popular in the Seaham area and are currently in demand.

Under the PSC Local Environmental Plan (LEP) 2013 the site is currently zoned RU1 Primary Production and has a minimum lot size requirement of 40 hectare (ha). In order to facilitate the future subdivision of Lot 100, enabling the creation of seventeen (17) additional allotments, the minimum lot size map over the site needs to be amended to reflect a minimum lot size of 1ha.

Future subdivision of the site into seventeen (17) lots would require minimal infrastructure upgrades; Hunter Water Corporation (HWC) has indicated that there is sufficient capacity in the existing reticulated water, to service the additional lots and Ausrgid has confirmed in writing, that electricity is readily available in the Seaham area, with low and high voltage lines adjacent to the site.

Any future conceptual subdivision layout prepared as part of the proposal, shall be designed in accordance with the provisions of PSC LEP 2013, PSC Development Control Plans (DCP) 2013 as well as Planning for Bushfire Protection 2006.

See Appendix A for the rezoning proposal.

1.4 Purpose and Scope of Study

The scope of this ecological assessment report is to:

- Identify vascular flora species on the site;
- Identify and map existing vegetation communities;
- Identify existing habitat types on the site and assess the habitat potential for threatened species, populations, or ecological communities known from the proximate area;
- Conducted a targeted search and habitat assessment for *Phascolarctos cinereus* (Koala) on the site;
- Assess the status of identified or potentially occurring flora species, vegetation communities and fauna species under relevant legislation;
- Assess the potential impacts of the proposal on threatened species, populations or ecological communities, or their habitats;
- Identify the biodiversity values and constraints on the site; and
- Provide recommendations to ensure that the recorded biodiversity values on the site are adequately managed and/or protected.

Whilst survey work has been undertaken wholly within the bounds of the site, consideration has been afforded to areas off the site in order to appreciate the environmental context of the site.

The purpose of this report is to:

- Ensure planning, management and development decisions are based on sound scientific information and advice by documenting the presence of any biodiversity components or potential significant impacts that may exist on the site;
- Provide information to enable compliance with applicable assessment requirements contained within the EP&A Act, BC Act, EPBC Act and any other relevant state, regional and local environmental planning instruments;
- Enable the provision and analysis of ecological data that is comparable with data for other sites within the region to ensure continuity and consistency for survey and results; and
- To undertake a preliminary ecological assessment which is of sufficient detail to justify a decision being made at the “gateway”, regarding the proposal. Should the decision by the NSW Government be supportive, then further ecological studies may be required, to ensure compliance with assessment requirements under the BC Act and any other study requirements requested by PSC, Department of Planning & Environment and/or Office of Environment & Heritage (OEH), as part of the gateway determination / consultation process.

1.5 Qualifications and Licensing

Qualifications

Fieldwork for this project was undertaken by Lizzie MacDonald, Ryan Herbert, Emily Thompson and Nick Weigner. This report was written by Ryan Herbert, Sarah Jones and Lizzie MacDonald. Qualifications are provided in Appendix B.

Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL100533;
- Animal Research Authority (Trim File No: TRIM 11/5655) issued by NSW Department of Primary Industries; and
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: TRIM 11/5655) issued by Department of Primary Industries.

Certification

As the principal author, I, Sarah Jones make the following certification:

- The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the site;
- Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, or where the survey work has been undertaken with specified departures from industry standard guidelines, details of which are discussed and justified in Section 2;
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995, National Parks and Wildlife Act 1974* and the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

Signature of Principal Author and Certifier:

Sarah Jones
Ecologist / Bushfire Planner
FPA BPAD-A Certified Practitioner (BPD-PA-26512)
BAAS18020 Accredited Assessor
B.Env.Sc., G.Dip.DBPA (Design for Bushfire Prone Areas)

2 METHODOLOGY

This assessment included a desktop based analysis of previous records of threatened species in the area, a review of any relevant literature and a field based survey of the site. Where possible, survey methods have been designed in accordance with the relevant survey and assessment guidelines.

The current study aims to provide a sufficient level of ecological information to support an initial gateway determination. Should a gateway determination be issued, a more comprehensive analysis of survey methods, results, and impact assessment can be provided in subsequent ecological assessment reports.

2.1 Desktop Research

2.1.1 Previous Vegetation Mapping

Vegetation mapping previously undertaken in the area was reviewed. This included a review of the Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS) vegetation mapping and *Hunter_Greater_v4_E_3855*.

2.1.2 Database Searches

The following database searches were undertaken, in order to compile a list of threatened flora and fauna species and Matters of National Environmental Significance (MNES), predicted to occur in the area:

- Review of threatened fauna and flora records within a 10 km radius of the site, contained in the OEH Atlas of NSW Wildlife (NSW BioNet).
- Review of the Matters of National Environmental Significance (MNES) records within a 10 km radius of the site, using the Commonwealth Department of Environment (DoE), EPBC Act Protected Matters Search Tool.

2.1.3 Literature Review

Information sources reviewed included, but were not limited to:

- Aerial Photograph Interpretation (API);
- Relevant guidelines, including (but not limited to):
    - HCCREMS *Flora and Fauna Survey Guidelines, Lower Hunter Central Coast Region 2002, Volume 1 & Volume 2* (Murray et al. 2002)*;*
    - OEH *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004).
    - *EPBC Act Referral Guidelines for the Vulnerable Koala* (Commonwealth of Australia, 2014)
- Environmental / planning reports relevant to the site / area, including (but not limited to):

- *Port Stephens LEP 2013;*
- *Lower Hunter Regional Strategy 2006-31* (Department of Planning 2006);
- *Port Stephens Planning Strategy 2011* (PSC 2011);
- *Draft Hunter Regional Plan* (Department of Planning and Environment, 2015);
- *Port Stephens CKPoM* (PSC, 2002); *Port Stephens Council Development Control Plan 2014;* and
- Any relevant recovery plans.

- OEH Threatened Species, Populations and Ecological Communities website <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/>;
- DEE Species Profile and Threats Database website < http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>; and
- Any environmental / ecological reports relevant to the site or area including for instance, Lunney et al. (1998) and Enviro Ecology (2012).

2.2 Field Surveys

Note that the site has been surveyed previously by Enviro Ecology (2012). The results of this study's field work component were used to complement the current study as well as ground truthing and surveys by Firebird ecosultants in 2018 and 2020.

2.2.1 Flora Survey and Vegetation Mapping

A flora survey was conducted on 5 April 2018, 29 November 2018, 12 October and 30 October 2020. The entire area was traversed in order to determine the boundaries of any vegetation communities and to determine the potential distribution of threatened flora species listed under the TSC Act and EPBC Act.

Vegetation communities on the site were mapped into definable map units, using a combination of API, confirmation of dominant structural / floristic attributes, a review of previous vegetation mapping in the area (see Section 2.1.1) and a review of Plant Community Types (PCTs) contained in the OEH BioNet Vegetation Classification database. This included an assessment of the potential for vegetation communities to constitute an EEC, listed under the TSC Act and EPBC Act.

2.2.2 Targeted Koala Survey and Habitat Assessment

A targeted survey for *P. cinereus* (Koala) was undertaken on 5 April 2018, 29 November 2018, 12 October and 30 October 2020. The entire site was traversed, with searches being undertaken at the base of each tree, for indirect evidence (scats and scratch marks) and in the tree canopy, for direct sightings. Effort was made to search for any *P. cinereus* (Koala) feed trees. This included tree species defined as Preferred Koala Feed Trees by the Port Stephens CKPoM (i.e. *Eucalyptus tereticornis* (Forest Red Gum), *E. parramatensis* (Parramatta Red Gum) and *E. robusta* (Swamp Mahogany)), and additional tree species (i.e. *E. moluccana* (Grey Box) and *E. punctata* (Grey Gum)),

which have recently been identified as preferred feed trees by a current PSC study (Michael Jacobson, PSC pers. comm. 21 July 2017).

A koala habitat assessment was undertaken in accordance with the *Guidelines for Koala Habitat Assessments*, in Appendix 6 of the CKPoM (PSC, 2002). This included the following:

- Previous mapping of the site by the *Koala Habitat Planning Map* (PSC, 2007) was examined.
- Effort was made to search for any *P. cinereus* (Koala) feed trees (as noted above). This data was combined with the flora survey data (see Section 2.2), to confirm the site's *P. cinereus* (Koala) habitat types (as defined by Lunney et al. (1998)).
- A map was produced, indicating the boundaries of the site's *P. cinereus* (Koala) habitat.

2.2.3 General Habitat Assessment

An assessment of the relative habitat values of the site was undertaken on 5 April 2018, 29 & 30 November 2018, 12 and 30 October 2020. The habitat assessment focused on the identification of habitat types and resources favoured by all major guilds of native flora and fauna, including threatened species known from the region. The assessment was based on specific habitat requirements in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology. Hollow-bearing trees were recorded by hand-held GPS.

2.2.4 Survey Limitations

The survey methods undertaken are unlikely to detect all of the species present within the site. In order to address this, the habitat assessment and the presence of local records for threatened species were used to assess whether threatened species were likely to be present. Where necessary the precautionary principle of 'assumed presence' was applied.

Note that the purpose of the survey work was to undertake a preliminary ecological assessment which is of sufficient detail to justify a decision being made at the "gateway", regarding the proposal. Should the decision by the NSW Government be supportive, then further ecological studies may be required, to ensure compliance with assessment requirements under the BC Act and any other study requirements requested by PSC, Department of Planning & Environment and/or Office of Environment & Heritage (OEH), as part of the gateway determination / consultation process.

Table 2-1: Field Survey Details

Date	Purpose	Survey Effort	Weather Conditions
05/04/18	Flora and habitat survey. Targeted Koala survey	systematic traverse of entire site, 1 observer. Targeted survey for direct or indirect evidence of *P. cinereus* ie. scratch marks or scats and koala feed trees within the site and adjoining land. All Koala feed trees were surveyed.	Temp (^{0}C): 17.2 – 27.7 Cloud: 8 Wind: calm Rain (mm): 0
29/11/2018	Hollow-bearing tree survey	Hollow-bearing tree survey two days	Temp (^{0}C): 15.0 – 22.8 Cloud: 8 Wind: 30 Rain (mm): 48.2
30/11/2018	Hollow-bearing tree survey	Hollow-bearing tree survey two days	Temp (^{0}C): 14.2 – 23.8 Cloud: 8 Wind: calm Rain (mm): 0.2
29/11/2018	Targeted Koala survey and *Cryptostylis hunteriana*	Targeted survey for direct or indirect evidence of *P. cinereus* ie. scratch marks or scats and koala feed trees within the site and adjoining land. All Koala feed trees were surveyed. Targeted surveys for *Cryptostylis hunteriana*	Temp (^{0}C): 15.0 – 22.8 Cloud: 0 Wind: 15 Rain (mm): 48.2
12/10/2020	Targeted survey for *Pterostylis chaetophora* (Taree Rustyhood)	Targeted survey for *Pterostylis chaetophora* (Taree Rustyhood)	Temp (^{0}C): 17.0 – 22
30/10/2020	Targeted Koala survey and BAM Transects in accordance with BC Act.	Targeted survey for direct or indirect evidence of *P. cinereus* ie. scratch marks or scats and koala feed trees within the site and adjoining land. All Koala feed	Temp (^{0}C): 12.0 – 21

Date	Purpose	Survey Effort	Weather Conditions
		trees were surveyed and BAM Transect.	

3 RESULTS

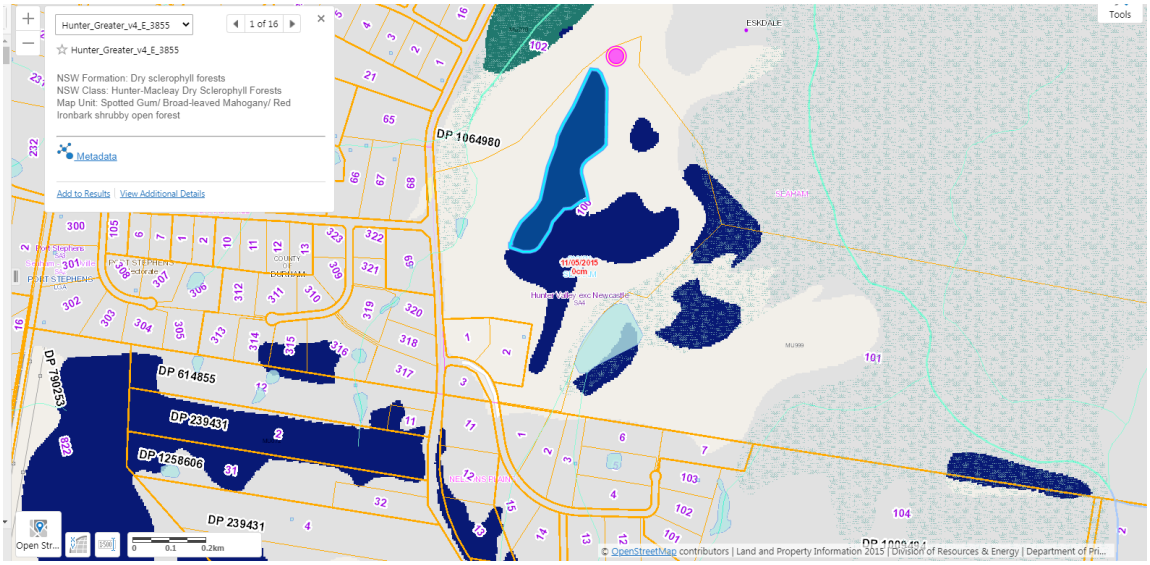
3.1 Desktop Research

3.1.1 Regional Vegetation Mapping

A review of the *Hunter Greater_v4_E_3855* indicates that the following PCTs have been mapped in the site and immediate surrounding area:

- PCT 1590 - Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest
    - HCCREMS Equivalent: MU 17 Lower Hunter Spotted Gum - Ironbark Forest
    - TEC: YES

Figure 3-1 Mapping of Site and Surrounding Area under *Greater Hunter Vegetation Mapping*



The site has been mapped as Map Unit (MU) 41 Swamp Oak Sedge Forest and MU 17 Lower Hunter Spotted Gum - Ironbark Forest (LHCCREMS, 2003).

3.1.2 Database Searches

A number of threatened species, EECs and MNES have been recorded on the Atlas of NSW Wildlife database and EPBC Act Protected Matters Search Tool (PMST), within a 10 km radius of the site. These are listed in Table 3-1. Note that marine species, not relevant to the site, have been excluded. See Appendix D for PMST report.

Table 3-1: Threatened Species / Populations / EECs Identified Within a 10km Radius of the Site by a Search of the NSW Atlas of Wildlife and the EPBC Act Protected Matters Search Tool

Scientific Name	Common Name	TSC Act	EPBC Act
Threatened Flora			
Angophora inopina	Charmhaven Apple	V	V
Asperula asthenes	Trailing Woodruff	V	V
Asterolasia elegans	-	E	E
Caladenia tessellata	Thick Lip Spider Orchid	E	V
Commersonia prostrata	Dwarf Kerrawang	E	E
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V
Cynanchum elegans	White-flowered Wax Plant	E	E
Dichanthium setosum	Bluegrass	V	V
Eucalyptus glaucina	Slaty Red Gum	V	V
Eucalyptus parramattensis subsp. decadens	Earp's Gum	V	V
Euphrasia arguta	-	CE	CE
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	V
Maundia triglochinoides	-	V	-
Melaleuca biconvexa	Biconvex paperbark	V	V
Persicaria elatior	Tall Knotweed	V	V
Phaius australis	Lesser swamp orchid	E	E
Prasophyllum sp. Wybong	a leek-orchid	-	CE
Rutidosis heterogama	Heath Wrinklewort	V	V
Syzygium paniculatum	Magenta Lilly Pilly	E	V
Tetratheca juncea	Black-eyed Susan	V	V
Thesium australe	Austral Toadflax	V	V
Threatened Birds			
Anseranas semipalmata	Magpie Goose	V	-
Anthochaera phrygia	Regent Honeyeater	CE	CE
Botaurus poiciloptilus	Australasian Bittern	E	E
Circus assimilis	Spotted Harrier	V	-

Scientific Name	Common Name	TSC Act	EPBC Act
Dasyornis brachypterus	Eastern Bristlebird	E	E
Ephippiorhynchus asiaticus	Black-necked Stork	E	-
Erythrotriorchis radiatus	Red Goshawk	CE	V
Falco subniger	Black Falcon	V	-
Glossopsitta pusilla	Little Lorikeet	V	-
Grantiella picta	Painted Honeyeater	V	V
Haliaeetus leucogaster	White-bellied Sea Eagle	V	-
Irediparra gallinacea	Comb-crested Jacana	V	-
Lathamus discolor	Swift Parrot	E	E
Lophoictinia isura	Square-tailed Kite	V	-
Ninox strenua	Powerful Owl	V	-
Numenius madagascariensis	Eastern Curlew	-	CE
Petroica boodang	Scarlet Robin	V	-
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-
Ptilinopus regina	Rose-crowned Fruit-Dove	V	-
Rostratula australis	Australian Painted Snipe	E	E
Tyto longimembris	Eastern Grass Owl	V	-
Threatened Mammals			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Dasyurus maculatus subsp. *maculatus*	Spotted-tailed Quoll	V	E
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-
Miniopterus australis	Little Bentwing-bat	V	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-
Mormopterus norfolkensis	Eastern Freetail-bat	V	-
Myotis Macropus	Southern Myotis	V	-
Petaurus norfolkensis	Squirrel Glider	V	-
Petaurus volans	Greater Glider	-	V
Petrogale penicillata	Brush-tailed Rock Wallaby	E	V

Scientific Name	Common Name	TSC Act	EPBC Act
Phascogale tapoatafa	Brush-tailed Phascogale	V	-
Phascolarctos cinereus	Koala	V	V
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	VP	VP
Pseudomys novaehollandiae	New Holland Mouse	-	V
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-
Threatened Herpetofauna			
Heleioporus australiacus	Giant Burrowing Frog	V	V
Litoria aurea	Green and Golden Bell Frog	E	V
Mixophyes balbus	Stuttering Frog	E	V
Ecological Communities			
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions (E, CE*)		E	CE
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions (E, CE*)		E	CE
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E, V*)		E	V
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)		E	-
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions (E)		E	-
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions (E)		E	-
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (V, CE*)		V	CE
Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions (E)		E	-
Hunter Valley Weeping Myall Woodland in the Sydney Basin Bioregion (E, CE*)		E	CE
Kurri Sand Swamp Woodland in the Sydney Basin Bioregion (E)		E	-
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E, CE*)		E	CE
Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion (E)		E	-

Scientific Name	Common Name	TSC Act	EPBC Act
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions (E, CE*)		E	CE
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)		E	-
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)		E	-
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)		E	-
Sydney Freshwater Wetlands in the Sydney Basin Bioregion (E)		E	-
Warkworth Sands Woodland in the Sydney Basin Bioregion (E)		E	-
White Box Yellow Box Blakely's Red Gum Woodland (E, CE*)		E	CE

Status: V: Vulnerable**,** E: Endangered**,** CE: Critically Endangered

3.1.3 Review of Enviro Ecology (2012)

The following summarises the relevant results of Enviro Ecology (2012):

- Three vegetation communities were identified on the site, being MU 41 Swamp Oak Sedge Forest, MU 17 Lower Hunter Spotted Gum - Ironbark Forest and derived grassland.
- MU 41 Swamp Oak Sedge Forest and MU 17 Lower Hunter Spotted Gum - Ironbark Forest were found to be in a 'poor/moderate' condition, with a cleared understorey and grazed/slashed groundcover.
- No threatened flora or fauna species were recorded during field surveys.

See Appendix C for the Enviro Ecology (2012) report.

3.2 Flora Survey and Vegetation Mapping

The site contains cleared areas interspersed with remnant native trees. Three vegetation communities were recorded on the site; two of these (being MU 41 Swamp Oak Sedge Forest and MU 17 Lower Hunter Spotted Gum - Ironbark Forest and Grassland with Scattered Trees) are consistent with defined native vegetation communities. The site's vegetation communities are highly modified from their original form, due to clearing of understorey and grazing/slashing.

Figure 3-2 provides a distribution map of the site's PCTs. The dominant floristic characteristics of each plant community type are described below.

PCT 1590 - Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest

Upper Stratum – 20 m to 30 m high with a PFC of 5% to 20%. The canopy is dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus paniculata* (Grey Ironbark), with some occasional *E. tereticornis* (Forest Red Gum) and *E. globoidea* (White Mahogany).

Mid Stratum 1 – Absent

Mid Stratum 2 – 1 m to 3 m high with a PFC of <5%. The understorey is almost entirely absent. Only occasional *Lantana camara* (Lantana) was recorded.

Lower Stratum – <1 m high with a PFC of 30% to 90%. The groundlayer is dominated by *Paspalum dilatatum* (Paspalum), *Cynodon dactylon* (Common Couch) and *Microlaena stipoides* (Weeping Grass). Other recorded species include *Entolasia stricta* (Wiry Panic), *Pratia purpurascens* (Whiteroot), *Plantago lanceolata* (Lamb's Tongues), *Senecio madagascariensis* (Fireweed), *Glycine clandestina* (Love Twiner) and *Sida rhombifolia* (Paddy's Lucerne).

Photo 1: PCT 1590 - Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest

PCT 1731 Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley

Upper Stratum – 5 m to 20 m high, with a PFC of 30%. This stratum is dominated entirely by *Casuarina glauca* (Swamp Oak) and *E. tereticornis* (Forest Red Gum).

Mid Stratum 1 – 3 m to 5 m high with a PFC of <5%. This stratum is dominated by regrowth *Casuarina glauca* (Swamp Oak) and *E. tereticornis* (Forest Red Gum).

Mid Stratum 2 – 1 m to 3 m high with a PFC of <5%. This stratum is almost entirely absent, with only very occasional *Einadia hastata* (Berry Saltbush) and regrowth *Casuarina glauca* (Swamp Oak).

Lower Stratum – <1 m high with a PFC of 10% to 30%. This stratum is dominated by *C. dactylon* (Common Couch), *M. stipoides* (Weeping Grass) and *S. rhombifolia* (Paddy's Lucerne). There are also scattered *P. dilatatum* (Paspalum), *Plantago lanceolata* (Lamb's Tongues), *Ranunculus plebeius* (Forest Buttercup) and *Alternathera denticulate* (Lessor Joyweed).

Grassland with Scattered Trees

Upper Stratum – 15 m to 30 m high, with a PFC of <5%. This stratum has occasional *C. maculata* (Spotted Gum), *E. paniculata* (Grey Ironbark) and *E. tereticornis* (Forest Red Gum).

Mid Stratum 1 – Absent.

Mid Stratum 2 – Absent.

Lower Stratum – <1 m high with a PFC of 50% - 90%. The groundlayer is dominated by *Paspalum dilatatum* (Paspalum), *Cynodon dactylon* (Common Couch) and *Pennisetum clandestinum* (Kikuyu). Other recorded species include *Microlaena stipoides* (Weeping Grass), *Entolasia stricta* (Wiry Panic), *Pratia purpurascens* (Whiteroot), *Plantago lanceolata* (Lamb's Tongues), *Senecio madagascariensis* (Fireweed), *Glycine clandestina* (Love Twiner) and *Sida rhombifolia* (Paddy's Lucerne).

3.2.1 Threatened Ecological Communities

Lower Hunter Spotted Gum - Ironbark Forest (LHSGIF) in the Sydney Basin Bioregion occurs within the site and is listed as an TEC under the BC Act. Swamp Oak Forest occurs within the site and is commensurate with River-Flat Eucalypt Forest on Coastal Floodplain of the NSW North Coast, Sydney Basin and South East Corner Bioregions which is also listed as an TEC under the BC Act. See Figure 3-2 for the distribution of TECs on the site.

3.2.2 Threatened Flora Species / Populations

No threatened flora species or populations were recorded on the site.

3.3 Fauna and Habitat Assessment

3.3.1 Incidental Fauna Sightings

Fauna sightings were confined to species adapted to open areas. Species sighted include *Cacatua galerita* (Sulphur-crested Cockatoo), *Platycercus eximius* (Eastern Rosella), *Cracticus tibicen* (Australian Magpie), *Manorina melanocephala* (Noisy Miner), *Ardea ibis* (Cattle Egret), *A. pacifica* (White-necked Heron) and Macropus giganteus (Eastern Grey Kangaroo).

3.3.2 Terrestrial Habitat

The following summaries the site's terrestrial habitat values:

- The site contains a high number of very large, mature native trees. A very high percentage of these trees contain multiple hollows. These hollows range in size (from small to large) and would potentially provide nesting / roosting habitat for range of microbats, small-large birds, small-large arboreal mammals and hollow-dependent herpetofauna (see Figure 3-3).
- The trees on the site may provide foraging, nesting, resting and roosting opportunities for a range fauna; however, the shrub layer is almost entirely absent and the groundlayer is highly disturbed / grazed. This limits habitat availability significantly, for fauna that aren't adapted to open areas (such as many small birds).
- The treed areas of the site contain scattered ground timber; this would provide habitat resources for birds, reptiles, frogs and invertebrates that rely on ground timber for foraging, nesting, resting, perching or basking.
- The site lacks rocky surfaces, outcrops, caves or ledges.

3.3.3 Aquatic and Riparian Habitat

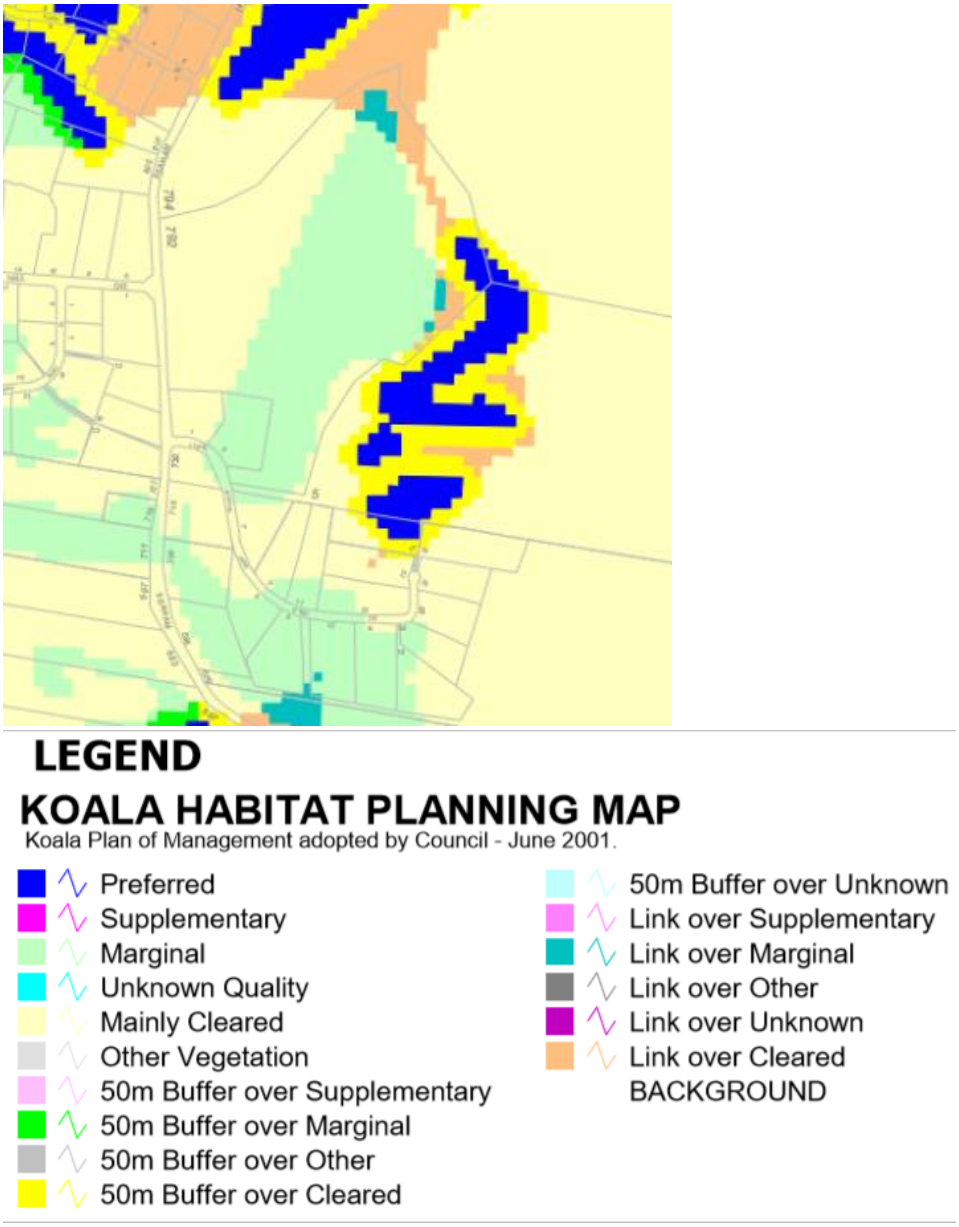
The following summaries the site's aquatic / riparian habitat values:

- The site contains a 1st order water-course (as defined by DPI, Office of Water) that flows into the Williams River (see Figure 3-1).
- The site also contains two dams. These dams both contain ample riparian vegetation, including dense patches of *Typha orientalis* (Bullrush), *Eichhornia crassipes* (Water Hyacinth), *Ludwigia peploides* (Water Primrose). These areas would provide potential habitat for a wide range of aquatic / wetland species, such as amphibians and wetland birds (see Figure 3-2).
- Note also, a forested area of wetland occurs just external to the site's eastern boundary (see Figure 3-2).

3.3.4 Koala Survey and Habitat Assessment

The targeted survey found no direct or indirect (e.g. scats and scratch marks on trees) evidence of *P. cinereus* (Koala) on the site. A search of the Atlas of NSW Wildlife database indicated that *P. cinereus* (Koala) has not been recorded in the site; however, there are a very high number of records in the area, ranging from 1980 to as recent as 2016 (adjacent to the site). The site contains some scattered *E. tereticornis* (Forest Red Gum), a Preferred Koala Feed Tree (see Figure 3-4).

The *Koala Habitat Planning Map* (PSC, 2007) identifies the site as a mix of 'Preferred Habitat', '50m Buffer Over Cleared', 'Link over Cleared Land', 'Preferred Link over Marginal habitat', 'Marginal Koala Habitat' and 'Mainly Cleared' habitat (see below).



Source: *Koala Habitat Planning Map* (PSC, 2007)

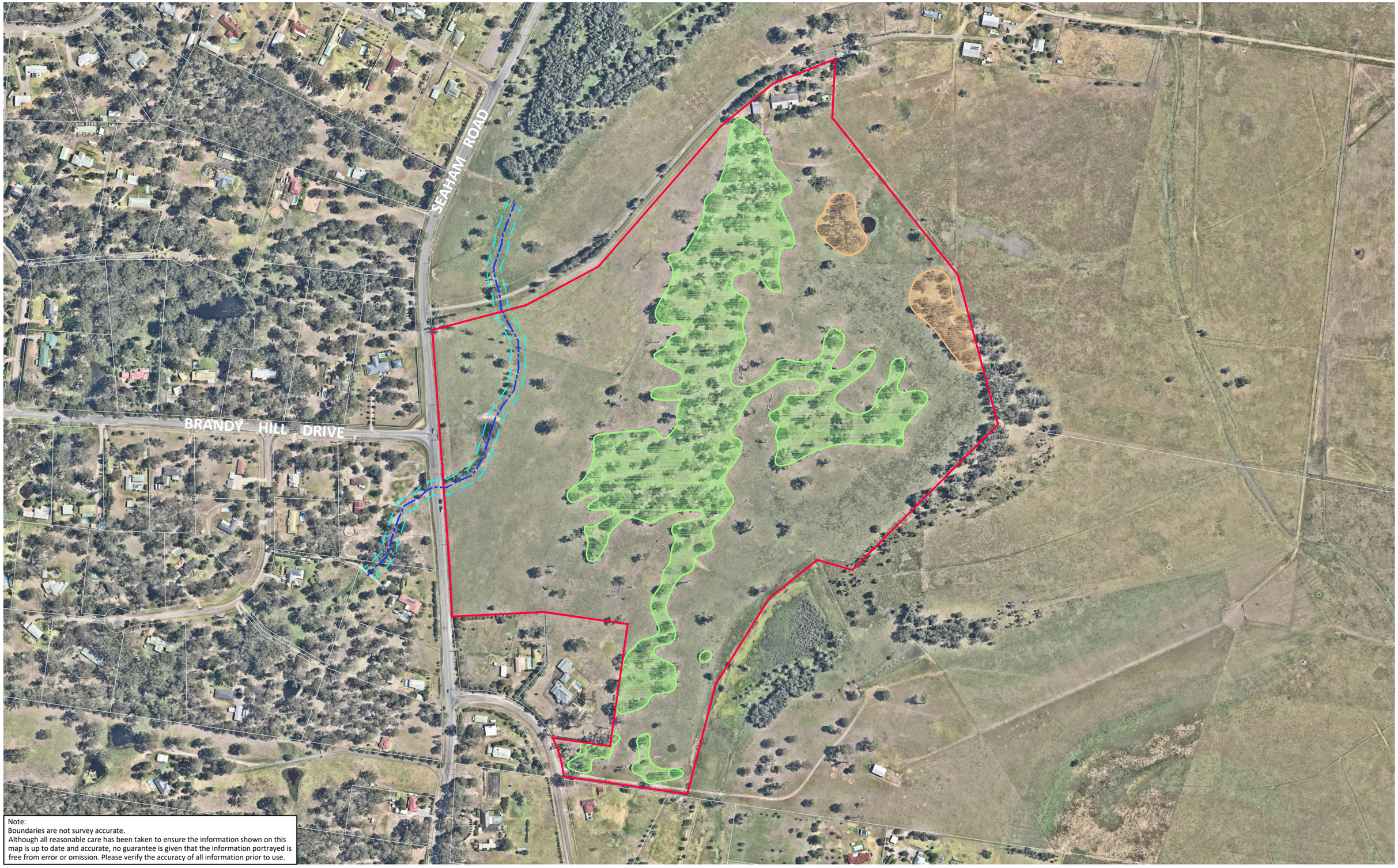
Eucalyptus tereticornis (Forest Red Gum), a Preferred Koala feed tree, was recorded as a co-dominate species within the site's PCT 1731 Swamp Oak. This plant community type occurs within the areas mapped as 'Preferred habitat', '50m Buffer Over Cleared' and 'Link over Cleared', which indicates that the distribution of these habitat types would differ slightly from that mapped in the *Koala Habitat Planning Map* (PSC, 2007).

The site's PCT 1590 - Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest and Grassland with Scattered Trees are mostly consistent (with minor deviations) with the distribution of areas mapped as 'Marginal Koala Habitat'.

Figure 3-4 provides a *P. cinereus* (Koala) habitat map, based on the findings of this assessment.

3.3.5 Hollow-bearing Tree Assessment

A habitat tree hollow assessment was conducted (for all hollow-bearing trees that may be removed by the proposal) in accordance with State Government's BioMetric Terrestrial Biodiversity Assessment Tool (see Department of Environment Climate Change & Water (DECCW), 2011), by Firebird ecoSultants on 29 and 30 November 2018. The location and species of each tree, as well as the number and size range of each hollow, were recorded. The locations of these trees are provided in Figure 3-3.



Note:
Boundaries are not survey accurate.
Although all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

FIGURE 3-2: VEGETATION MAP

CLIENT	Client
SITE DETAILS	No.792 Seaham Road Seaham
DATE	29 November 2018

Legend

- Subject Site
- Spotted Gum-Ironbark Forest
- Swamp Oak Sedge Forest
- 10m Riparian Buffer
- Drainage

NORTH

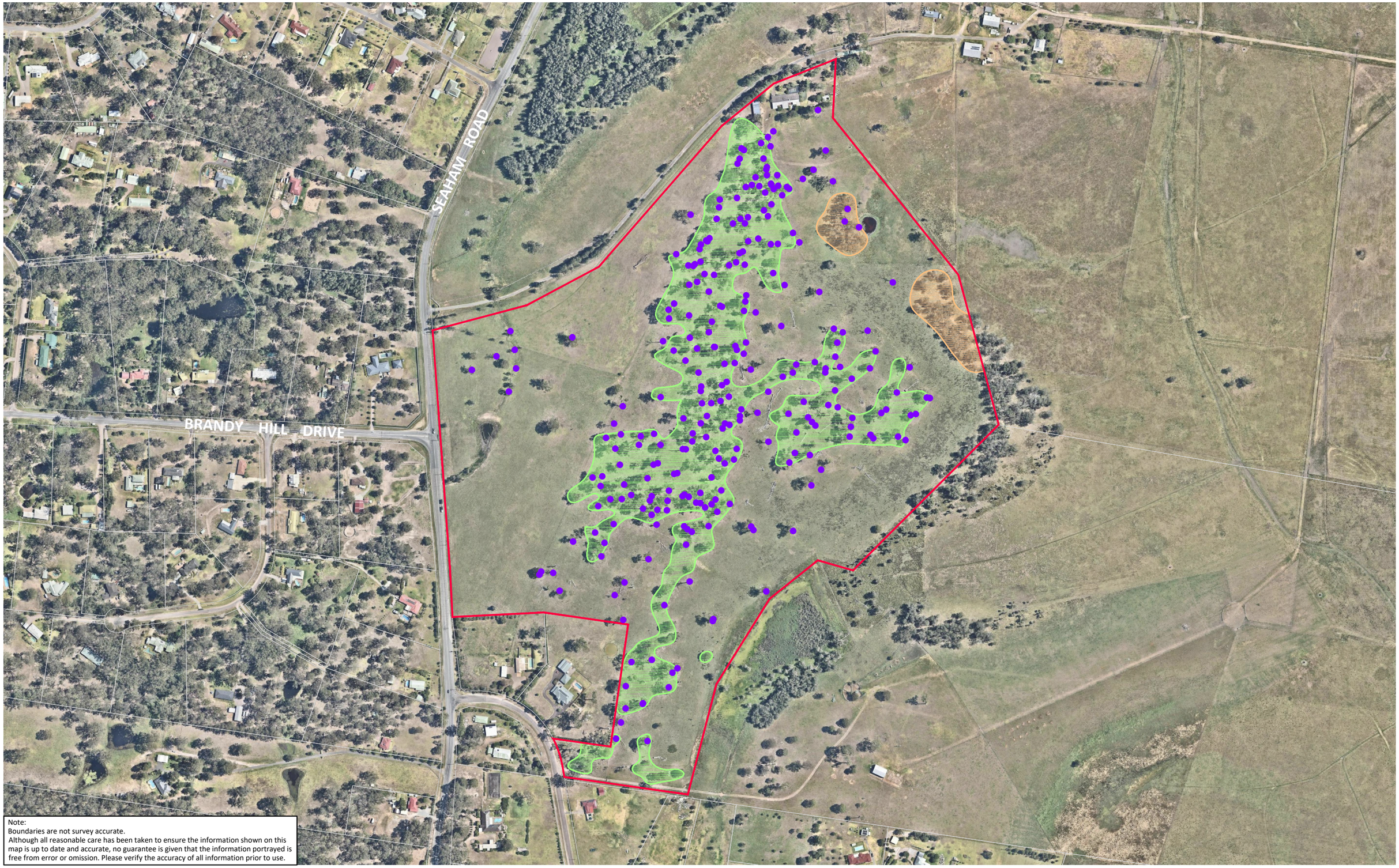
0 50 150 250

SCALE 5000 @ A3

PIXELDRAFTING

Firebird ecoSultants Pty Ltd
ABN - 16 105 985 993
Level 1, 146 Hunter Street, Newcastle NSW 2300
P O Box 354 Newcastle NSW 2300

Ref No 2300



Note:
Boundaries are not survey accurate.
Although all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

FIGURE 3-3: HABITAT TREE MAP

CLIENT	Client
SITE DETAILS	No.792 Seaham Road Seaham
DATE	3 December 2018

Legend

- Subject Site
- Spotted Gum-Ironbark Forest
- Swamp Oak Sedge Forest
- Habitat Tree

NORTH

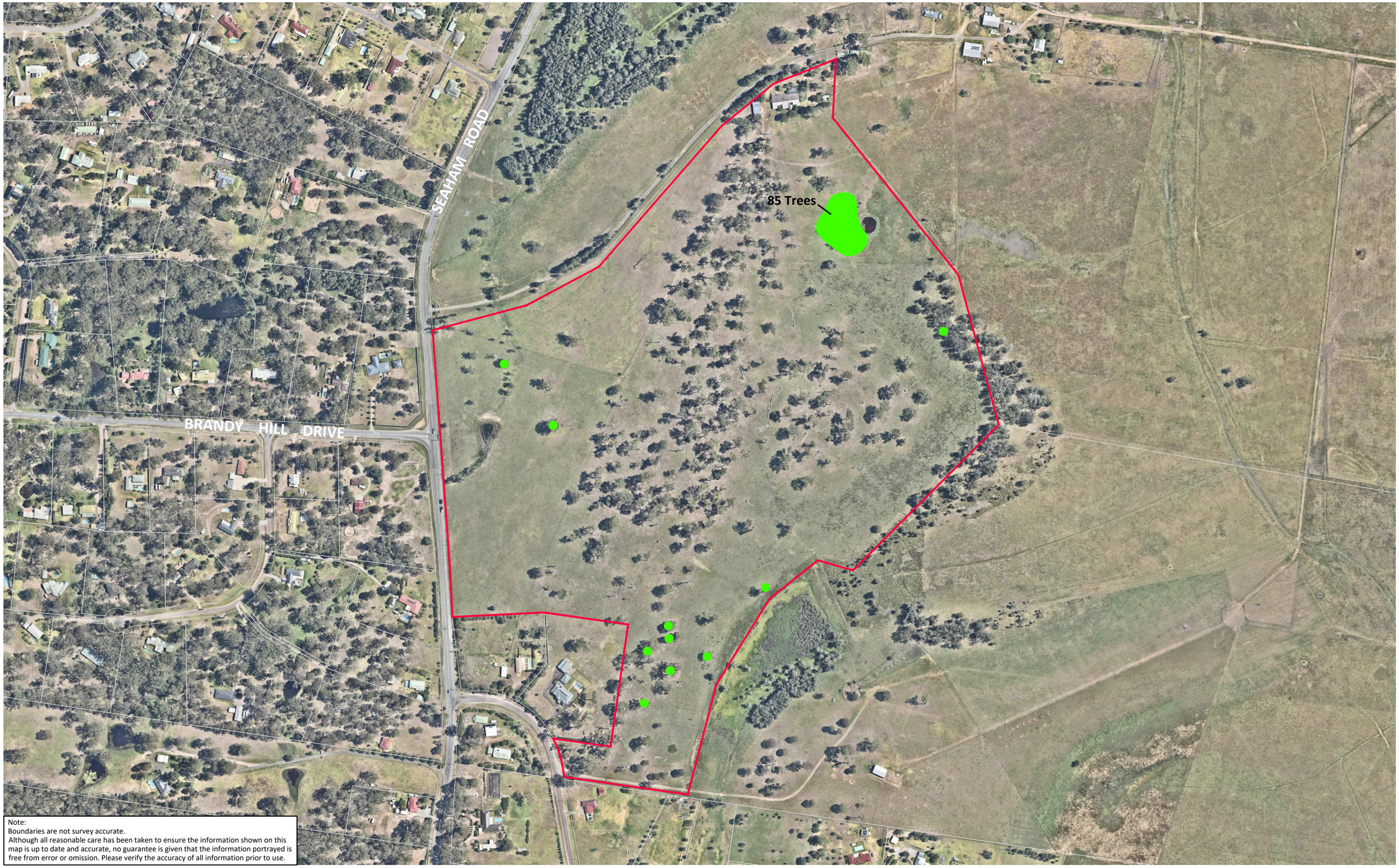
0 50 150 250

SCALE 5000 @ A3

PIXELDRAFTING

Firebird ecoSultants Pty Ltd
ABN - 16 105 985 993
Level 1, 146 Hunter Street, Newcastle NSW 2300
P O Box 354 Newcastle NSW 2300

Ref No 2300



Note:
Boundaries are not survey accurate.
Although all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

FIGURE 3-4: KOALA FEED TREES MAP

CLIENT	Client
SITE DETAILS	No.792 Seaham Road Seaham
DATE	6 April 2018

Legend
- Subject Site
- Eucalyptus tereticornis

NORTH

0 50 150 250

SCALE 5000 @ A3

PIXELDRAFTING

Ref No 2300

Firebird ecoSultants Pty Ltd
ABN - 16 105 985 993
Level 1, 146 Hunter Street, Newcastle NSW 2300
P O Box 354 Newcastle NSW 2300

firebird

3.3.6 Corridors and Connectivity

The site's vegetation has links to patches of bushland within the residential township of Brandy Hill, to west, south-west and north-west of the site as well as to a much larger area of more intact bushland approximately 3.5km to the north-west. It is otherwise surrounded by residential development to the west, north-west and south-west and by cleared agricultural land to the east, north-east and south-east (although an area of forested wetland occurs just external to the site's eastern boundary). The site is likely to form part of a network of 'stepping stones' through the area for fauna species that are able to cross relatively open areas.

The site is located outside of the Watagan to Stockton Green Corridor, which is identified in the *Lower Hunter Regional Strategy 2006-31* (Department of Planning, 2006). A review of OEH key habitats and corridors mapping (Scotts, 2003) shows that the site is not part of any state or regional wildlife corridor.

4 THREATENED SPECIES / COMMUNITY / MNES LIKELIHOOD OF OCCURRENCE

Several threatened species / populations were identified in Section 3 of this report, as potentially occurring in the area. An assessment of the likelihood of occurrence for each of these threatened species / populations was conducted; see Table 4-1. This assessment deals with the following heads of consideration in tabulated form:

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

'Habitat Description and Known Populations' – Provides a brief account of the preferred habitat attributes required for the existence / survival of each species / population and information on known populations in the area.

'Likelihood of Occurrence' – Assesses the likelihood of each species / population to occur in or within the immediate vicinity of the study area 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 OEH Atlas of NSW Wildlife, herbariums, etc.) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Potential for Impact'– Assesses the likely level / significance of impacts to each species / population that would result from the proposed development, taking into account direct and indirect short and long-term impacts.

Table 4-1: Chance of Occurrence

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Threatened Flora			
Angophora inopina Charmhaven Apple (V, V*)	Small tree, up to 8 m tall. Found in open dry sclerophyll woodland of *Eucalyptus haemastoma* and *Corymbia gummifera* with a dense shrub understorey. The woodland occurs on deep white sandy soils over sandstone, often with some gravelly laterite. The current known distribution of is restricted to the Wallarah catchment between Charmhaven and Wyee.	**Low** Was not recorded on site. This is a relatively conspicuous species and it is unlikely to have been overlooked during surveys.	**Low** Unlikely, as it did not occur onsite.
Asperula asthenes Trailing Woodruff (V,V*)	Grows in damp sites often along river banks; from Taree to Bulahdelah.	**Low** Was not recorded within the site. One record from 2009 occurs approximately 5km to the south-east of the site (OEH 2017b).	**Low** Unlikely, as it did not occur onsite.
Asterolasia elegans (E,E*)	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (Syncarpia glomulifera subsp. glomulifera), Smooth-barked Apple (Angophora costata), Sydney Peppermint (Eucalyptus piperita), Forest Oak (Allocasuarina torulosa) and Christmas Bush (Ceratopetalum gummiferum) (OEH, 2017a).	**Low** Was not recorded on site. The site lacks suitable habitat of sheltered forests on mid- to lower slopes and valleys or adjacent to gullies which support sheltered forest.	**Low** Unlikely, as it did not occur onsite.
Caladenia tessellata Thick Lip Spider Orchid (E,V*)	The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations).	**Low** Was not recorded on site. Surveys were conducted during the flowering period for this species (Sep-Oct). However, this species was not recorded on site during a previous ecological assessment that was taken place during the flowering period (Enviro Ecology 2012). Thus, it is considered that this species is not likely to occur on site.	**Low** Unlikely, as it did not occur onsite.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Commersonia prostrata Dwarf Kerrawang (E,E*)	Dwarf Kerrawang occurs on the Southern Highlands and Southern Tablelands (one plant at Penrose State Forest, one plant at Tallong, a small population near the Corang and about 2000 plants at Rowes Lagoon), a larger population in the Thirlmere Lakes area (particularly among the dying reeds at the edge of the water), and on the North Coast (less than 100 plants at the Tomago sandbeds north of Newcastle). It is also found in Victoria. Occurs on sandy, sometimes peaty soils in a wide variety of habitats: Snow Gum (Eucalyptus pauciflora) Woodland and Ephemeral Wetland floor at Rowes Lagoon; Blue leaved Stringybark (E. agglomerata) Open Forest at Tallong; and in Brittle Gum (E. mannifera) Low Open Woodland at Penrose; Scribbly Gum (E. haemostoma)/ Swamp Mahogany (E. robusta) Ecotonal Forest at Tomago. Associated native species may include Imperata cylindrica, Empodisma minus and Leptospermum continentale.	**Low** Was not recorded within the site. This species is only known to occur at the Tomago sandbeds locally.	**Low** Unlikely, as it did not occur onsite.
Cryptostylis hunteriana Leafless Tongue-orchid (V, V*)	A cryptic Saprophytic orchid species that flowers between December and February. Has been recorded in a wide variety of habitats including heathlands, heathy woodlands, sedgelands, *Xanthorrheoa* spp. plains, dry sclerophyll forests (shrub/grass sub-formation and shrubby sub-formation), forested wetlands, freshwater wetlands, grasslands, grassy woodlands, rainforests and wet sclerophyll forests (grassy sub-formation). Soils are generally considered to be moist and sandy.	**Low** Was not recorded on site. Surveys were conducted during the flowering period for this species (November). Furthermore, this species was not recorded on site during a previous ecological assessment that was taken place during the flowering period (Enviro Ecology 2012). Thus, it is considered that this species is not likely to occur on site.	**Low** Unlikely, as it did not occur onsite and the site
Cynanchum elegans White-flowered Wax Plant (E, E*)	A climber or twiner that can grow up to 10 m high. Occurs on a variety of lithologies and soil types, usually on steep slopes with varying degrees of soil fertility. Recorded from rainforest gullies scrub and scree slopes; from the Gloucester district to the Wollongong area and inland to Mt Dangar (OEH, 2017a).	**Low** Was not recorded on the site. The site lacks suitable, steep gully habitat.	**Low** Unlikely, as it did not occur onsite.
Dichanthium setosum Bluegrass (V,V*)	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. (Often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched). It is open to question whether the species tolerates or is promoted by a certain amount of disturbance, or whether this is indicative of the threatening processes behind its depleted habitat (OEH, 2017a).	**Low - Moderate** Was not recorded on site. Potential habitat occurs on site due to the site's disturbed nature.	**Low** Did not occur onsite.
Eucalyptus glaucina Slaty Red Gum (V,V*)	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest (OEH, 2017a).	**Low** Was not recorded on site. All redgums on site were identified as *Eucalyptus tereticornis*.	**Low** Unlikely, as it did not occur onsite.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Eucalyptus parramattensis subsp. *decadens* Earp's Gum (V, V*)	Occurs in low-lying, often swampy areas and in woodlands with associates such as *Eucalyptus racemosa, E. globoidea* and *Angophora bakeri*. Occurs in two vegetation communities: Tamago Sand Swamp and the Kurri Sands Swamp communities, both of which occur on poor sandy soils from either Pleistocene sands or Permian sediments (OEH, 2017a).	**Low** Was not recorded on site. All redgums on site were identified as *Eucalyptus tereticornis*.	**Low** Unlikely, as it did not occur onsite.
Euphrasia argute (CE,CE*)	Euphrasia arguta has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha. The Royal Botanic Gardens Specimen Register records an additional location reported and vouchered in 2002 from near the Hastings River; and Euphrasia arguta was also recorded from the Barrington Tops in 2012. Known to occur in the open forest country around Bathurst in sub humid places, on the grassy country near Bathurst, and in meadows near rivers (OEH, 2017a).	**Low** Was not recorded on site. Unlikely to occur due to the highly disturbed nature of the site.	**Low** Unlikely, as it did not occur onsite.
Grevillea parviflora subsp. *parviflora* Small-flower Grevillea (V, V*)	Occurs in sandy or light clay soils, usually over thin shales often with lateritic ironstone gravels which are often infertile and poorly drained. Occurs in a range of vegetation types from heath and scrubby woodland to open forest (OEH, 2017a).	**Low** The survey did not record the species It is considered that the survey effort was sufficient. The site also lacks potential habitat of heath and scrubby woodland to open forest due to its highly disturbed and cleared state.	**Low** Unlikely, as it did not occur onsite.
Maundia triglochinoides (V)	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients (OEH 2017a).	**Low** Was not recorded on site. Three records occur approximately 4km to the west of the site (OEH 2017b).	**Low** Unlikely, as it did not occur onsite.
Melaleuca biconvexa Biconvex paperbark (V, V*)	Shrub or small tree, to 10 m tall. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north	**Low** Was not recorded on site. This is a relatively conspicuous species and it is unlikely to have been overlooked during surveys.	**Low** Unlikely, as it did not occur onsite.
Persicaria elatior Tall Knotweed (V,V*)	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	**Low** Was not recorded on site. The site contains some marginal habitat adjacent to the site's wetland habitat. One record from 1996 occurs approximately 1km to the north of the site (OEH 2017b).	**Low** Unlikely, as it did not occur onsite.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Phaius australis Lesser swamp orchid (E,E*)	Associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often in association with Broad-leaved Paperbark or Swamp Mahogany (OEH, 2017a).	**Low** Was not recorded on site. The site contains some marginal habitat adjacent to the site's wetland habitat.	**Low** Unlikely, as it did not occur onsite.
Prasophyllum sp. Wybong a leek-orchid (CE*)	Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Most populations are small, although the Wybong population contains by far the largest number of individuals. A perennial orchid, appearing as a single leaf over winter and spring. Known to occur in open eucalypt woodland and grassland (OEH, 2017a).	**Low** Was not recorded on site. Surveys were conducted during the flowering period for this species (Winter-Spring). However, this species was not recorded on site during a previous ecological assessment that was taken place during the flowering period (Enviro Ecology 2012). Thus, it is considered that this species is not likely to occur on site.	**Low** Unlikely, as it did not occur onsite.
Rutidosis heterogama Heath Wrinklewort (V,V*)	Recorded from near Cessnock to Kurri Kurri with an outlying occurence at Howes Valley. On the Central Coast it is located north from Wyong to Newcastle. There are north coast populations between Wooli and Evans Head in Yuraygir and Bundjalung National Parks. It also occurs on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes. Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides. Generally flowers in Autumn (OEH, 2017a).	**Low** Was not recorded on site. Unlikely to occur due to the highly disturbed nature of the site.	**Low** Unlikely, as it did not occur onsite.
Syzygium paniculatum Magenta Lilly Pilly (E,V*)	A small to medium sized rainforest tree that grows to 8 m tall. Bark is flaky and the leaves are shiny, dark-green above and paler underneath. Leaves can be up to 10 cm long. Plants produce white flower-clusters at the end of each branch, between November and February. This species is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities (OEH, 2017a).	**Low** Was not recorded on site. The site lacks potential habitat of rainforest.	**Low** Unlikely, as it did not occur onsite.
Tetratheca juncea Black-eyed Susan (V, V*)	Found in sandy, occasionally moist heath and in dry sclerophyll vegetation communities endemic to coastal NSW. Prefers ridges in areas from 0–200 m in altitude with an annual rainfall of 1000–1200 mm and restricted to open forest of *Angophora costata, Eucalyptus haemastoma, E. globoidea, Corymbia gummifera*, and *E. capitellata*. The preferred substrates are: sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral. This species is difficult to see unless in flower which occurs between July and December.	**Low** Was not recorded on site. Surveys were conducted within the flowering period for this species (Jul-Dec). However, this species was not recorded on site during a previous ecological assessment that was taken place during the flowering period (Enviro Ecology 2012). Thus, it is considered that this species is not likely to occur on site.	**Low** Unlikely, as it did not occur onsite.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Thesium austral Austral Toadflax (V,V*)	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*). It is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands (OEH, 2017a).	**Low** Was not recorded on site. Surveys were conducted outside the flowering period for this species (Spring). However, this species was not recorded on site during a previous ecological assessment that was taken place during the flowering period (Enviro Ecology 2012). Thus, it is considered that this species is not likely to occur on site.	**Low** Unlikely, as it did not occur onsite.
Threatened Birds			
Anseranas semipalmata Magpie Goose (V)	This species is found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off; breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level; most breeding now occurs in monsoonal areas; nests are formed in trees over deep water; breeding is unlikely in south-eastern NSW (OEH, 2017a).	**Low - Moderate** Was not recorded on the site. This species may occasionally pass through the site and utilise the site's dams. Five records occur approximately 4km to the north of the site in the township of Seaham (OEH 2017b)	**Low** This is a highly mobile species, able to forage over large ranges. The area of vegetation to be removed would represent an insignificant portion foraging habitat.
Anthochaera Phrygia Regent Honeyeater (CE, CE*)	Inhabits dry open forest and woodlands that support a high abundance and species richness of birds; these areas have large numbers of mature trees, high canopy cover and abundance of mistletoes. A shrubby understorey is an important source of insects and nesting material. Distributed in NSW is very patchy but mainly confined to breeding areas in the Capertee Valley and the Bundarra-Barraba regions (OEH, 2017a).	**Low** Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value habitat, due to its disturbed and cleared state, however this species may occasionally pass through the site. One record occurs approximately 4km to the north-east of the site (OEH 2017b)).	**Low** This is a highly mobile species, able to forage over large ranges. The area of vegetation to be removed would represent an insignificant portion foraging habitat.
Botaurus poiciloptilus Australasian Bittern (E, E*)	Requires large, relatively undisturbed freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.) (OEH, 2017a).	**Low – Moderate** The site lacks large undisturbed wetland; however, this species may occasionally pass through the site.	**Low** This is a highly mobile species, able to forage over large ranges. The area of vegetation to be removed would represent an insignificant portion foraging habitat.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Circus assimilis Spotted Harrier (V)	The Spotted Harrier occurs throughout the Australian mainland, except in densly forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands (OEH, 2017a).	**Low – Moderate** Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value foraging habitat, due to its cleared and disturbed state, however this species may occasionally pass through the site. One record occurs approximately 4km to the south-east of the site (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.
Dasyornis brachypterus Eastern Bristlebird (E, E*)	Requires dense understory vegetation in a broad range of habitat types including sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland, and rainforest. Occurs near the coast, on tablelands and in ranges. There are three main populations (Northern, Central and Southern). The Northern population extends from northern Qld to northern NSW. The Central population occurs in Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula. The Southern population occurs in Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. There are no known populations in the Port Stephens area (OEH, 2017a).	**Low** Was not recorded on site. The site lacks potential habitat of dense understory vegetation. However, this species may occasionally pass through the site.	**Low** The proposal is unlikely to impact on this species' as the site lacks suitable habitat.
Ephippiorhynchus asiaticus Black-necked Stork (E)	Requires relatively large, open wetlands. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. Builds large nests high in tall trees close to water. Widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas) (OEH, 2017a).	**Low - Moderate** The site lacks large open wetland; however, this species may occasionally pass through the site. Numerous records within the surrounding area of the site (OEH 2017b).	**Low** The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
Erythrotriorchis radiates Red Gosshawk (CE,V*)	Very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers (OEH, 2017a).	**Low** The site lacks suitable rainforest, melaleuca or riparian habitat.	**Low** This species is unlikely to utilise the site due to the lack of potential habitat.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Falco subniger Black Falcon (V)	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (OEH, 2017a).	**Low** Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value habitat, due to its disturbed and cleared state, however this species may occasionally pass through the site. One record occurs approximately 4km to the north-east of the site (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.
Glossopsitta pusilla Little Lorikeet (V)	Found in dry, open *Eucalyptus* forests and woodlands. Feeds on abundant flowering *Eucalyptus* sp., but will also take nectar from *Melaleuca* sp and fruit from *Mistletoe* sp. On the eastern slopes and coastal areas favoured food sources are *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark), *E. robusta* (Swamp Mahogany) and *E. pilularis* (Blackbutt). Requires hollow-bearing trees for nesting (OEH, 2017a).	**Low - Moderate** Was not recorded on site. Marginal potential habitat occurs within the site because of its woodland features and feed trees, though the site is highly disturbed. This species may occasionally pass through and utilise the site. Two records occur approximately 5km to the north of the site (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.
Grantiella picta Painted Honeyeater (V, V*)	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Nomadic; the greatest concentrations of birds and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution (OEH, 2017a).	**Low** The site lacks Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	**Low** This species is unlikely to utilise the site due to the lack of potential habitat.
Haliaeetus leucogaster White-bellied Sea Eagle (V)	Distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. The inland limits of the species are most restricted in south-central and south-western Australia, where it is confined to a narrow band along the coast. It is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands, typically characterised by the presence of large areas of open water (larger rivers, swamps, lakes, and the sea) (OEH, 2017a).	**Low - Moderate** Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value habitat, due to its highly disturbed and cleared state, however this species may occasionally pass through the site. Numerous records occur within the surrounding area of the site (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Irediparra gallinacean Comb-crested Jacana (v)	The Comb-crested Jacana occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW. The Comb-crested Jacana inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation (OEH 2017a).	**Low - Moderate** Was not recorded on site. The site contains marginal potential habitat within the site's waterways, however the site lacks permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation. This species may occasionally pass through the site. One record occurs approximately 4km to the north-east of the site (OEH 2017b).	**Low** This is a highly mobile species, able to forage over large ranges. The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
Lathamus discolor Swift Parrot (E, E*)	Occurs where eucalypts are flowering profusely or where there are abundant lerp (from sap sucking bugs) infestations. Favoured feed trees include winter flowering species such as *E. robusta* (Swamp Mahogany), *C. maculata* (Spotted Gum), *E. gummifera* (Red Bloodwood), *E. sideroxylon* (Mugga Ironbark) and *E. albens* (White Box). Commonly used lerp infested trees include Grey Box *E. macrocarpa* (Grey Box), *E. moluccana* (Grey Box) and *E. pilularis* (Blackbutt). Breeds in Tasmania during spring and summer and migrates to south-eastern Australia during autumn and winter. In NSW, it mostly occurs on the coast and south west slopes (OEH, 2017a).	**Low - Moderate** Was not recorded on site. Marginal potential habitat occurs within the site because of its woodland features and feed trees, though the site is highly disturbed. This species may occasionally pass through and utilise the site.	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.
Lophoictinia isura Square-tailed Kite (V)	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses (OEH, 2017a).	**Low – Moderate** Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value habitat, due to its disturbed and cleared state, however this species may occasionally pass through the site. Two records occur within 4-5km to the south-east of the site (OEH 2017b)	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Ninox strenua Powerful Owl (V)	Occurs in coastal and adjacent ranges of eastern Australia in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals such gliders and flying foxes, but also birds). Requires large and specific tree hollow characteristics for nesting. Occupies exclusive territories in the order of 1000 ha in size (OEH, 2017a).	**Low - Moderate** Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value foraging habitat, due to its disturbed and cleared state, however this species may occasionally pass through the site. Two records occur within 4km of the site (OEH 2017b).	**Low** This is a highly mobile species, able to forage over large ranges. The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
Numenius madagascariensis Eastern Curlew (CE*)	In NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts (OEH, 2017a).	**Low** The site lacks coastal lakes, inlets, bays and estuarine habitats.	**Low** Unlikely to occur onsite due to the lack of suitable habitat.
Petroica boodang Scarlet Robin (V)	This species is found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. Inhabits dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps (OEH, 2017a).	**Low - Moderate** Was not recorded on site. Marginal potential habitat occurs within the site because of its woodland features, though the site is highly disturbed. This species may occasionally pass through and utilise the site. One record occurs approximately 4km to the north of the site (OEH 2017b).	**Low** This is a highly mobile species, able to forage over large ranges. The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies) (V)	The eastern subspecies (temporalis occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions (OEH, 2017a).	**Moderate** Was not recorded on site. Marginal potential habitat occurs within the site because of its woodland features, though the site is highly disturbed. This species may occasionally pass through and utilise the site. Numerous records occur in the surrounding area of the site as recent as 2017 (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Ptilinopus regina Rose-crowned Fruit-Dove (V)	Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria. Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	**Low** The site is highly disturbed and lacks potential habitat of sub-tropical and dry rainforest, moist eucalypt forest or swamp forest with plentiful fruit. One record occurs within 4km to the south-west of the site.	**Low** Unlikely to occur onsite due to the lack of suitable habitat.
Rostratula australis Australian Painted Snipe (E,E*)	Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (OEH, 2017a).	**Low - Moderate** Was not recorded on site. The site contains potential marginal wetland habitat.	**Low** This is a highly mobile species, able to forage over large ranges. The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
Tyto longimembris Eastern Grass Owl (V)	Eastern Grass Owls have been recorded occasionally in all mainland states of Australia but are most common in northern and north-eastern Australia. In NSW they are more likely to be resident in the north-east. Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains (OEH 2017b).	**Low - Moderate** Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value habitat, due to its disturbed and cleared state, however this species may occasionally pass through the site. One record from 1980 occurs approximately 500m to the west of the site (OEH 2017b).	**Low** This is a highly mobile species, able to forage over large ranges. The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
Threatened Mammals			
Chalinolobus dwyeri Large-eared Pied Bat (V, V*)	Roosts in caves, crevices in cliffs, old mine workings. Frequents low to mid-elevation dry open forest and woodland close to these features. Requires a canopied habitat (OEH, 2017a).	**Moderate** Was not recorded on site. The site lacks suitable roosting habitat (i.e. caves or similar structures); however, it contains potential foraging habitat.	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.
Dasyurus maculatus subsp. *maculatus* Spotted-tailed Quoll (V, E*)	Found in a variety of forested habitats from sclerophyll forests, rainforests and coastal woodlands. Creates a den in fallen hollow logs or among rocky outcrops and is an opportunistic hunter of a variety of prey. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. Hunter Region records are largely confined to the surrounding ranges and larger vegetation remnants (OEH, 2017a).	**Low** Was not recorded on site. The site lacks suitable undisturbed habitat. Five records occur within 4km in the surrounding area of the site (OEH 2017b).	**Low** Unlikely to occur onsite due to the lack of suitable habitat.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Falsistrellus tasmaniensis Eastern False Pipistrelle (V)	Found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20 m). Roosts in tree hollows. Appears to locally favour upland habitats. A limited number of records occur on the central coast and the Hunter Region (OEH, 2017a).	**Moderate** Was not recorded on site. The site contains hollow-bearing trees and potential foraging habitat. One record occurs approximately 5km to the south-east of the site (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.
Miniopterus australis Little Bentwing-bat (V)	Prefers moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings. Forages for small insects beneath the canopy of densely vegetated habitats (OEH, 2017a).	**Moderate** Was not recorded on site. The site contains hollow-bearing trees and potential foraging habitat. Several records occur in the surrounding area (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.
Miniopterus schreibersii subsp. *oceanensis* Eastern Bentwing-Bat (V)	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 (OEH, 2017a).	**Moderate** Was not recorded on site. The site lacks suitable roosting habitat (i.e. caves or similar structures); however, it contains potential foraging habitat. Three records occur in the surrounding area (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.
Mormopterus norfolkensis Eastern Freetail-bat (V)	Distributed south of Sydney extending north into south-eastern Queensland. No records west of the Great Dividing Range. Most records have been reported from dry eucalypt forest and woodland. It is expected that open forested areas and the cleared land adjacent to bushland, constitutes important habitat. Predominantly a tree-dwelling species, roosting in hollows or behind loose bark in mature *Eucalypts* (OEH, 2017a).	**Moderate** Was not recorded on site. The site contains hollow-bearing trees and potential foraging habitat. Two records occur in the surrounding area (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.
Myotis Macropus Southern Myotis (V)	Found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Rarely found more than 100 km inland, except along major rivers. Roosts in groups of 10-15, close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings and under bridges. Forages over streams and pools catching insects and small fish by raking their feet across the water surface (OEH, 2017a).	**Moderate** Was not recorded on site. The site contains hollow-bearing trees and potential foraging habitat. One record occurs approximately 5km to the south-east of the site (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance of BC Act.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Petaurus norfolkensis Squirrel Glider (V)	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. Tree hollows are required for nesting. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrubs and small tree species. Sparsely distributed in eastern Australia, from northern Queensland to western Victoria (OEH, 2017a).	**Low** Was not recorded on site. Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value habitat, due to its disturbed and cleared state, however this species may occasionally pass through the site. One record occurs within 2km to the west of the site (OEH 2017b).	**Low** The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
Petaurus volans Greater Glider (V*)	Inhabits eucalypt forests and woodlands. Favours forests with a diversity of eucalypt species, due to seasonal variation in preferred feed trees. Shelters and nests in large tree hollows. Prefers large, undisturbed habitat patches (>160 km²). Restricted to eastern Australia, occurring from Windsor Tableland in North Qld through to central Victoria (OEH, 2017a).	**Low** The site lacks potential habitat of large, undisturbed habitat patches of eucalypt forest.	**Low** Unlikely to occur onsite due to the lack of suitable habitat.
Petrogale penicillata Brush-tailed Rock-wallaby (E,V*)	In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north (OEH, 2017a).	**Low** The site lacks suitable habitat of rocky escarpments, outcrops and cliffs.	**Low** Unlikely to occur onsite due to the lack of suitable habitat.
Phascogale tapoatafa Brush-tailed Phascogale (V)	Inhabits dry open forest and woodlands, often in areas with sparse groundcover. Hunts mainly invertebrates, although some vertebrate prey is taken on occasion. Utilises small tree hollows for nesting and refuge sites (OEH, 2017a).	**Low** Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value habitat, due to its disturbed and cleared state, however this species may occasionally pass through the site. Several records occur in the surrounding area of the site from 1990-1997 (OEH 2017b).	**Low** The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
Phascolarctos cinereus Koala (V, V*)	Occurs in forests and woodlands where it requires suitable feed trees (particularly *Eucalyptus* spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions. Within the Greater Hunter Region it is largely confined to the Port Stephens area, the Lake Macquarie hinterland and the Watagan Mountains (OEH, 2017a).	**Low - Moderate** Was not recorded on site. One species of Koala feed tree, *Eucalyptus tereticornis*, was recorded within the site. This species may occasionally pass through and utilise the site. Numerous records occur within the surrounding area of the site as recent as 2013 (OEH 2017b).	**Low – Moderate** Due to the presence of potential habitat and numerous records any potential impact will be assessed in accordance with the BC Act.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Potorous tridactylus tridactylus Long-nosed Potoroo (V, V*)	In NSW it is sparsely distributed along the coast and Great Dividing Range. Found in wet eucalypt forests to coastal heaths and scrubs. Requires access to dense vegetation for shelter and the presence of an abundant supply of fungi for food (OEH, 2017a).	**Low** The site lacks potential habitat of wet eucalypt forests to coastal heaths and scrubs.	**Low** Unlikely to occur onsite due to the lack of suitable habitat.
Pseudomys novaehollandiae New Holland Mouse (V*)	Inhabits open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. Habitats with deep top soils and soft substrates are preferred for digging burrows. Fragmented distribution across Tasmania, Victoria, New South Wales and Queensland (OEH, 2017a).	**Low** The site lacks suitable open heathy habitat.	**Low** Unlikely to occur onsite due to the lack of suitable habitat.
Pteropus poliocephalus Grey-headed Flying-Fox (V, V*)	Occurs along the east coast from Bundaberg, Queensland to Melbourne, Victoria. Utilises a range of habitats including rainforests, sclerophyll forests and woodlands, heaths, swamps and mangroves. Considered an important pollinator and seed disperser of native trees. Colonies usually formed in gullies with a dense vegetation canopy and a water source nearby (OEH, 2017a).	**Low** Was not recorded on site. The vegetation within the proposed development footprint is considered to be very low value habitat, due to its disturbed and cleared state, however this species may occasionally pass through the site. Two records occur within the 4-5km to the south-east of the site (OEH 2017b).	**Low** The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
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. Roosts in tree hollows and is relatively widespread within the Lower Hunter Region (OEH, 2017a).	**Moderate** Was not recorded on site. The site contains hollow-bearing trees and potential foraging habitat. Two records occur in the surrounding area (OEH 2017b).	**Low – Moderate** This is a highly mobile species, able to forage over large ranges. However, any potential impact will be assessed in accordance with the of BC Act.
Threatened Hepetofauna			
Heleioporus australiacus Giant Burrowing Frog (V,V*)	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based (OEH, 2017a).	**Low - Moderate** Was not recorded on site. While this species may pass through the site occasionally, the site would contain very low value habitat, due to its disturbed nature.	**Low** The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Litoria aurea Green and Golden Bell Frog (E, V*)	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands (OEH, 2017a).	**Low** Potential habitat occurs within the site's dams; however, the site is highly disturbed. Previous target surveys conducted by Enviro Ecology, 2012 failed to find any individual *L.aurea.*	**Low** The proposal is unlikely to impact on this species' ability to utilise the site, particularly as the site is already of limited habitat value to this species
Mixophyes balbus Stuttering Frog (E, V*)	Found in association with permanent streams through temperate and sub-tropical rainforest and wet sclerophyll forest. Shows a preference for the interiors of large forest tracts in areas with relatively cool mean annual temperatures. These sites are typically free from any disturbance with a thick canopy and relatively simple understorey. Occurs along first order streams and occasionally associated with springs. Not associated with ponds or ephemeral pools (OEH, 2017a).	**Low** The site lacks potential habitat of permanent streams through temperate and sub-tropical rainforest and wet sclerophyll forest.	**Low** Unlikely to occur onsite due to the lack of suitable habitat.
Ecological Communities			
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions (E, CE*)	Occurs in areas of relatively low rainfall and high temperatures. It is associated mostly with Permian lithology, and is situated on gently undulating hills, slopes and valleys, or occasionally on rocky knolls (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions (E, CE*)	Occupies undulating country including low rises and slopes, occurring on all aspects. It may also occur on alluvial and colluvial soils in valleys (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E, V*)	Occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)	Known from along the majority of the NSW coast. However, it is distinct from Sydney Freshwater Wetlands which are associated with sandplains in the Sydney Basin bioregion (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions (E)	Associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes but may also occur in backbarrier landforms where floodplains adjoin coastal sandplains. Generally occur below 20 m elevation on level areas. They are dominated by herbaceous plants and have very few woody species. The structure and composition of the community varies both spatially and temporally depending on the water regime (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions (E)	Occurs on gentle slopes of depressions and drainage flats on the Hunter Valley floor (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (V, CE*)	Occurs on colluvial soils derived from Triassic sandstones and conglomerates that has covered the underlying Permian (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions (E)	Mainly occurs on rocky slopes on Carboniferous sediments and volcanics, occasionally with limestone (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Hunter Valley Weeping Myall Woodland in the Sydney Basin Bioregion (E, CE*)	Associated with heavy clay soils on depositional landforms in the south-western part of the Hunter River valley floor (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Kurri Sand Swamp Woodland in the Sydney Basin Bioregion (E)	Occurs on soils developed on poorly-drained Tertiary sand deposits that blanket Permian sediments (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E, CE*)	Occurs on sand dunes and on soil derived from underlying rocks (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion (E)	Occurs principally on Permian geology in the central to lower Hunter Valley. The Permian substrates most commonly supporting the community belong to the Dalwood Group, the Maitland Group and the Greta and Tomago Coal Measures, although smaller areas of the community may also occur on the Permian Singleton and Newcastle Coal Measures and the Triassic Narrabeen Group (OEH, 2017a).	**High** Was recorded on the site.	**Moderate** Any potential impact will be assessed in accordance with the of BC Act.
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions (E, CE*)	An ecological community of subtropical rainforest and some related, structurally complex forms of dry rainforest (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains (OEH, 2017a).	**High** Was recorded on the site.	**Moderate** Any potential impact will be assessed in accordance with the of BC Act.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence	Potential Impact
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)	Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)	Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Sydney Freshwater Wetlands in the Sydney Basin Bioregion (E)	Largely restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplains such as those of the Warriewood and Tuggerah soil landscapes. Swampy areas on alluvium with a saline influence do not fall within this community (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
Warkworth Sands Woodland in the Sydney Basin Bioregion (E)	Occurs on aeolian sand deposits south of Singleton in the Hunter Valley (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.
White Box Yellow Box Blakely's Red Gum Woodland (E, CE*)	Remnants generally occur on fertile lower parts of the landscape where resources such as water and nutrients are abundant (OEH, 2017a).	**Low** Not recorded on or near the site.	**Low** Unlikely, as it did not occur onsite.

Notes: V = Vulnerable (TSC Act), **V* =** Vulnerable (EPBC Act), **E** = Endangered (TSC Act), **E*** = Endangered (EPBC Act), **CE** = Critically Endangered (TSC Act), **CE*** = Critically

5 BIODIVERSITY CONSTRAINTS AND OPPORTUNITIES

This assessment has identified important biodiversity values on the site (such as an abundance of large, hollow-bearing trees, two TECs and potential habitat for threatened fauna species). Development controls and/or design features to minimise impacts on threatened species habitats could be established through subsequent development assessment processes. For instance, future development controls may be put in place, to avoid or minimise removal of hollow-bearing trees and Preferred Koala Habitat.

The baseline ecological investigations outlined within this report are considered to provide a sufficient level of detail to justify a decision being made at the "gateway" regarding the proposal. Should the decision by the NSW Government be supportive, further ecological studies should be undertaken to ensure compliance with the relevant survey and assessment guidelines, and any other requirements by PSC, Department of Planning & Environment and OEH, as part of the gateway determination / consultation process.

Future targeted flora and fauna surveys will consider the following relevant guidelines, including:

- *Biodiversity Assessment Method*
- *NSW Guide to Surveying Threatened Plants* (OEH, 2016)
- *'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method* (OEH, 2018)
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (Department of Environment and Conservation (DEC), 2004)

The site's biodiversity constraints and opportunities are detailed below.

5.1 Preliminary Biodiversity Conservation Act 2016

5.1.1 Biodiversity Offset Scheme

The BC Act sets out the Biodiversity Offsets Scheme (BOS) framework, which aims to avoid, minimise and offset impacts on biodiversity from development and clearing, and to ensure land that is used to offset impacts is secured in-perpetuity. The types of developments that the BOS applies to, include local development (under Part 4 of the EP&A Act) that is likely to significant affect threatened species / EECs, as determined by:

- BOS development threshold; or
- Assessment of Significance; or

- Development on Areas of Outstanding Biodiversity Value (AOBV) (note, at this stage AOBVs include areas of declared critical habitat under the old *Threatened Species Conservation Act 1995.* This site does not contain any such areas).

The BOS development threshold has two elements:

- Area Criteria – whether the amount of native vegetation being cleared exceeds a threshold area set out below; and
- Biodiversity Values Map (BVM) – whether the impacts occur on an area mapped on the BVM.

The BVM identifies a small part of the site as having high biodiversity values. This is presumably due to the site containing the EEC - River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, as the distribution of this area in the BVM is correlated with the areas mapped by Firebird ecoSultants (see Figure 5-1 and previous Figure 3-1). The vegetation within this area has the potential to be retained as part of any development proposals within the site.

However, to clear the site's vegetation would meet the Area Criteria (under the Area Criteria, the clearing threshold for land containing a minimum lot size of 1 ha is 0.5 ha and the area of vegetation for any future proposal including building envelopes, APZs and access roads would exceed 0.5ha).

5.1.2 Preliminary Investigations under the Biodiversity Offset Scheme

Under the BOS, applications for development or clearing approvals must set out how impacts on biodiversity will be avoided and minimised. The BAM is then used to calculate an offset obligation (in biodiversity credits) for the remaining residual impacts. A preliminary assessment using the BAM has been undertaken. The full details of this assessment are provided in Appendix E. It is noted that further surveys will be undertaken to confirm absence or putrescence of candidate species.

Further, an investigation has been undertaken into whether the proposal would meet the avoidance and minimisation obligations under the BOS. The planning proposal seeks to amend the Port Stephens LEP 2013 to rezone the site from Zoned RU1 Primary Production and has a minimum lot size requirement of 40 hectare (ha). In order to facilitate the future subdivision of Lot 100, enabling the creation of seventeen (17) additional allotments, the minimum lot size map over the site needs to be amended to reflect a minimum lot size of 1ha.

An area of vegetation removal would be required under this scenario and the avoid and minimisation obligations would not be adequately satisfied.

It is concluded that the proposal would meet the avoidance and minimisation obligations under the BOS if the vegetation within the flood prone area is retained and enhanced (as mapped in Figure 3-3). Furthermore, retention of some of the hollow bearing trees can occur within the allotments.

5.1.3 Threatened Ecological Communities

The site contains two BC Act listed TEC, being:

- Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

5.1.4 Threatened Fauna Species

No threatened species, listed under the BC Act, were recorded on the site; however as demonstrated in Section 4, the site could potentially provide habitat for the following threatened fauna species:

- *Glossopsitta pusilla* (Little Lorikeet)
- *Lathamus discolour* (Swift Parrot)
- *Haliaeetus leucogaster* (White-bellied Sea-Eagle)
- *Falco subniger* (Black Falcon)
- *Lophoictinia isura* (Square-tailed Kite)
- *Circus assimilis* (Spotted Harrier)
- *Pomatostomus temporalis temporalis* (Grey-crowned Babbler (eastern subspecies))
- *Phascolarctos cinereus* (Koala)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii* subsp. *Oceanensis* (Eastern Bentwing-Bat)
- *Myotis Macropus* (Southern Myotis)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)

Woodland / Open Forest Birds

Black Falcon, White-bellied Sea-Eagle, Square-tailed Kite, Spotted Harrier, Little Lorikeet, Swift Parrot,

These species have not been recorded on site, and although the proposal will result in the minor loss of some areas of potential habitat, the majority of these birds are generally highly mobile species with large home ranges and therefore also forage over large areas.

The proposed development site would only constitute a very small proportion of the home ranges of these species.

Some species, such as the Little Lorikeet and Swift Parrot may occasionally use the site during the flowering of Eucalyptus gums. While the proposal may potentially result in the loss of less than approximately 11.8 ha of potential foraging habitat within the site, however, large areas of suitable habitat occurs approximately 3.2 km to the north-west and 4 km to the east of the site, ensuring that any local scale impacts from the vegetation removal would be unlikely to impact on populations of these wide ranging species.

Numerous hollow-bearing trees and potential roosting trees may be removed by the proposal which contain hollows suitable for a range of species including large birds and mammals, small birds and mammals, and microbats. There is scope to avoid and retain these trees. There is also scope for hollows to be salvaged and / or replaced by artificial nest boxes on site at a ratio of 1:1 which will reduce the impacts on these species and their prey species.

Overall it is not considered likely that any viable local populations of these species if they occur will be placed at risk of extinction.

Grey-crowned Babbler

This species has not been recorded within the site. However, any vegetated areas are likely to offer foraging habitat for this family group. The proposed rezoning of the site would involve the removal of potential habitat for this species.

The *NSW Scientific Committee - final determination for the Grey-crowned babbler (eastern subspecies) - vulnerable species listing* states that "Grey-crowned Babblers occupy open woodlands dominated by mature eucalypts, with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs. The species builds conspicuous dome-shaped nests and breeds co-operatively in sedentary family groups of 2-13 birds. Grey-crowned Babblers are insectivorous and forage in leaf litter and on bark of trees." Further it is identified that "Grey-crowned Babbler habitat has been disproportionately cleared for agriculture. Isolation of populations in scattered remnants is exacerbated by the apparent reluctance of birds to traverse tracts of cleared land."

Babbler groups' home ranges vary from 2-53 ha (Blakers et al. 1984) and increase with increasing group size (Counsilman 1977). Group size also appears to be related to habitat elements such as the amount of wooded cover and the type of ground layer (Department of Sustainability and Environment, 2003).

Size of home range does not therefore relate directly to size of group but is probably associated with the density of standing vegetation in the home range to which the Babblers largely confine their activities. For example, the two groups with the largest home ranges, studied by King (1980) which included home ranges between 38 to 53 hectares, both occupied areas that were largely cleared of tall vegetation and moved among widely scattered individual or clumps of trees and shrubs.

As stated within the scientific literature (e.g. Department of Sustainability and Environment, 2003) minimum home ranges for the Grey-crowned Babbler appear to be greater than 2 hectares. Therefore, the site is only likely to offer a portion of a larger home range of this family group. Suitable and occupied habitat for the species was found to occur in the wider locality.

Grey-crowned Babblers are relatively common within the wider locality and are able to persist within rural residential areas and therefore there is some potential that local populations could survive within the future development of the site provided that there is sufficient green open space and vegetation is retained/replanted within larger lots. There are a number of recorded populations and records of Grey-crowned Babbler's on the Atlas of NSW Wildlife (BioNET) in the Maitland, Port Stephens and Cessnock LGAs including within the townships of Thornton, Berry Park, Black Hill, Brandy Hill, Seaham, Wallalong, Tocal and Paterson.

It is unlikely that the loss of some potential habitat within the site would result in a significant impact for the species, especially as there is scope to mitigate any impacts, by retention of vegetation within future allotments within the larger lots.

P. cinereus (Koala)

Koala Feed Tree species *E. tereticornis* (Forest Red Gum) listed in Appendix 8 of the PSC CKPoM, was recorded within the site. No direct or indirect evidence of *P. cinereus* (Koala) was recorded on the site, during the targeted survey. All potential feed trees were inspected for *P. cinereus* (Koala) scats and/or large scratches. A search of OEH Atlas of NSW Wildlife database indicated that there are numerous records of *P. cinereus* (Koala) within 10 km of the site, the most recent record being from 2018 approximately 1 km to the west of the site. There are no known resident populations of *P. cinereus* (Koala) in the area. The potential loss of habitat within the site is unlikely to have a significant impact on *P. cinereus* (Koala) because the area surrounding Seaham is already predominantly cleared for agricultural and residential purposes. Large areas of suitable habitat for the Koala occurs approximately 3.2 km to the north-west and 4 km to the east of the site, ensuring that any local scale impacts from the vegetation removal would be unlikely to impact on the local population. Furthermore, there is scope to retain and / or replace Koala feed trees within the site. No additional threats to the Koala, such as from severing of wildlife corridor or dog attack would be introduced or exacerbated by the proposed development.

Microchiropteran Bats – *M. norfolkensis* (Eastern Freetail-bat), *F. tasmaniensis* (Eastern False Pipistrelle), *M. australis* (Little Bentwing Bat), *M. schreibersii* ssp. *oceanensis* (Eastern Bentwing Bat), *M. macropus* (Southern Myotis), *S. rueppellii* (Greater Broad-nosed Bat), *and C. dwyeri* (Large-eared Pied Bat)

These species are highly mobile and known to travel large distances to forage. They generally forage in structurally open and associated edge habitat and roost in trees

containing hollows, or (in the case of *M. schreibersii oceanensis* (Eastern Bentwing-bat), *M. macropus* (Southern Myotis), *V. troughtoni* (Eastern Cave Bat) *C. dwyeri* (Large-eared Pied Bat)), caves or similar structures. The site and wider study area contains a mixture of suitable foraging habitats for microbats (including forested habitat, structurally open/edge habitat and aquatic habitat).

M. australis (Little Bentwing Bat) forages over a wide range of habitats. The proposed rezoning of the site is unlikely to significantly impact on the local population that is using the site for foraging purposes, as the area to be impacted would only make up a small proportion of this foraging area. No potential roost sites occur on the site. Any future rezoning of the wider study area has the potential to result in a reduced use of the area by *M. australis* (Little Bentwing Bat). This species congregates at maternity colonies and then disperse during non-breeding times; therefore, it would be unlikely that the loss of this area would result in the extinction of the 'local' population, however it could contribute to a cumulative loss of foraging habitat over the species range. There would be scope to mitigate such an impact, by retention of vegetation within the larger allotments of the site.

M. norfolkensis (Eastern Freetail-bat) may forage and roost in the wider study area, suitable hollows also occur within the site. There are also buildings such as old dwellings and sheds which may provide suitable roost habitat. It is unlikely that the loss of some trees within the e site would result in a significant impact for the species. There would be scope to mitigate any impacts, by incorporating retention and enhancement of vegetation within the site.

5.2 Consideration of the NSW Office of Water Guidelines

A 1st order watercourse runs through the western part of the site. In accordance with the Office of Water (2012) Guidelines for Riparian Corridors on Waterfront Land, this watercourse would require a vegetated riparian zone (VRZ) of 10 m on each side. As indicted in previous Figure 3-1, the proposed development footprint would remain external to the VRZ.

5.3 Strategic planning guidelines

The land is currently zoned RU1 Primary Production under the Port Stephens LEP 2013. There are three primary planning guidelines applicable to the site, being the *Lower Hunter Regional Strategy 2006-2031*, the *Port Stephens Planning Strategy 2011-2036* and the Port Stephens CKPoM (PSC, 2002).

5.3.1 Lower Hunter Regional Strategy 2006-2031

The site is located outside of the Watalgan to Stockton Green Corridor, identified in the *Lower Hunter Regional Strategy* (LHRS) *Map* (Department of Planning, 2006). The LHRS Map identifies that the site occurs in an area mapped as 'Rural Land & Environmental Assets'. The site does not occur within a 'Proposed Urban Area'; however, the LHRS makes provision for consideration of the release of land for urban development, not currently identified in the LHRS, if the proposal satisfies certain specified Sustainability Criteria (in Appendix 1 of the LHRS). Assessment of the proposal against the specific Sustainability Criteria that are relevant to this ecological assessment is provided in Table 5-2.

Table 5-1: Assessment of the Proposal against the LHRS Sustainability Criteria

LHRS Sustainability Criteria relevant to this ecological assessment	Measurable explanation of criteria	Response

6. Natural Resources
Natural resource limits not exceeded / environmental footprint minimised
	• Demand for water within infrastructure capacity to supply water and does not place unacceptable pressure on environmental flows.
	• Demonstrates most efficient/suitable use of land:
	  ○ avoids identified significant agricultural land
	  ○ Avoids productive resource lands — extractive industries, coal, gas and other mining, and quarrying.
	• Demand for energy does not place unacceptable pressure on infrastructure capacity to supply energy — requires demonstration of efficient and sustainable supply solution.
		• Future subdivision of the site would require minimal infrastructure upgrades; Hunter Water Corporation (HWC) has indicated that there is sufficient capacity in the existing reticulated water, to service the additional lots and Ausrgid has confirmed in writing, that electricity is readily available in the Seaham area, with low and high voltage lines adjacent to the site.
		• The site is not within identified significant agricultural land or any productive resource lands (for extractive industries, coal, gas and other mining, and quarrying).

7. Environmental Protection Protect and enhance biodiversity, air quality, heritage and waterway health	• Consistent with Government-approved Regional Conservation Plan (if available). • Maintains or improves areas of regionally significant terrestrial and aquatic biodiversity (as mapped and agreed by DEC). This includes regionally significant vegetation communities, critical habitat, threatened species, populations, ecological communities and their habitats. • Maintain or improve existing environmental condition for air quality. • Maintain or improve existing environmental condition for water quality: > consistent with community water quality objectives for recreational water use and river health (DEC and CMA) > consistent with catchment and stormwater management planning (CMA and council). • Protects areas of Aboriginal cultural heritage value (as agreed by DEC).	• The Lower Hunter Regional Conservation Plan (LHRCP) is a partner document to the LHRS. The LHRCP identifies regional conservation priorities for the Port Stephens LGA. The site is not mapped as containing any 'high priority regional conservation areas' (i.e. areas prioritised for new formal conservation reserves) (see Map 2 in the LHRCP). • Development controls and/or design features to minimise impacts on threatened species habitats could be established through subsequent development assessment processes, post gateway determination. For instance, future development controls may be put in place, to avoid or minimise removal of hollow-bearing trees and Preferred Koala Habitat. • The proposal would not affect areas of Aboriginal cultural heritage value.

5.3.2 Port Stephens Planning Strategy 2011-2036

The site is located Rural West area of the LGA. Population projections for the Rural West area indicates that the population will increase from 5,225 people in 2009 to 6,203 people in 2031. It is considered that the proposal would support this anticipated population growth and respond to housing demand, whilst ensuring future protection of the high ecological values identified at the rear of the lot.

5.3.3 Port Stephens Comprehensive Koala Plan of Management

PSC (2002) has prepared the Port Stephens CKPoM in accordance with SEPP 44. Rather than assessing the presence of 'potential' or 'core' Koala habitat, as defined under SEPP 44, the Performance Criteria for Re-zoning Requests / Development Applications, in the Port Stephens CKPoM (PSC, 2002) must be addressed.

Assessment of the proposal against the Performance Criteria for Re-zonings, is provided in Table 5-3.

Table 5-2: Assessment of the Proposal against the Port Stephens CKPoM Performance Criteria for Re-zoning Requests

Performance Criteria **Council should be satisfied that the rezoning would:**	**Response**
a) Not result in development within areas of Preferred Koala Habitat or defined Habitat Buffers;	As detailed in Section 3.3.2, a portion of the site contains Preferred Koala Habitat and defined Habitat Buffers. Further development controls may be put in place to ensure that these areas are protected, under future development scenarios.
b) Allow for only low impact development within areas of Supplementary Koala Habitat and Habitat Linking Areas;	As detailed in Section 3.3.2, a portion of the site contains Habitat Linking Areas. Further development controls may be put in place to ensure that these areas are protected, under future development scenarios.
c) Minimise the removal of any individuals of preferred koala food trees, where ever they occur on the site; and	Further development controls may be put in place to ensure that the removal of any Preferred Koala Feed Trees is minimised.
d) Not result in development which would sever koala movement across the site. This should include consideration of the need for maximising tree retention on the site generally and for minimising the likelihood of impediments to safe/unrestricted koala movement.	Further development controls may be put in place to ensure that the retention of trees in areas that facilitate koala movement across the site.
Conclusion: the proposal would meet the Port Stephens CKPoM Performance Criteria for Rezoning Requests.	

5.3.4 Addressing the Port Stephens Council Tree Technical Specification

The PSC *Tree Technical Specification September 2014* provides guidance for the retention and removal of trees, including the replacement planting ratios for *P. cinereus* (Koala) feed trees. 95 *Eucalyptus tereticornis* occur on site. The prescribed replacement ratios are provided in Table 5-3 and the maximum number of trees that may need to be replaced is provided in Table 5-4.

Table 5-3: Koala Feed Tree Replacement Ratios

Koala feed tree size class (DBH)	Replacement ratio (loss:gain)
<100 mm	1:6
100-300 mm	1:8
>300 mm	1.10

Table 5-4: Koala Feed Trees to be replaced in accordance with PSC Tree Technical Specification

Species	No. trees to be Replaced (1:6)	No. trees to be Replaced (1:8)	No. trees to be Replaced (1:10)	Total
No. of E. tereticornis on site	7	45	43	**95**
Total No. of *E. tereticornis* that may be replaced	42	360	430	**832**

Disclaimer: The above table describes the replacement for all Koala feed trees within the site. However, it is highly unlikely that all Koala feed trees within the site would require removal.

5.4 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act focuses Commonwealth interests on MNES. The MNES identified in the EPBC Act, which require assessment and approval by the Commonwealth, include:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of International Importance (declared Ramsar wetlands);
- Listed threatened species and ecological communities;
- Listed migratory species;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park;
- Nuclear actions
- a water resource, in relation to coal seam gas development and large coal mining development.

The assessment and approval process apply to any action that has, will have, or is likely to have, a significant impact on MNES. The MNES and study area-specific responses are as follows.

World Heritage Properties

The study area is not a World Heritage area and is not in close proximity to any such area.

National Heritage Places

The study area is not part of a National Heritage Place and is not in close proximity to any such area.

Wetlands of International Importance

The site is not part of a Ramsar wetland and is not in close proximity to any such area.

Listed Threatened Species and Ecological Communities

No EECs listed under the EPBC Act occur in the site. No threatened species were recorded on the site; however, as detailed in Section 5.1, a number of threatened species have the potential to occur in the site. Of these, the following are listed under the EPBC Act:

- *Lathamus discolour* (Swift Parrot)
- *Phascolarctos cinereus* (Koala)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)

5.4.1 Critically endangered and endangered species - significant impact criteria

An assessment is conducted in accordance with the Significant Impact Criteria defined in the *Matters of National Environmental Significance Significant impact guidelines 1.1 – Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013).

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

- lead to a long-term decrease in the size of a population
- reduce the area of occupancy of the species
- fragment an existing population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of a population
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a critically endangered or
- endangered species becoming established in the endangered or critically endangered species' habitat
- introduce disease that may cause the species to decline, or
- interfere with the recovery of the species.

The Swift Parrot is listed as critically endangered under the EPBC Act. This species could potentially occur on the site during autumn and winter due to suitable foraging resources such as winter-flowering eucalypts. The potential removal of approximately 10.7 hectares of Lower Hunter Spotted Gum – Ironbark Forest and 1.1 hectares of Swamp Oak Sedge Forest is considered to be a relatively minor impact on these migratory / nomadic bird species, particularly given that there is scope to retain many of these trees within the site. This species breeds in Tasmania; therefore, the site provides potential foraging and roosting habitat only.

Based on a review of the above listed significant impact criteria it is considered unlikely that the Swift Parrot would be significantly impacted upon by the proposed development. None of the criteria would be triggered or impacted upon by the proposed development.

5.4.2 Vulnerable species - significant impact criteria

An assessment is conducted in accordance with the Significant Impact Criteria defined in the Matters of National Environmental Significance Significant impact guidelines 1.1 – Environment Protection and Biodiversity Conservation Act 1999 (DoE 2013).

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

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of an important population

- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

Large-eared Pied Bat

The site contains areas of potential foraging habitat and therefore it is considered that this species may occur on a seasonal basis. The species is found mainly in areas with extensive cliffs and caves where it roosts in caves (near their entrances), crevices in cliffs, and old mine workings. It is generally rare with a very patchy distribution in NSW. There are scattered records from the Hunter region. The proposed development may result in the partial removal of approximately 10.7 hectares of Lower Hunter Spotted Gum – Ironbark Forest and 1.1 hectares of Swamp Oak Sedge Forest, both of which are highly modified. The area surrounding Seaham is already predominantly cleared for agricultural and residential purposes. Large areas of suitable habitat for the Large-eared Pied Bat occurs approximately 3.2 km to the north-west and 4 km to the east of the site, ensuring that any local scale impacts from the vegetation removal would be unlikely to impact on the local population.

Based on a review of the above listed significant impact criteria it is considered unlikely that the proposal would have a significant impact on the Large-eared Pied Bat. None of the criteria would be triggered or impacted upon by the proposed development.

Koala

Targeted surveys for the current study failed to identify the presence of Koalas on the site through direct or indirect evidence (i.e. characteristic scratch marks on trees). The proposed development would result in the removal of approximately 10.7 hectares of Lower Hunter Spotted Gum – Ironbark Forest and 1.1 hectares of Swamp Oak Sedge Forest, both of which are highly modified. The area surrounding Seaham is already predominantly cleared for agricultural and residential purposes. Large areas of suitable habitat for the Koala occurs approximately 3.2 km to the north-west and 4 km to the east of the site, ensuring that any local scale impacts from the vegetation removal would be unlikely to impact on the local population. Furthermore, there is scope to retain and / or replace Kola feed trees within the site. No additional threats to the Koala, such as from severing of wildlife corridor or dog attack would be introduced or exacerbated by the proposed development.

An assessment under the *EPBC Act Referral Guidelines for the Vulnerable Koala* (Commonwealth of Australia, 2014) has been undertaken for the proposal. These guidelines encourage the assessment of significant impacts on the *P. cinereus* (Koala), through the assessment of habitat critical to the survival of *P. cinereus* (Koala) and actions that interfere substantially with the recovery of *P. cinereus* (Koala). The Koala Habitat Assessment Tool (Table 4 of Commonwealth of Australia, (2014)) was utilised and it was determined that the site's vegetation does not constitute as 'critical koala habitat', as defined under the EPBC act (see Table 5-5); The proposal is therefore unlikely to require referral under the EPBC act.

Based on a review of the above listed significant impact criteria it is considered unlikely that the proposal would have a significant impact of any potential Koala populations. None of the criteria would be triggered or impacted upon by the proposed development.

Table 5-5: Assessment of the Koala using the Koala Habitat Assessment Tool in EPBC Act Referral Guidelines for the Vulnerable Koala (Commonwealth of Australia, 2014).

Attribute	Score	Habitat Appraisal	
Koala Occurrence	+2 (high) Evidence of one or more koalas within the last 2 years.	Desktop	A search of the Atlas of NSW Wildlife database (NSW BioNet) indicated that a high number of records of *P. cinereus* (Koala) occur within a 10 km radius of the site. The most recent of these was a sighting in 2018, approximately 1 km west of the site.
		On Ground	Surveys conducted by Firebird Eco (2018) found no evidence of *P. cinereus* (Koala) on the site.
Vegetation Composition	+1 (medium) Has forest or woodland with only 1 species of known koala food tree species	Desktop	Mapped by LHCCREMS 2003 as Lower Hunter Spotted Gum - Ironbark Forest and River-flat Eucalypt Forest that consist of Koala feed tree species; *E. tereticornis* (Red Forest Gum).
		On Ground	One species of koala feed tree, being *E. tereticornis* (Red Forest Gum) (as defined in schedule 2 of SEPP 44), was recorded in the site.
Habitat Connectivity	0 (low) Area is not part of a contiguous landscape	The area is not part of a contiguous landscape	
Key Existing Threats	+1 (medium) Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence	The site is adjacent to a road and is thus considered to have some degree of vehicle strike threat present. Surrounding land owners may also keep dogs.	
Recovery Value	+0 (low) Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context.	Due to the site not being part of a contiguous landscape and the level of threats present the habitat is considered unlikely to be important for the recovery of the koala.	
Total	**4**	**The site does not contain habitat critical to the survival of the koala**	

Listed Migratory Species

Several listed migratory species may occur in the area. In particular, the site's wetland may provide habitat for migratory wetland species.

Commonwealth Marine Area

The study area is not part of a Commonwealth marine area and is not in close proximity to any such area.

The Great Barrier Reef Marine Park

N/A

Nuclear Actions

N/A

A water resource, in relation to coal seam gas development and large coal mining development.

N/A

5.4.3 EPBC Act Assessment Conclusion

The MNES potentially applicable to the site include three threatened fauna species and several migratory species. Should a decision be made at the "gateway" to proceed with the preparation of a planning proposal, further ecological studies should be undertaken to determine the likely presence of the aforementioned species and to provide a more detailed impact assessment of potential development scenarios.

6 AVOIDANCE, MINIMISATION AND OFFSETTING OF IMPACTS

6.1 Description of Impacts

It is considered that the proposal would have potential direct and indirect impacts on flora and fauna, as summarised below.

6.1.1 Potential Direct Impacts

Removal of native vegetation and habitat

A total of 10.7 ha of LHSGIF and 1.1 ha of Swamp Oak Sedge Forest occurs within the site (see previous Figure 3-1). There are also 95 Koala feed trees within the site (see previous Figure 3-3). These trees are predominantly old growth senescent trees and occur within two EECs, being;

Lower Hunter Spotted Gum - Ironbark Forest (LHSGIF) in the Sydney Basin Bioregion occurs within the site and is listed as an EEC under the TSC Act. Swamp Oak Sedge Forest occurs within the site and is commensurate with River-Flat Eucalypt Forest on Coastal Floodplain of the NSW North Coast, Sydney Basin and South East Corner Bioregions which is also listed as an EEC under the TSC Act. See Figure 3-1 for the distribution of EECs on the site. Part of this vegetation may be removed; although selected trees within APZs could be retained, and all trees outside of APZs would be retained.

Overall, there are two-hundred and sixty-eight hollow-bearing trees counted within the site, each containing multiple hollows that are suitable for a wide range of potentially occurring species.

See previous Figure 3-2 for an indication of the distribution of hollow-bearing trees within the site.

Risk of runoff, erosion and sedimentation, during construction

There would be risk of runoff, erosion and sedimentation, during construction. Further, accidental leaks/spills of oil, fuel, cement or other substances, could pollute downstream surface waters.

Temporary noise, dust, light and vibration disturbance, during construction work

Impacts of noise, dust, light and vibration upon fauna are difficult to predict. Potential impacts may include effects on predator-prey interactions and changes to mating and nesting behaviour.

6.1.2 Potential Indirect Impacts:

Long-term Hydrological changes

There would be an increase in stormwater runoff, from non-permeable roof surfaces. The proposal includes stormwater management infrastructure to address this, including a drainage basin.

Long-term Increase in artificial light

The proposal would lead to a long-term increase in artificial light. Impacts from this are difficult to predict, but may include effects on predator-prey interactions and changes to mating and nesting behaviour.

Edge Effects

While the site's vegetation is already exposed to edge effects, the proposal would subject new areas of vegetation to these effects. Edge vegetation is more impacted by wind and has more sunlight penetration, changing its characteristics compared to intact native vegetation.

6.2 Avoidance of Impacts

The proposed development footprint should be designed to avoid the majority of the site's older growth vegetation and hollow-bearing trees, which predominantly occurs within the site's LHSGIF (which is an EEC) in the centre of the site (refer to previous Figure 3-2). Overall, there are two-hundred and sixty-eight hollow-bearing trees counted within the site, each containing multiple hollows that are suitable for a wide range of potentially occurring species. See previous Figure 3-2 for an indication of the distribution of hollow-bearing trees within the site.

A 1st order watercourse runs through the western part of the site. In accordance with the Office of Water (2012) *Guidelines for Riparian Corridors on Waterfront Land*, this watercourse would require a vegetated riparian zone (VRZ) of 10 m on each side. As indicted in previous Figure 3-1, the proposed development footprint would remain external to the VRZ.

Overall, it is considered that the proposal can be designed in a sensitive way that would avoid removal of the site's most important areas of native vegetation and habitat.

6.3 Minimisation / Mitigation of Impacts

There is potentially scope for a Vegetation Management Plan (VMP) to be prepared for the site, and would be reviewed and approved by Council prior to the issuing of the construction certificate. This VMP would include measures to be implemented in the pre-construction, construction and post-construction phases. It is considered that these measures would serve to minimise any potential direct or indirect ecological impacts.

6.4 Offsetting of Impacts

Overall, there are two-hundred and sixty-eight hollow-bearing trees counted within the site, each containing multiple hollows that are suitable for a wide range of potentially occurring species. There are also 95 Koala feed trees within the site. These trees are predominantly old growth senescent trees and occur within two TECs, being;

Lower Hunter Spotted Gum - Ironbark Forest (LHSGIF) in the Sydney Basin Bioregion occurs within the site and is listed as an EEC under the TSC Act. Swamp Oak Sedge Forest occurs within the site and is commensurate with River-Flat Eucalypt Forest on Coastal Floodplain of the NSW North Coast, Sydney Basin and South East Corner Bioregions which is also listed as an EEC under the TSC Act. See Figure 3-1 for the distribution of EECs on the site.

As discussed in previous Section 6.3, a VMP could be prepared for the site, and would be reviewed and approved by Council prior to the issuing of the construction certificate. This VMP would include the mitigation / offset measures. Such measures would include (but not be limited to) the installation, monitoring and maintenance of nest boxes, periodic weed control and supplementary plantings of indigenous flora where required, within the conserved areas. The VMP would aim to significantly improve the condition and conservation value any retained vegetation / habitat within the site.

7 CONCLUSION & RECOMMENDATIONS

This assessment has identified important biodiversity values on the site (such as an abundance of large, hollow-bearing trees, two TECs and potential habitat for threatened fauna species). Development controls and/or design features to minimise impacts on threatened species habitats could be established through subsequent development assessment processes, post gateway determination. For instance, future developments may be designed to avoid or minimise removal of hollow-bearing trees and Preferred Koala Habitat.

It is also concluded that compliance with the relevant planning strategies (the *Lower Hunter Regional Strategy 2006-31*, the *Port Stephens Planning Strategy 2011-2036* and the Port Stephens CKPoM) can be achieved on site.

It is considered that the proposal would remove greater than 0.5 hectares of native vegetation, thus triggering the biodiversity offsets scheme under the *Biodiversity Conservation Act* 2016. Should a decision be made at the "gateway" to proceed with the preparation of a planning proposal, further ecological studies should be undertaken to provide a more detailed assessment of potential development scenarios, in accordance with the BC Act, which would include the required offsets and liabilities.

The baseline ecological investigations outlined therein are considered to provide a sufficient level of detail to justify a decision being made at the "gateway" regarding the proposal. The proposal to rezone the site to pave way for future residential development it is considered to have minimal ecological impacts; although assessment under the BAM assessment and offsetting under the BC Act would be required, particularly as some of the site's EEC would be removed. Should the decision by the NSW Government be supportive, further ecological studies should be undertaken to ensure compliance with the relevant survey and assessment guidelines, and any other requirements by PSC, Department of Planning & Environment and OEH, as part of the gateway determination / consultation process.

8 BIBLIOGRAPHY

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APPENDIX A SITE MAPS

PROPOSED REZONING

LOT 100 DP 1064980
No.792 SEAHAM ROAD, SEAHAM

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SHEET SCHEDULE

LE MOTTEE GROUP
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STRATA CERTIFICATION | ECOLOGY | BUSHFIRE ASSESSMENT
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P: 4987 1748

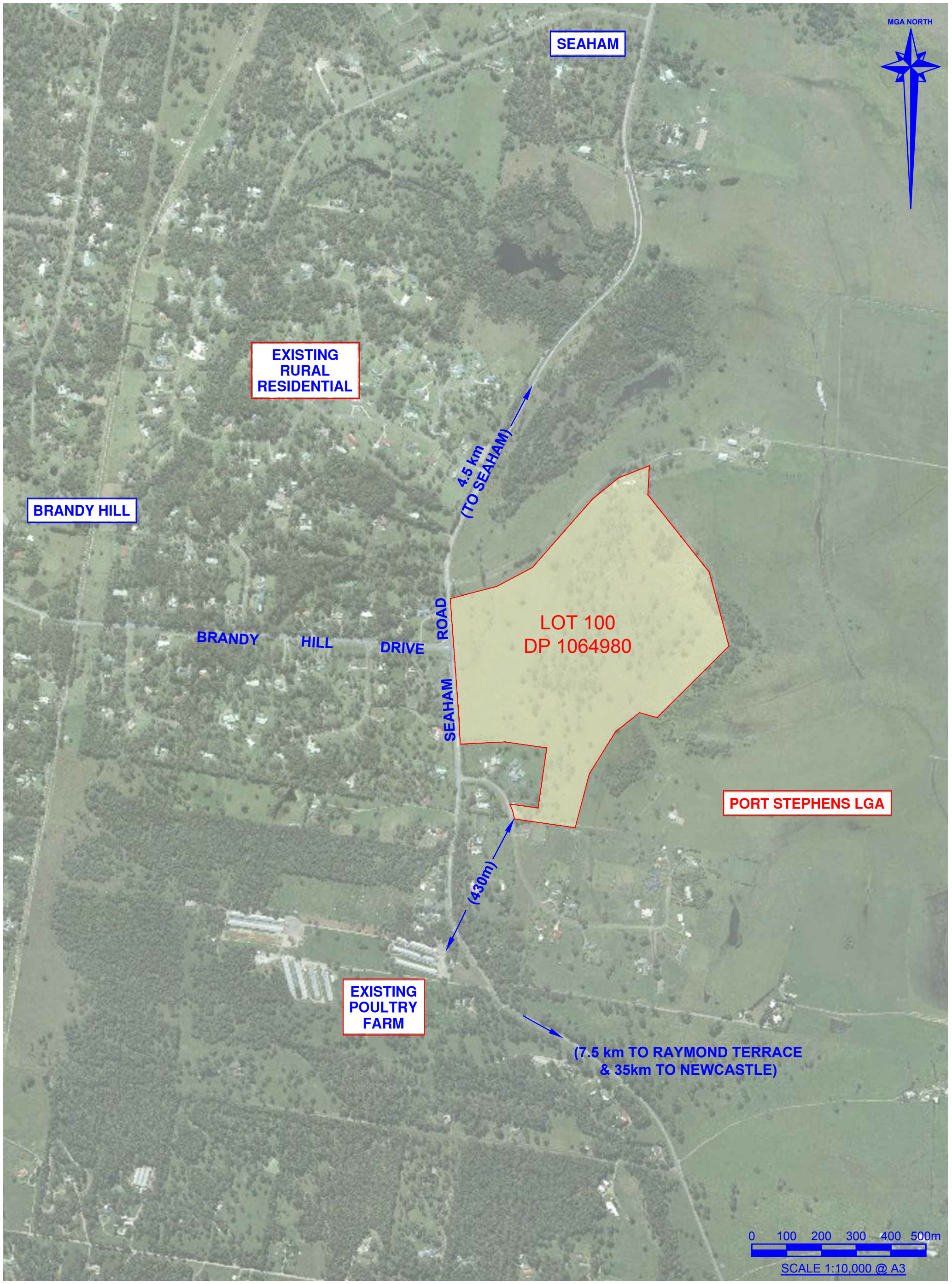
reception@lemottee.com
ABN 38 136 535 153

Technical Details:
Azimuth -
Origin -
Easting -
Northing -
Datum -
Origin -
R.L. -
Contour Int. -

Surveyed
Drafted
Checked

Title COVERSHEET
Client STATHAM
Site Lot 100 DP 1064980 - No. 792 SEAHAM ROAD
Locality SEAHAM LGA PORT STEPHENS

Our Ref: 6182 REZ-V1
Sheet No. 0 of 8
Original Size A3



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Drafted PDM 5/7/17
Checked AJM

Title SITE ANALYSIS LOCALITY PLAN
Client STATHAM
Site Lot 100 DP 1064980 - No. 792 SEAHAM ROAD
Locality SEAHAM LGA PORT STEPHENS

Our Ref: 6182 REZ-V1
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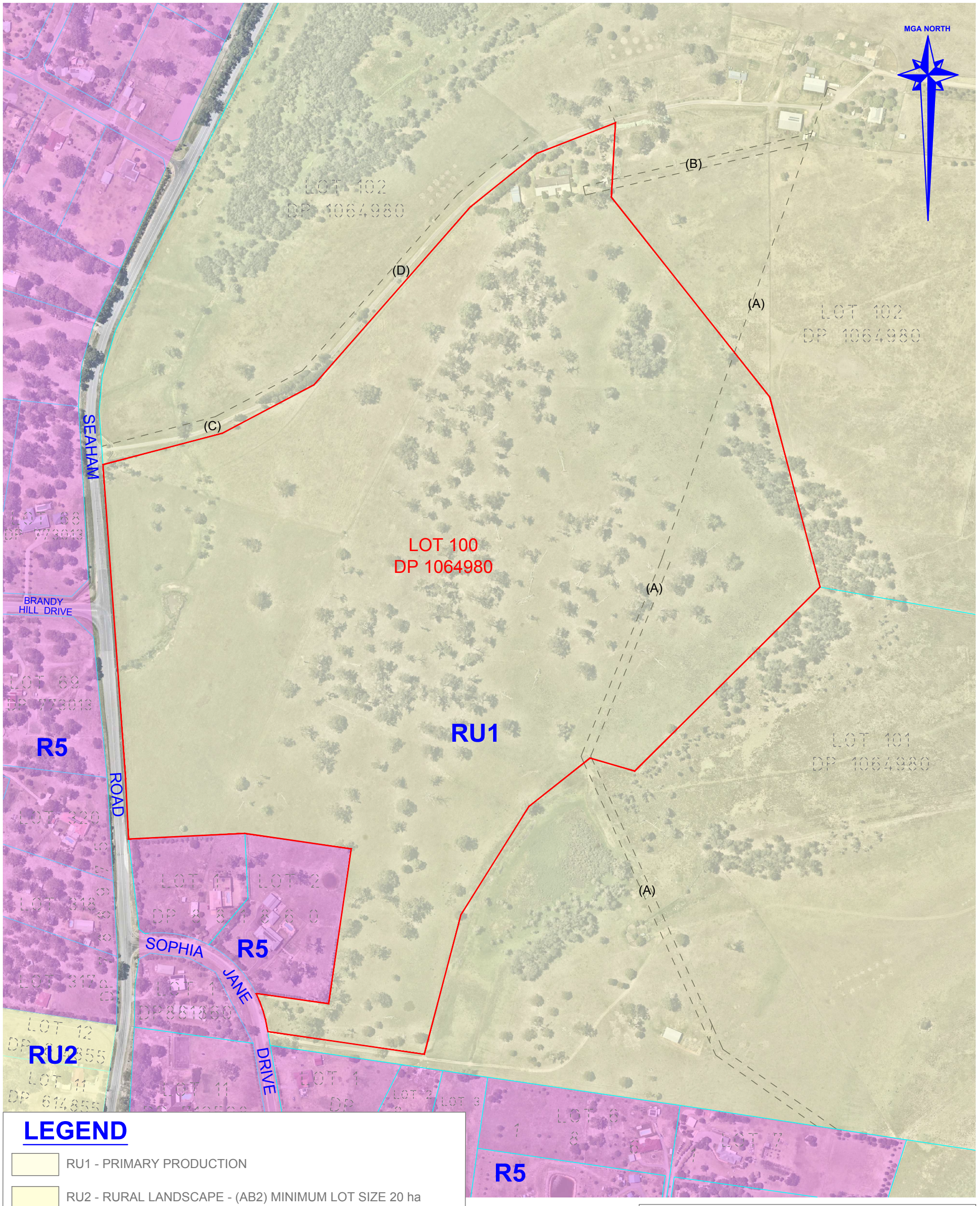

LEGEND

- RU1 - PRIMARY PRODUCTION
- RU2 - RURAL LANDSCAPE - (AB2) MINIMUM LOT SIZE 20 ha
- R5 - RESIDENTIAL - LARGE LOT

(A) EASEMENT FOR TRANSMISSION LINE 10 WIDE (DP 810145)
(B) EASEMENT FOR ELECTRICITY PURPOSES 10 WIDE (DP 1064980)
(C) RIGHT OF CARRIAGEWAY 20 WIDE (DP 1064980)
(D) POSITIVE COVENANT (DP 1064980)

NOTES - GENERAL

1. Maps obtained from Port Stephens Shire Council LEP 2013, and are indicative only

0 50 100 150 200 250m

SCALE 1:4000 @ A3

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Northing -
Datum -
Origin -
R.L. -
Contour Int. -

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Drafted PDM 5/7/17
Checked AJM

Title SITE ANALYSIS
SUBJECT LAND & ZONING
Client STATHAM
Site Lot 100 DP 1064980 - No. 792 SEAHAM ROAD
Locality SEAHAM LGA PORT STEPHENS

Our Ref: 6182 REZ-V1
Sheet No. 2 of 8
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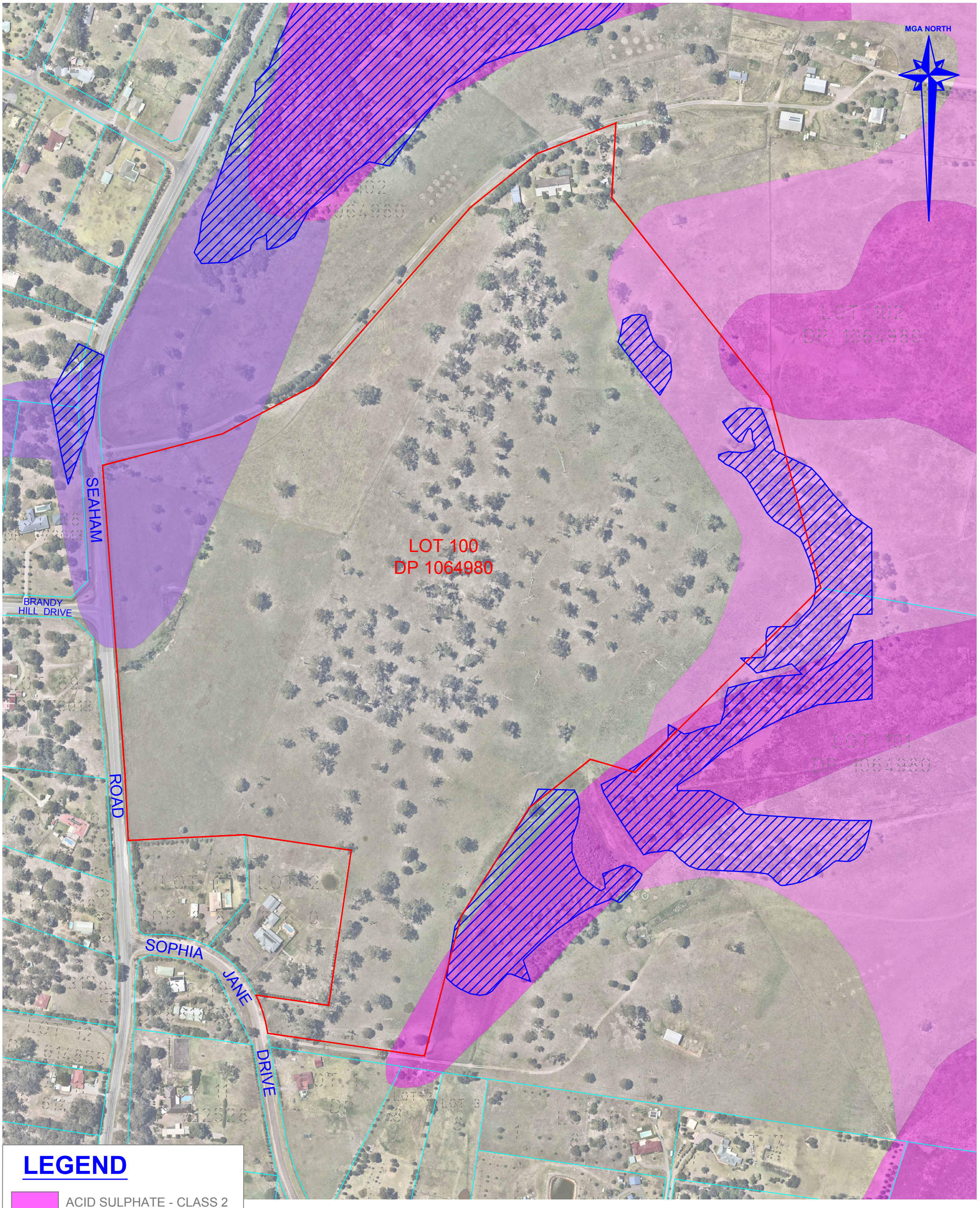

LEGEND

- ACID SULPHATE - CLASS 2
- ACID SULPHATE - CLASS 3
- ACID SULPHATE - CLASS 4
- WETLANDS

NOTES - GENERAL

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Contour Int. -

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Drafted
PDM 5/7/17

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Title: SITE ANALYSIS
WETLANDS & ACID SULPHATE

Client: STATHAM

Site: Lot 100 DP 1064980 - No. 792 SEAHAM ROAD

Locality: SEAHAM LGA: PORT STEPHENS

Our Ref:
6182 REZ-V1

Sheet No.
3 of 8

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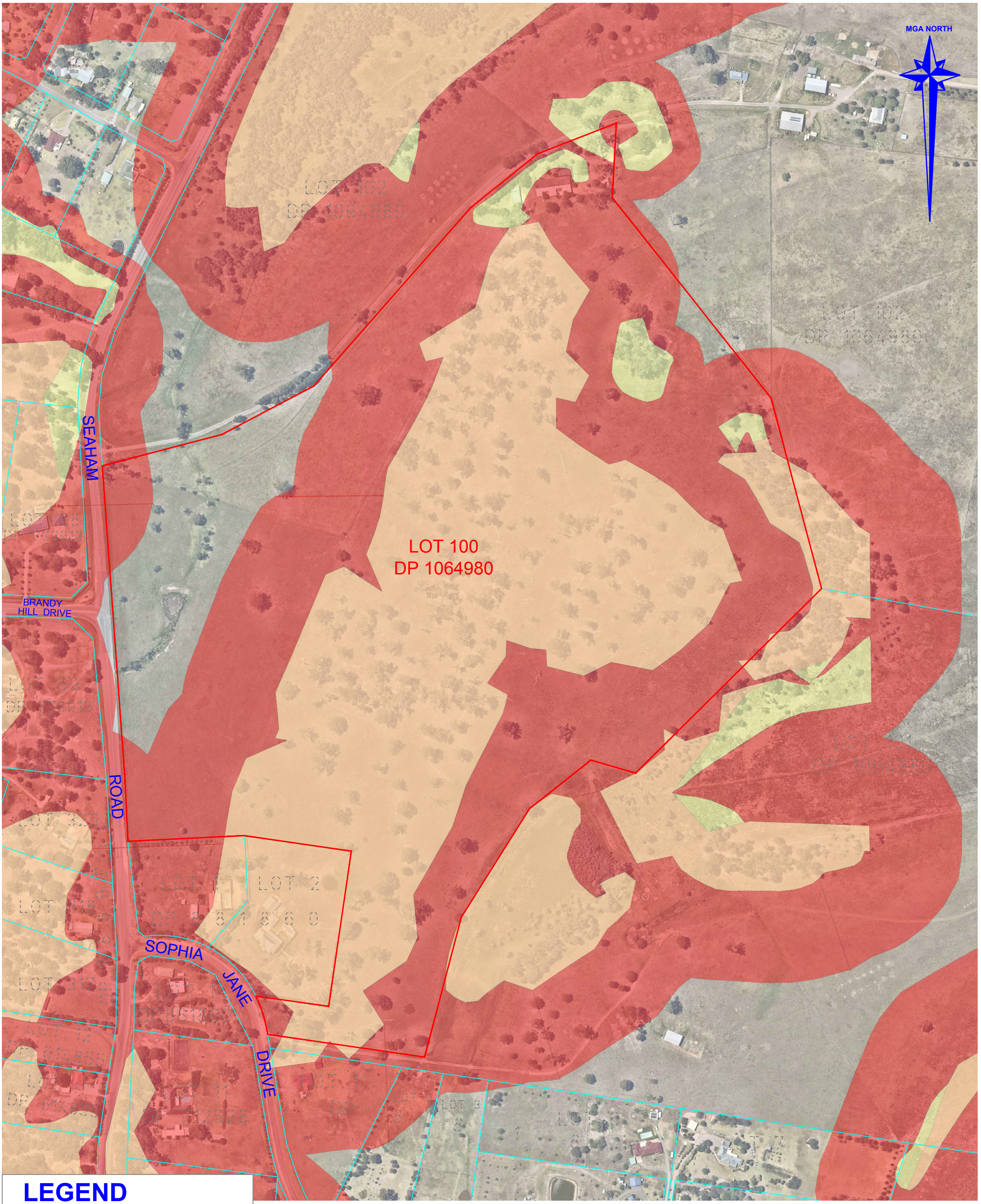

LEGEND

- BUSHFIRE PRONE LAND - VEGETATION CATEGORY 1
- BUSHFIRE PRONE LAND - VEGETATION CATEGORY 2
- BUSHFIRE PRONE LAND - VEGETATION BUFFER (100m & 30m)

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Title SITE ANALYSIS
BUSHFIRE & FLOOD PRONE LAND
Client STATHAM
Site Lot 100 DP 1064980 - No. 792 SEAHAM ROAD
Locality SEAHAM LGA PORT STEPHENS

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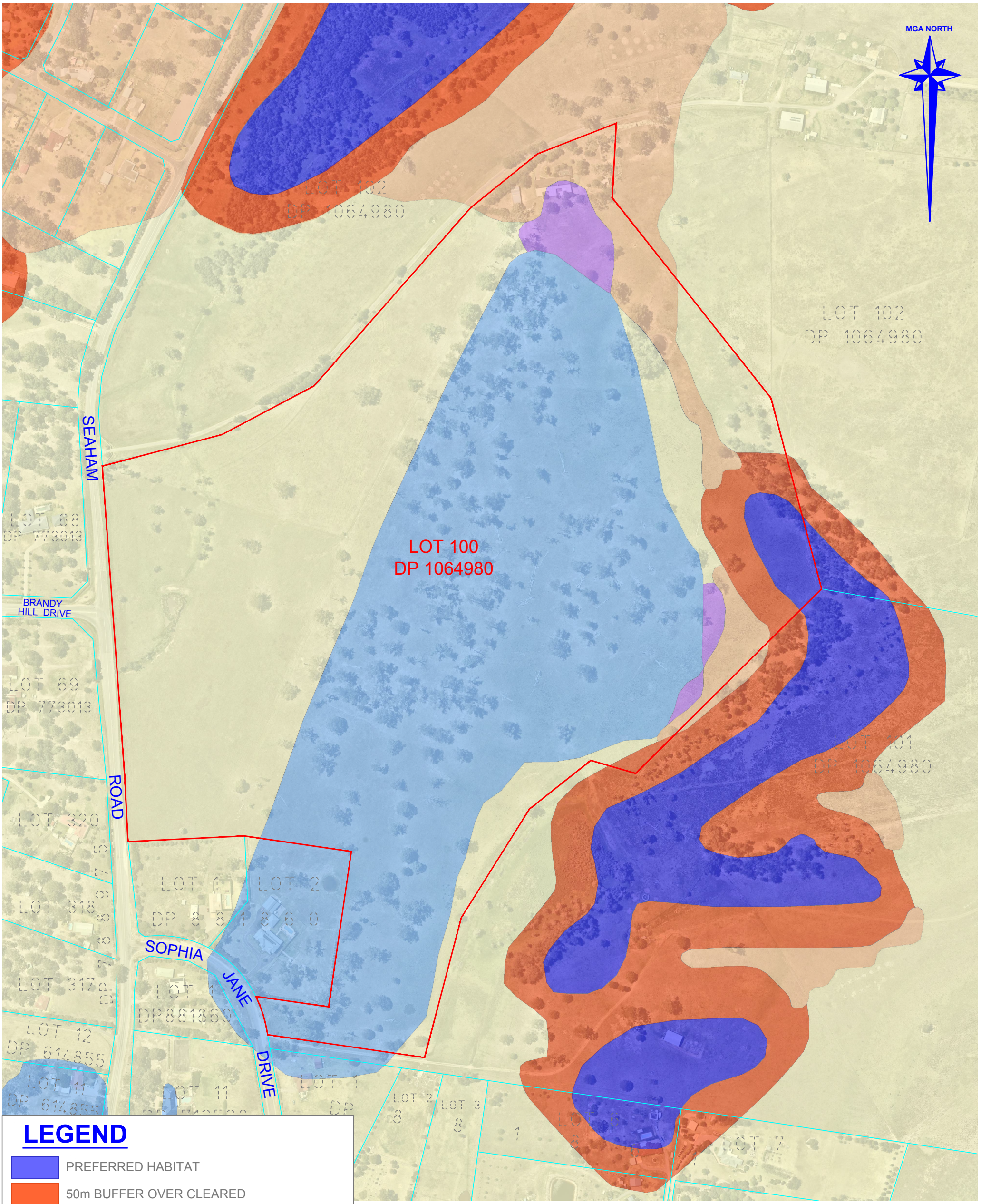

LEGEND

- PREFERRED HABITAT
- 50m BUFFER OVER CLEARED
- LINK OVER CLEARED LAND
- MAINLY CLEARED
- MARGINAL KOALA HABITAT
- PREFERRED LINK OVER MARGINAL HABITAT

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Title: SITE ANALYSIS
KOALA HABITAT & BUFFER ZONES

Client: STATHAM

Site: Lot 100 DP 1064980 - No. 792 SEAHAM ROAD

Locality: SEAHAM LGA: PORT STEPHENS

Our Ref: 6182 REZ-V1

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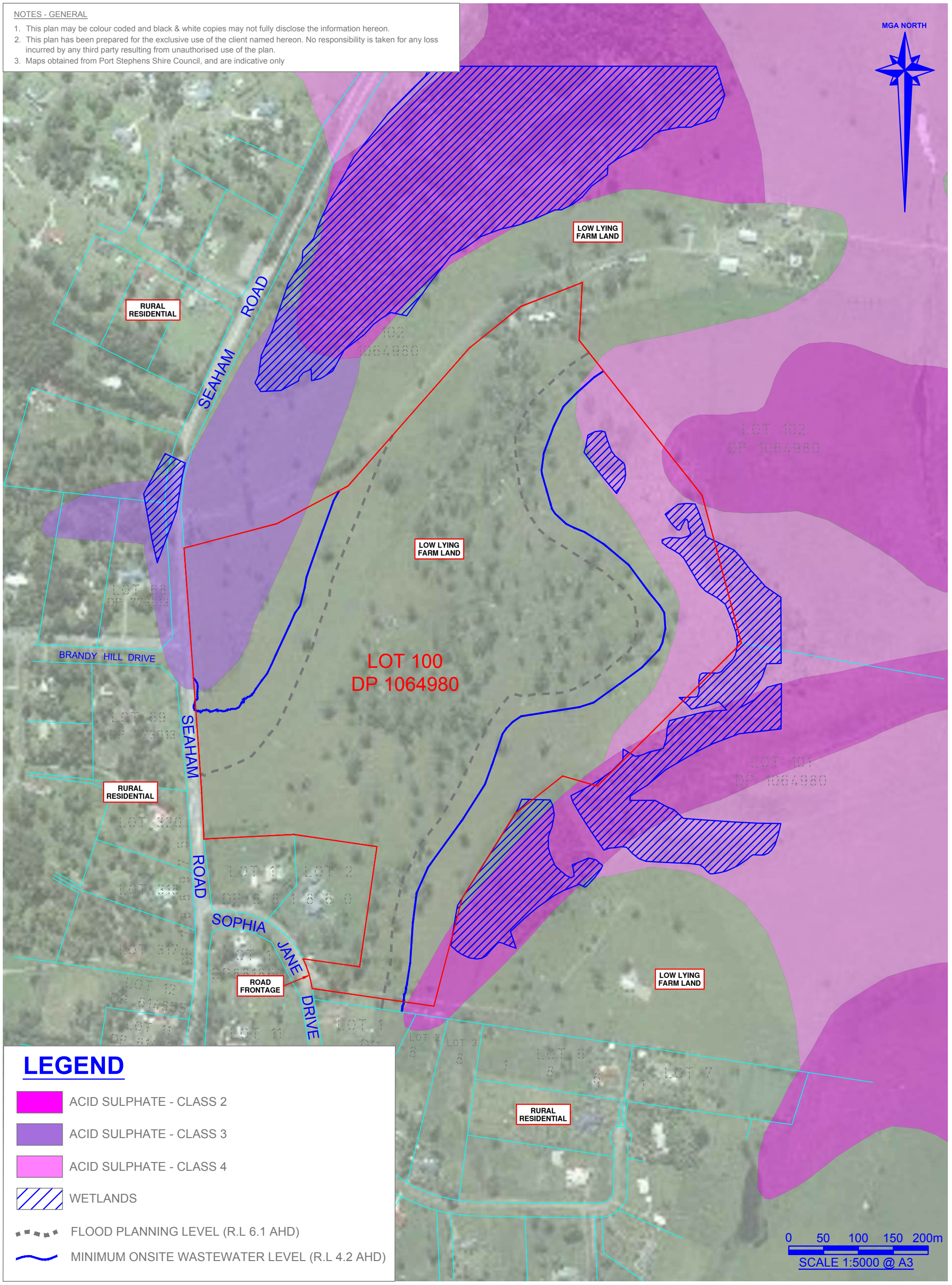

LEGEND

- ACID SULPHATE - CLASS 2
- ACID SULPHATE - CLASS 3
- ACID SULPHATE - CLASS 4
- WETLANDS
- FLOOD PLANNING LEVEL (R.L 6.1 AHD)
- MINIMUM ONSITE WASTEWATER LEVEL (R.L 4.2 AHD)

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Client: STATHAM
Site: Lot 100 DP 1064980 - No. 792 SEAHAM ROAD
Locality: SEAHAM LGA: PORT STEPHENS

Our Ref: 6182 REZ-V1
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NOTES - PROPOSED SUBDIVISION PLAN

1. This subdivision layout is a concept only and is subject to council approval.

No.	DISTANCE
1	A 25.85
2	A 25.85
3	21.26
4	24.65
5	24.67
6	24.48
7	8.54
8	13.83
9	12.5
10	7.72
11	15.9
12	16.54
13	15.9
14	21.26
15	22.11
16	9.45
17	16.54
18	A 28.91

MGA NORTH

LOT9 2 ha
LOT8 2 ha
LOT18 4.11 ha
LOT7 2.04 ha
LOT6 2.37 ha
LOT5 2.3 ha
LOT4 2 ha
LOT3 2 ha
LOT2 2 ha
LOT1 2.65 ha
LOT10 2 ha
LOT11 2.61 ha
LOT12 2.6 ha
LOT13 2 ha
LOT14 2 ha
LOT15 2 ha
LOT16 2.15 ha
LOT17 2.17 ha
LOT19 1437 m² (PUBLIC RESERVE)

SEAHAM ROAD
BRANDY HILL DRIVE
SOPHIA JANE DRIVE
PROPOSED ROAD (20 WIDE)

(A) EASEMENT FOR TRANSMISSION LINE 10 WIDE (DP 810145)
(B) EASEMENT FOR ELECTRICITY PURPOSES 10 WIDE (DP 1064980)
(C) RIGHT OF CARRIAGEWAY 20 WIDE (DP 1064980)
(D) POSITIVE COVENANT (DP 1064980)

LEGEND

FLOOD PLANNING LEVEL (R.L 6.1 AHD)

MINIMUM ONSITE WASTEWATER LEVEL (R.L 4.2 AHD)

0 50 100 150 200 250m

SCALE 1:4000 @ A3

LE MOTTEE GROUP
SURVEYING | CIVIL ENGINEERING | TOWN PLANNING | PROJECT MANAGEMENT
STRATA CERTIFICATION | ECOLOGY | BUSHFIRE ASSESSMENT
4/199 ADELAIDE STREET PO BOX 363
RAYMOND TERRACE, 2324
P: 4987 1748

Technical Details:
Azimuth - MGA
Origin -
Easting -
Northing -
Datum -
Origin -
R.L. -
Contour Int. -

Surveyed
Drafted PDM 5/7/17
Checked AJM

Title PROPOSED LOT LAYOUT (OVERLAID ON SITE AERIAL)
Client STATHAM
Site Lot 100 DP 1064980 - No. 792 SEAHAM ROAD
Locality SEAHAM LGA PORT STEPHENS

Our Ref: 6182 REZ-V1
Sheet No. 7 of 8
Original Size A3

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NOTES - GENERAL

1. This plan may be colour coded and black & white copies may not fully disclose the information hereon.
2. This plan has been prepared for the exclusive use of the client named hereon. No responsibility is taken for any loss incurred by any third party resulting from unauthorised use of the plan.

NOTES - PROPOSED SUBDIVISION PLAN

1. This subdivision layout is a concept only and is subject to council approval.

No.	DISTANCE
1	A 25.85
2	A 25.85
3	21.26
4	24.65
5	24.67
6	24.48
7	8.54
8	13.83
9	12.5
10	7.72
11	15.9
12	16.54
13	15.9
14	21.26
15	22.11
16	9.45
17	16.54
18	A 28.91

MGA NORTH

LOT 102 DP 1064980

LOT 102 DP 1064980

LOT9 2 ha

LOT8 2 ha

LOT18 4.11 ha

LOT7 2.04 ha

LOT6 2.37 ha

LOT5 2.3 ha

LOT4 2 ha

LOT3 2 ha

LOT2 2 ha

LOT1 2.65 ha

LOT10 2 ha

LOT11 2.61 ha

LOT12 2.6 ha

LOT13 2 ha

LOT14 2 ha

LOT15 2 ha

LOT16 2.15 ha

LOT17 2.17 ha

LOT19 1437 m² (PUBLIC RESERVE)

SEAHAM ROAD

BRANDY HILL DRIVE

(20 WIDE) ROAD

(20 WIDE) PROPOSED ROAD

SOPHIA JANE DRIVE

LOT 68 DP 773013

LOT 69 DP 773013

LOT 320

LOT 318

LOT 317

LOT 12 DP 614855

LOT 11 DP 614855

LOT 11 DP 712528

LOT 1 DP 881860

LOT 1 DP 881860

LOT 2 DP 881860

LOT 1 DP

LOT 2 8

LOT 3 8

LOT 6 1 8 6

LOT 7 1

LOT 101 DP 1064980

(A) (B) (C) (D)

LEGEND

FLOOD PLANNING LEVEL (R.L 6.1 AHD)

MINIMUM ONSITE WASTEWATER LEVEL (R.L 4.2 AHD)

(A) EASEMENT FOR TRANSMISSION LINE 10 WIDE (DP 810145)
(B) EASEMENT FOR ELECTRICITY PURPOSES 10 WIDE (DP 1064980)
(C) RIGHT OF CARRIAGEWAY 20 WIDE (DP 1064980)
(D) POSITIVE COVENANT (DP 1064980)

0 50 100 150 200 250m

SCALE 1:4000 @ A3

LE MOTTEE GROUP
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APPENDIX B QUALIFICATIONS

Curriculum Vitae

Lizzie MacDonald
Ecologist
B.Sc, GradCert.EnvMgt&Sus

Qualifications / Licences

- Bachelor of Science (Macquarie University)
- Graduate Certificate in Environmental Management and Sustainability (University of Newcastle)
- Niche Wildlife School, General Survey & ID Management
- WorkCover NSW, National WHS General Construction Induction Training

Areas of Expertise

Lizzie MacDonald is an ecologist with over 10 years of experience in the environmental management field; she has worked extensively in the government and non-profit sectors and has recently entered the world of consulting. In particular, Lizzie has a strong background in conservation management planning, ecological field surveys and biodiversity assessment, monitoring and reporting.

Lizzie's experience in the consulting industry has included environmental impact assessment, flora and fauna survey and monitoring, targeted threatened species survey and monitoring, vegetation and conservation management plans, Review of Environmental Factors, constraints and opportunities reporting and Part 3A and Section 5A assessments under the *Environmental Planning and Assessment Act 1975*. Lizzie is also an experienced fauna handler and has supervised tree clearing works.

Employment History

Ecologist
Firebird ecoSultants Pty Ltd
Aug 2015 to present

Ecologist
Fraser Ecological
Jan 2015 – Sep 2015

Project Officer (Biodiversity and Sustainable Agriculture)
NSW Department of Primary Industries
Dec 2008 – Jan 2013

Conservation Management Officer (Fisheries)
NSW Department of Primary Industries
Jun 2008 to Dec 2008

Project Officer (Aquaculture)
NSW Department of Primary Industries
Jan 2008 – Jun 2008

Research Assistant
Humane Society International
2004-2007

Curriculum Vitae

Ryan Herbert
Ecologist / Bushfire Planning Consultant
B.Env.Sc&Mgt

Qualifications / Licences

- Bachelor of Environmental Science & Management (The University of Newcastle)
- Rabies immunisation (for working with Microchiropteran bats)
- WorkCover NSW OHS General Induction for Construction Work in NSW
- Work Safely at Heights (RIIWHS204D)

Areas of Expertise

Ryan Herbert is an ecologist and bushfire planning consultant with 5 years experience in the ecological consulting field, bushfire consulting field, as well as some volunteer experience in non-profit wildlife conservation and research projects.

Ryan's experience in the ecological consulting industry has included undertaking various assessments under the Environmental Planning and Assessment Act 1979 (EP&A Act), the Biodiversity Conservation Act 2016 (BC Act) and the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), including flora and fauna impact assessments, vegetation and conservation management plans, Koala assessments under the Koala Habitat Protection SEPP and Biodiversity Development Assessment Reports (BDAR). Ryan has extensive experience in undertaking flora and fauna surveys, including targeted threatened species surveys, harp trapping, mammal trapping, hair trapping, reptile searches, bird surveys, spotlighting and call playback. Ryan also has extensive experience in supervising tree clearing works and is very competent with handling fauna under these conditions.

Ryan Herbert also has experience in Bushfire Planning and Design, Bushfire Attack Level (BAL) assessments, Complying and Development Application assessments (79BA & 100B) in accordance with Planning for Bush Fire Protection (PBP), the Building Code of Australia (BCA) and Australian Standards AS3959-2009.

Employment History

Ecologist & Bushfire Planning Consultant
Firebird ecoSultants Pty Ltd
August 2016 to present

Volunteer Research/Field Assistant
Amphibian Research Laboratory, University of Newcastle
March 2012 – October 2015

Firebird ecoSultants Pty Ltd
Level 1, 146 Hunter Street Mall, Newcastle NSW 2300
PO Box 354, Newcastle NSW 2300
P: 02 4910 3939 M: 0414 465 990 E: sarah@firebirdeco.com.au

Curriculum Vitae

Sarah Jones
Ecologist / Bushfire Consultant
B.Env.Sc, G.Dip.DBPA
BPAD-A Certified Practitioner (BPD-PA-26512)

Qualifications / Licences

- Bachelor of Environmental Science (The University of Newcastle)
- Graduate Diploma in Design for Bush Fire Prone Areas (University of Western Sydney)
- *BAAS18020 Accredited Assessor, as required by the Biodiversity Conservation Regulation 2017 and accredited to apply the BAM*
- NSW Scientific Licence SL100533
- Fire Protection Authority of Australia (FPAA) Member
- BPAD- A (Alternate Solutions) Bushfire Planning and Design Certified Practitioner – Certification No: PBD-PA-26512
- RFS / PIA NSW Consulting Planners Bushfire Training Course
- WorkCover NSW OHS General Induction for Construction Work in NSW

Areas of Expertise

Sarah Jones is an ecologist and bushfire planning specialist with over 18 years ecological experience within both the consulting, and the government sector. Sarah is ab Accredited Biodiversity Assessor and has an extensive range of Ecological Assessment reporting experience and ecological field experience. Experience within the consulting industry has primarily included a wide range of flora and fauna assessment disciplines as required by a wide range of public and private clients. Sarah has a strong grounding in threatened flora and fauna species, endangered ecological communities and populations. She has experience in the preparation of environment impact assessments in terrestrial environments, constraints and opportunities reporting, flora and fauna monitoring and survey, vegetation and conservation management plans. Sarah Jones is accredited to Biodiversity Development Assessment Reports (BDAR) and Tests of Significance (5-part test) to assess biodiversity / flora and fauna / ecological impacts when undertaking Development Applications (DA) and Major Projects / State Significant Developments (SSD) in New South Wales.

Sarah Jones is a (Bushfire Planning and Design) BPAD-A Certified Practitioner through Fire Protection Australia (FPA). BPAD Accredited Practitioners are recognised by industry, regulators, fire agencies, end-users and the community as providers of professional bushfire assessment, planning, design and advice services. The Scheme provides an enhanced level of confidence for government and the community that practitioners are accredited by a suitably robust scheme that is administered by the peak national body for fire safety.

Sarah Jones has qualifications and experience in Bushfire Planning and Design, Bushfire Attack Level (BAL) assessments, Complying and Development Application

assessments) in accordance with Planning for Bush Fire Protection (PBP), the Building Code of Australia (BCA) and Australian Standards AS3959-2018.

Employment History

Bushfire Consultant & Ecologist
Firebird ecoSultants Pty Ltd
Jan 2011 to present

Consultant Role Development Planner – (Flora and Fauna)
Lake Macquarie City Council
June 2013 –February 2015
Previous temporary role August - October 2012

Senior Bushfire Consultant / Ecologist
RPS Group plc.
June 2006 to Jan 2011

Development Planner (Flora & Fauna)
Lake Macquarie City Council
Jan 2005 to Sept 2005

Ecologist / Bushfire Consultant
Harper Somers O'Sullivan
Nov 2001 to Jan 2005

Ecologist
Ecotone Environmental Consultants, Waratah, NSW
Jan 2001 – Nov 2001

Volunteer Environmental Educator
Community Partnership Newcastle City Council
Sept 2000 – Dec 2000

APPENDIX C ENVIRO ECOLOGY FLORA & FAUNA ASSESSMENT

Flora and Fauna Assessment of East Ridge Estate No 792 (Lot 100 DP 1064980) Seaham Rd, Seaham (Ref:2011#33)

Enviro *Ecology*

Po Box 820
Gosford, NSW
www.enviroecology.com.au
enviroecology@live.com.au
Mobile: 0402592399

Revision	Details	Date	Amended By
A	Draft Ecological Assessment	16/03/2012	John Whyte
B	Final	02/04/2012	John Whyte

Author: .....John Whyte

Signed:

Date: .....24th April 2012

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1. Introduction

Enviro Ecology has been engaged by Graham Oborn of Oborn Professional Consulting to carry out a Flora and Fauna Assessment for the East Ridge Estate No 792 (Lot 100 DP 1064980) Seaham Road, Seaham within Port Stephens LGA, hereafter referred to as the study area (Figure 1-1).

The Subject Property (Figure 1-1) contains a single dwelling & machinery shed and is located within the most northern end. The property has been primarily used for cattle grazing. The proposed development is to subdivide the existing lot into 93 residential lots ranging in size from 1008m^2 -1594m^2 (Figure 1-2). Upon approval of the subdivision only the road works are to be undertaken.

This report examines the terrestrial flora assemblages and faunal species and their habitats within the location of proposed subdivision (Figure 1-2). The report then determines the impacts of the clearing works establishment of roads upon local biodiversity. It summarises proposed mitigation measures as well as the assessment under the *Environmental Planning and Assessment Act 1979* and under the (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*.

1.1 Terminology

This report uses the following terminology:

- Subject property is defined by the red boundary as depicted on (Figure 1-1)
- Study area is defined as the red boundary as depicted on (Figure 2-1);
- Subject site is defined as the developable area of the site which is to be subdivided (Figure 1.3);
- TSC Act abbreviates the *Threatened Species Conservation Act 1995;*
- EPBC Act abbreviates the *Environment Protection and Biodiversity Conservation Act 1999;*
- EP&A Act abbreviates the *Environmental Planning and Assessment Act 1979*;
- OEH abbreviates Office of Environment & Heritage (NSW);
- LGA abbreviates Local Government Area;
- Threatened species refers to those flora and fauna species listed as vulnerable, endangered or critically endangered under the TSC Act or EPBC Act
- EEC abbreviates Endangered Ecological Community

Figure 1-1 Study area

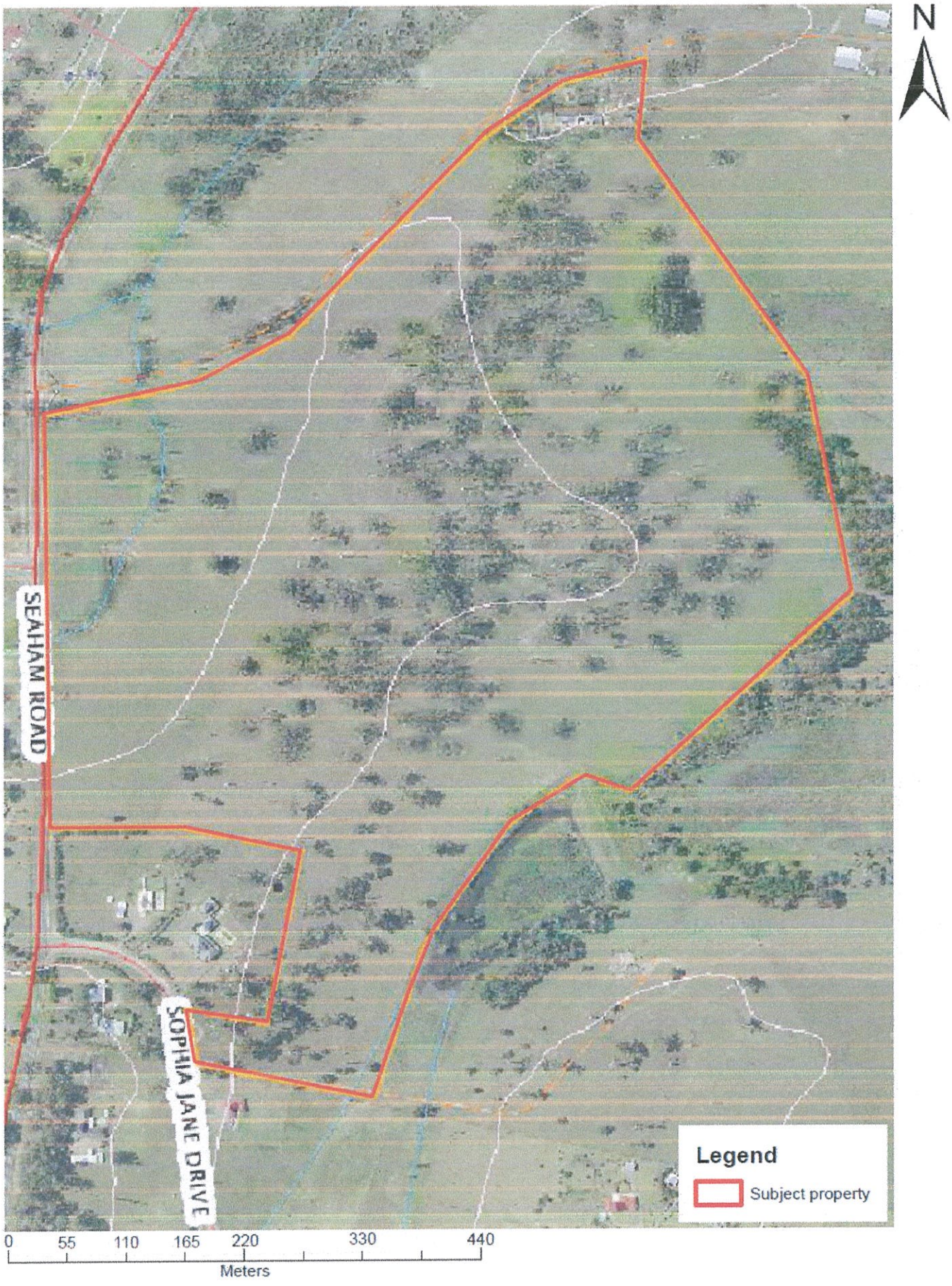


Figure 1-2 Proposed development

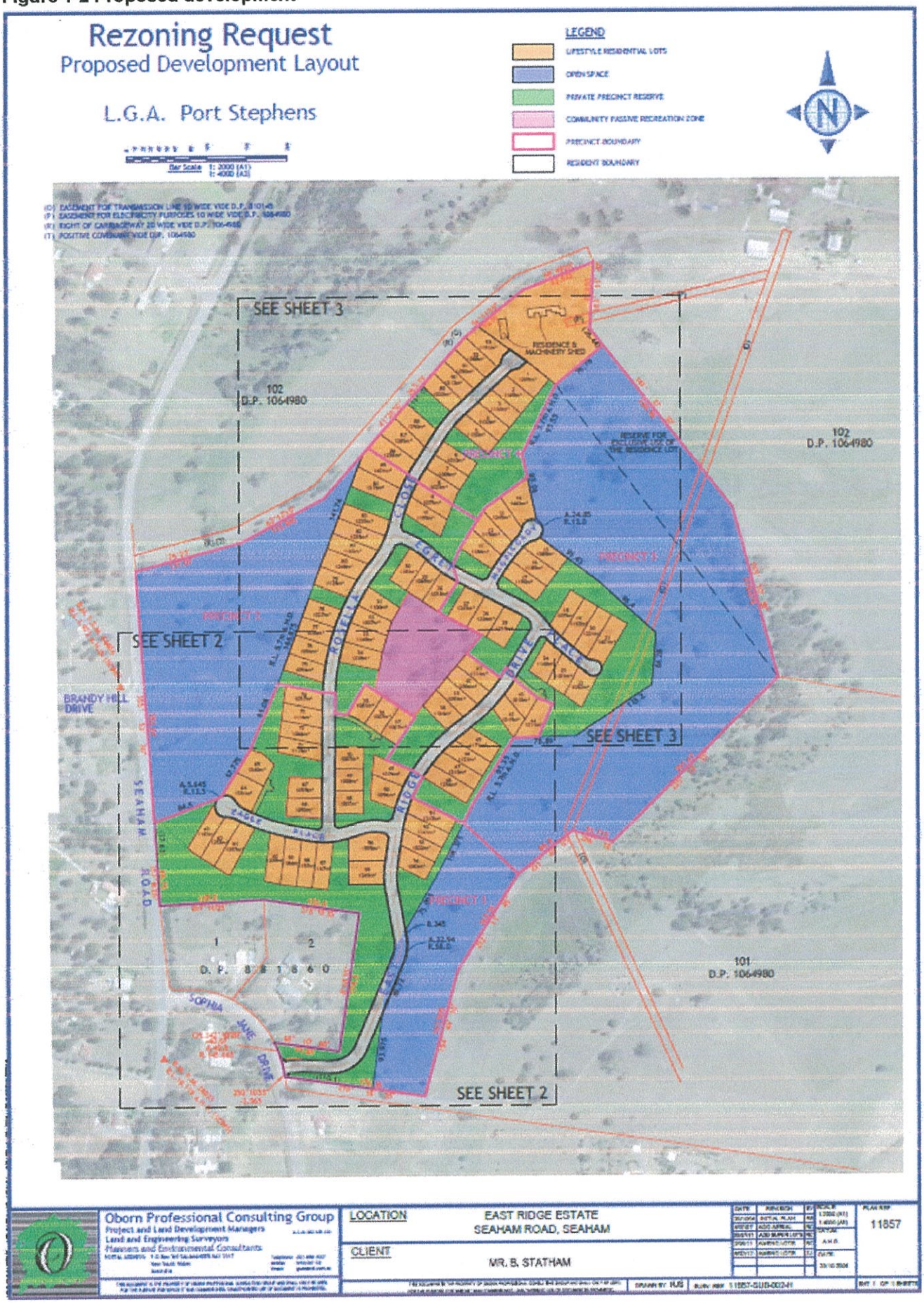


Figure 1-3 Proposed development

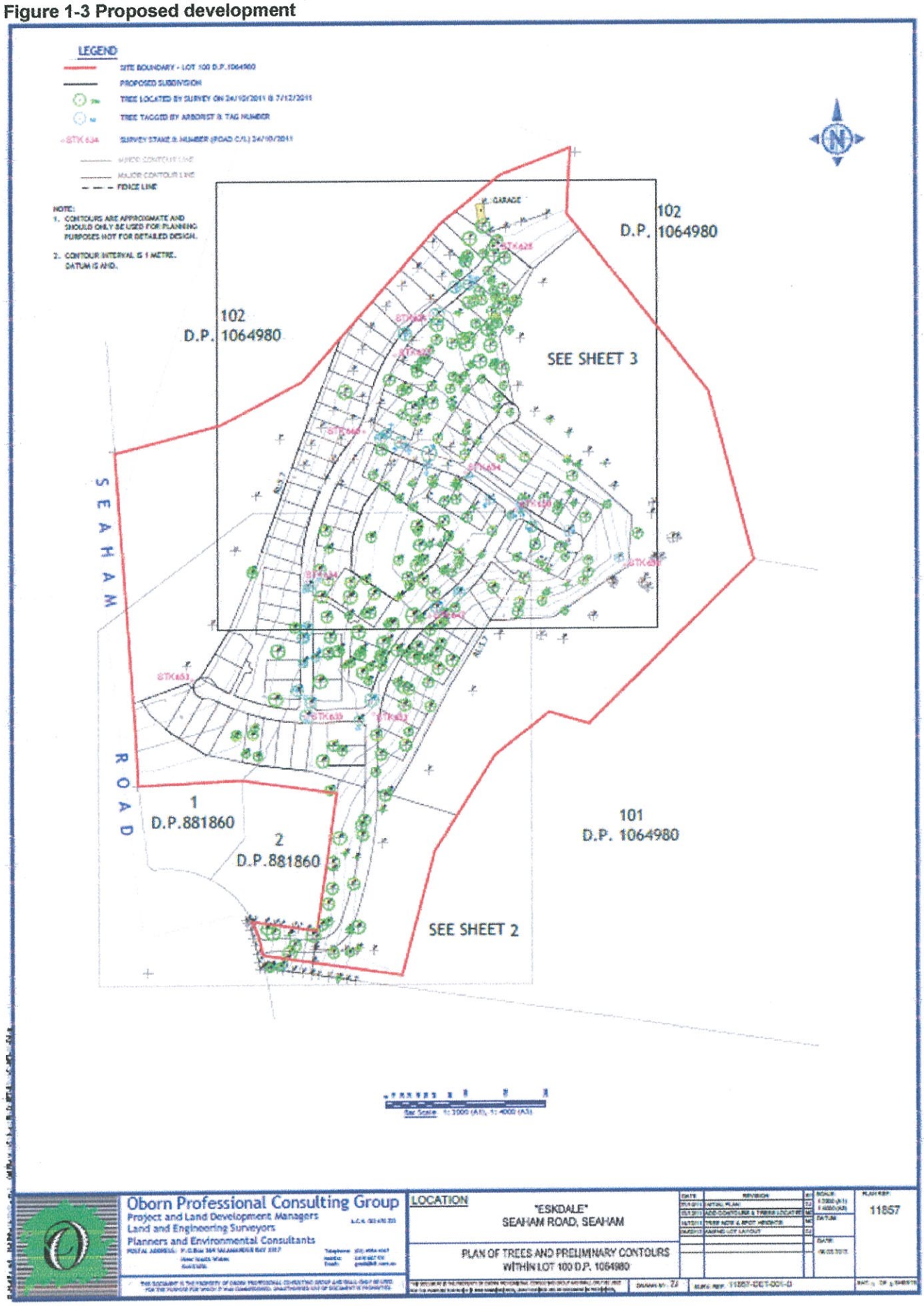


Figure 1-4 Proposed development & tree locations

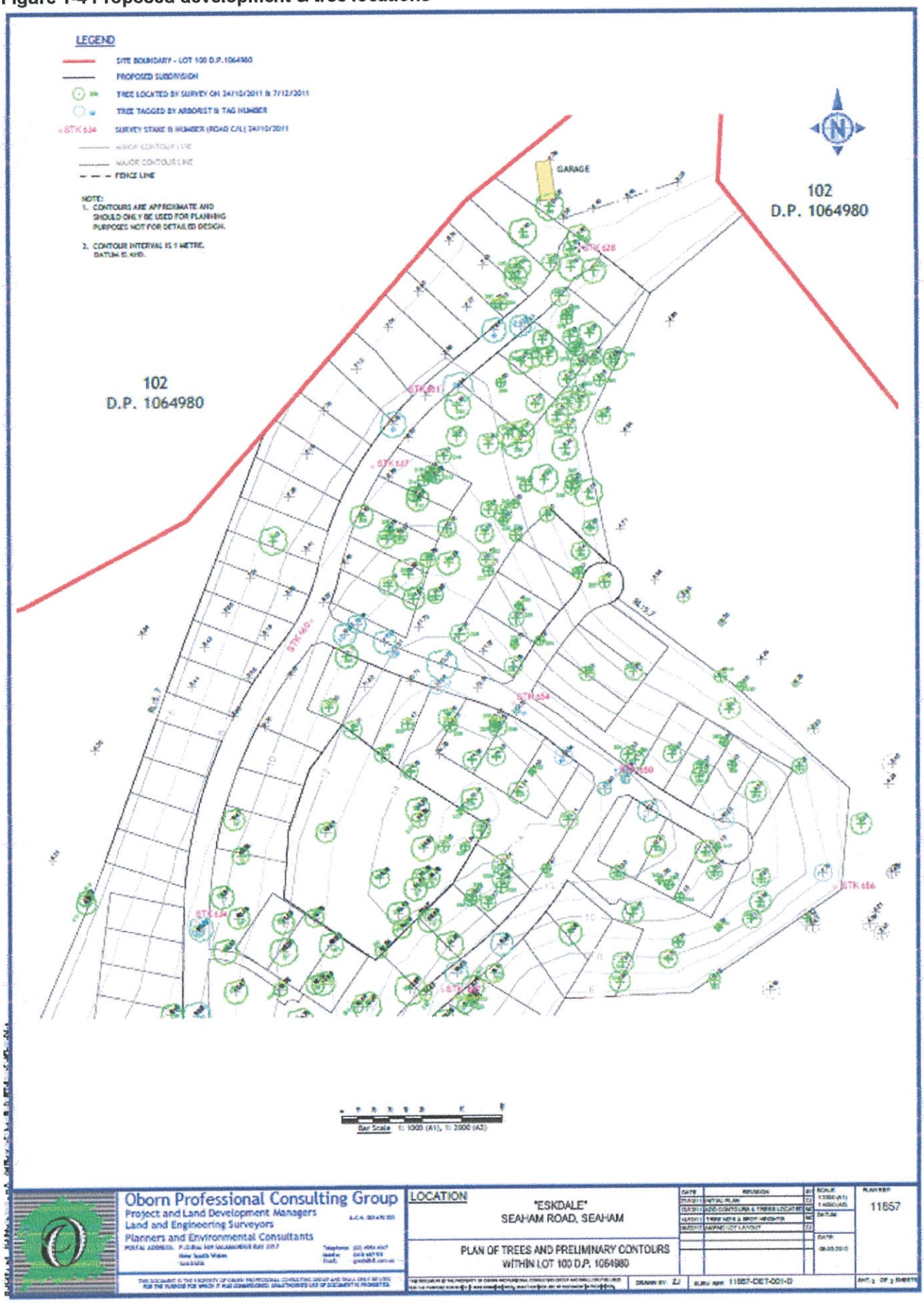
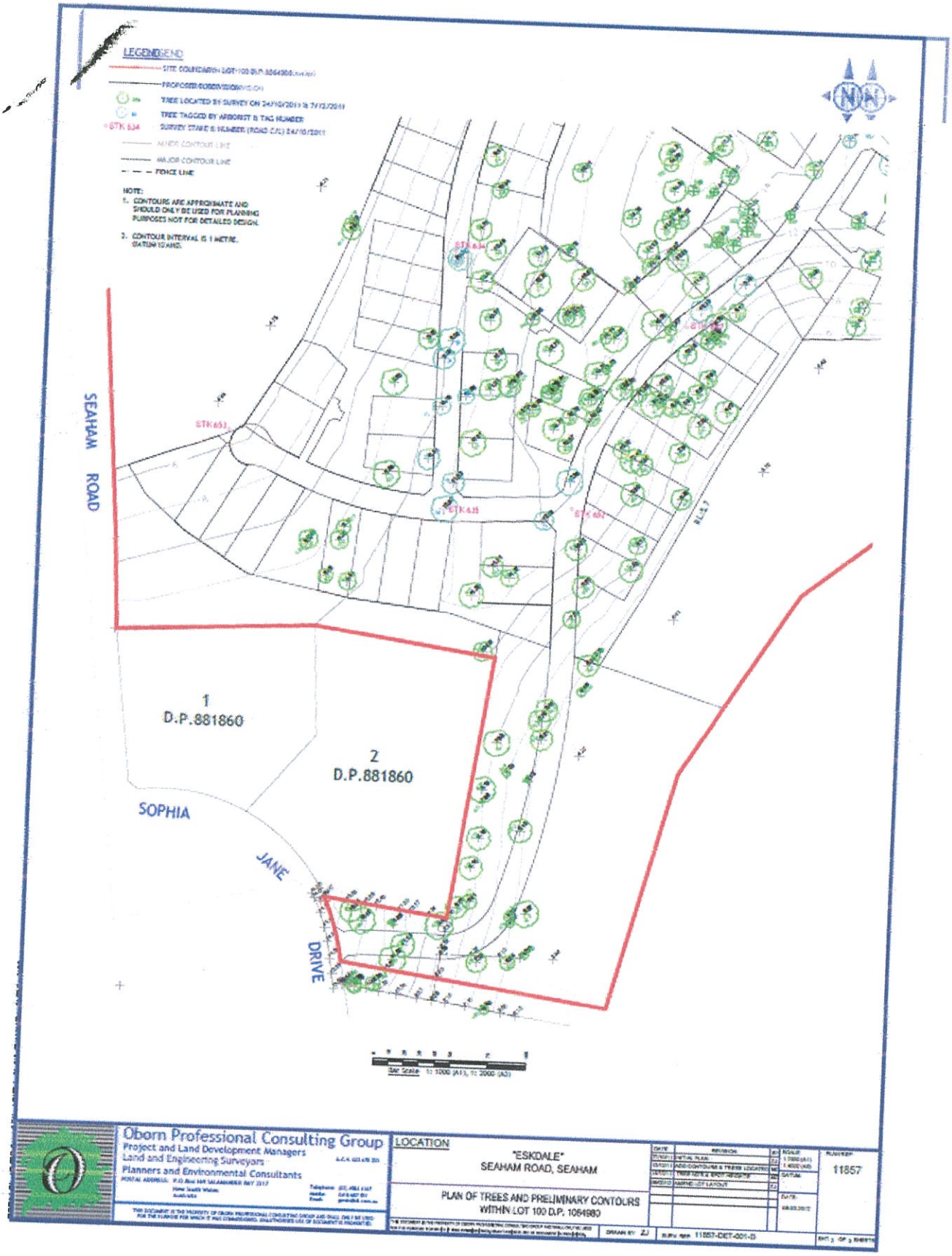


Figure 5 Proposed development & tree locations



1.2 Legislative context

All proposals assessed under the *Environmental Planning and Assessment Act 1979* must include an examination of the threatened biodiversity, or their habitats, that are likely to occur within the development area or that may be indirectly affected by the construction and operation of a proposal. In the event that threatened biodiversity is within the vicinity of a proposal, the application must also include an assessment of the potential impact.

Other Commonwealth and State legislation relevant to the protection of flora, fauna and biodiversity within the study area include:

- *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*
- *Threatened Species Conservation Act 1995*
- *National Parks and Wildlife Act 1974*
- *Noxious Weeds Act 1993.*

1.3 Site Description

The planning and cadastral details of the study area are provided in (Table 1-1). The subject property is bordered to the west partially by Seaham Road, and to the north, east, south & partially to the west by rural lands (Figure1-1).

Table 1-1 Site details

Location	No 792 (Lot 100 DP 1064980) Seaham Road, Seaham
Subject Property Area	44 ha
Impact Area	1.1 ha
Topographic Map	Port Stephens 1:25000
Site Location	379586E, 6381554N
Local Government Area	Port Stephens
Aspect	Northerly
Vegetation	Map unit 41 Swamp Oak Sedge Forest, Remnant Map unit 17 Spotted Gum Ironbark Forest & Grassland with Scattered Trees

1.4 Study objectives

The objectives of this report are to:

- Conduct a fauna survey and habitat assessment to determine the likelihood of occurrence of threatened or Migratory species of animal occurring within the study area.
- Conduct a floral survey to identify any threatened species of plant present or considered likely to occur within the proposal area determine and describe the characteristics and condition of the vegetation communities and flora.
- Determine the presence, or likelihood of occurrence, of threatened biodiversity listed under the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999* occurring within the study area.
- Describe and assess likely impacts of the project on biodiversity.
- Undertake significance assessments for threatened biodiversity that occur or have potential habitat within the study area.
- Propose amelioration measures to mitigate or minimise impacts on the ecological values of the study area.

2. Methodology

This ecological assessment was based on the results of a desktop review and site inspections on the 5th of September, 12th & 13th of October 2011 & on the 26th of February 2012 by Mr John Whyte B.Bio.Sc (Majors Botany & Zoology) of Enviro Ecology. This assessment has been prepared to identify potential impacts as a result of the proposed activity on biodiversity.

2.1 Licensing

All work was carried out under the appropriate licences, including a scientific licence as required under Clause 22 of the National Parks and Wildlife Regulations 2002 and Section 132C of the *National Parks and Wildlife Act 1974,* and under an Animal Research Authority issued by the Department of Industries and Investment formerly the Department of Primary Industries (Agriculture) 2010.

2.2 Nomenclature

Names of plants used in this document follow Harden (Harden 1992; Harden 1993; Harden 2000; Harden 2002) with updates from PlantNet (Royal Botanic Gardens 2012). Scientific names are used in this report for species of plant. Scientific and common names of plants are listed in Appendices A and C.

Names of vertebrates follow the Census of Australian Vertebrates (CAVS) database maintained by the Department of Sustainability, Environment, Water, Population and Communities 2012. Common names are used in the report for species of animal. Scientific names are included in species lists found in Appendices B and D.

2.3 Database searches and literature review

This assessment included a review of:

- Topographic maps
- Aerial photographs
- Vegetation Survey, Classification and Mapping - (Lower Hunter and Central Coast Regional Environmental Management Strategy 2000).
- Database searches, as summarised in Table 2-1.

Table 2-1 Database searches

Database	Search date	Area searched	Reference
Bionet Atlas of NSW Wildlife	5th September 2011	Locality (10 km)	(Office of Environment and Heritage 2011)
PlantNet Database	5th September 2011	Locality (10 km)	(Royal Botanic Gardens 2011)
Protected Matters Search Tool	5th September 2011	Locality (10 km)	(Department of Sustainability Environment Water Population and Communities 2011)

Field Survey

Inspections of the site were undertaken on the 5th of September, 12th & 13th of October 2011 & on the 26th of February 2012. This included:

- Six quadrats & a random meander survey recording all species of plant encountered within the study area (Figure 2-1)
- Searching for specialised fauna habitat resources such as roosting/nesting hollows, whitewash, foraging resources e.g. feed trees
- Targeted surveys for flora and fauna (Sections 2.5 & 2.6)
- Opportunistic fauna surveys during the flora survey

2.4 Flora Surveys

A combination of quadrat and traverse flora surveys was used to assess native floral diversity, dominant species, condition of vegetation communities and search for Threatened species within the study area. The flora survey effort was determined to exceed the suggested minimum survey requirements of the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (refer to table 2-2, Department of Environment and Conservation 2004).

Table 2-2 Suggested survey technique and effort for plant quadrats

Survey technique	Suggested minimum effort per stratification unit
Quadrat	1 quadrat for areas <2 ha
	2 quadrats for area 2-50 ha
	3 quadrats for areas 51-250 ha
	5 quadrats for areas 251-500 ha
	10 quadrats for areas 5,001-1,000 ha, plus 1 additional quadrat for each extra 100 ha thereof
Random Meander	30 minutes for each quadrat sampled within the same stratification unit as the quadrat

Source: *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (Working Draft) (Department of Environment and Conservation 2004).

2.4.1 Quadrat surveys

Six quadrats were placed randomly within the study area to provide a quantitative examination of species abundance in each vegetation community (Figure 2-1). Quadrat surveys are also likely to detect inconspicuous species that may be missed by a random meander or transect surveys (Department of Environment and Conservation 2004).

Vegetation quadrats were 400 m^2 (20 x 20 m) within which all floral species were identified and assigned a vegetative cover abundance rating based on the following modified Braun-Blanquet scale (Table 7-1).

Table 2-3 Vegetation community condition classes

Cover/abundance scale 1-6		
1	<5% - Rare or few individuals	3 or less individuals
2	<5% - Common	Consistent throughout plot
3	Cover >5% and <25%	
4	Cover <25% and <50%	
5	Cover >50% and <75%	
6	Cover >75%	

2.4.2 Random meander surveys

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by Cropper (1993), whereby the recorder walks in a random manner throughout the site recording all species observed. The survey is continued until no additional species are observed within a patch. Random meander surveys also allow the boundaries between various vegetation communities and condition of vegetation to be recorded and are valuable for recording species that may not occur within quadrats including, including Threatened species (Department of Environment and Conservation 2004).

Individual random meander surveys were separated whenever there was a significant change in vegetation community type or condition. For each random meander survey, the vegetation community was determined based on the dominant canopy species and the structure formation in accordance with Specht (1981) with reference to existing mapped vegetation communities. A random meander was conducted throughout the entire study area.

2.4.3 Vegetation condition

The condition of vegetation communities is an important criterion to determine suitable habitats for Threatened species and the conservation status of certain ecological communities. Vegetation within the study area was assigned to one of the following condition classes (Table 2-4).

Table 2-4 Vegetation community condition classes

Condition Class	Criteria
Good	Vegetation still retains the species complement and structural characteristics of the pre-European equivalent. Such vegetation has usually changed very little over time and displays resilience to weed invasion due to intact groundcover.
Moderate	Vegetation generally still retains its structural integrity, but has been disturbed and has lost some component of its original species complement. Weed invasion can be significant in such remnants
Poor	Vegetation that has lost most of its species and is significantly modified structurally. Often such areas now have a discontinuous canopy of the original tree cover and very few shrubs. Exotic species, such as introduced pasture grasses or weeds, replace much of the indigenous ground cover. Environmental weeds are often co-dominant with the original indigenous species.

2.5 Terrestrial fauna

2.5.1 Fauna habitats

Fauna habitat assessments were undertaken to assess the likelihood of Threatened species of animal (those species identified from the literature and database review) to occur within the study area. Fauna habitat characteristics assessed included the:

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

The assessment of these fauna habitat characteristics enabled an overall assessment of fauna habitat condition within the study area (refer Table 2-5).

Table 2-5 Fauna Habitat Condition Classes

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

2.5.2 Koala habitat assessment

The site is located in the Port Stephens Local Government Area, which is listed under Schedule 1 of *State Environmental Planning Policy - 44 Koala Habitat Protection* (SEPP 44). This policy is applicable to proposals assessed by a determining authority under Part 3 of the *Environmental Planning and Assessment Act 1979*, the likelihood of the site to be 'potential koala habitat' or 'core koala habitat' was assessed. Under *State Environmental Planning Policy - 44 Koala Habitat Protection*, the following definitions apply:

'Potential Koala Habitat' - areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

'Core Koala Habitat' - area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

2.5.3 Fauna survey

The presence of faunal species within the study area was determined primarily through consideration of suitable habitats, with species of animal identified opportunistically during the vegetation survey, habitat assessments and through direct targeted surveys. Although recording Threatened species during field survey can confirm their presence in an area, a lack of Threatened species records does not necessarily indicate the absence of the species from the study area when suitable habitat is present. By the very nature of their rarity, Threatened species are often difficult to detect. Suitable habitat is, therefore, an important factor to consider when determining the potential presence of Threatened species.

The following fauna surveys detailed below were conducted within the study area due to the presence of the following fauna habitat characteristics: ground cover vegetation, leaf litter, water bodies (west of the study area) and fallen timber that has the potential to provide protection, foraging, roosting and nesting opportunities for birds, reptiles and amphibians.

The assessment of these fauna habitat characteristics enabled an overall assessment of fauna habitat condition within the study area.

2.5.4 Diurnal Birds

Diurnal birds were recorded within the study area over 1.5 hour observation periods on two mornings and three afternoons. During these surveys the entire study area was traversed and birds were identified either from sightings or characteristic calls.

Additional birds species not recorded during this survey period were also opportunistically recorded throughout the study area whilst completing vegetation surveys, habitat assessments and also during targeted fauna surveys.

Birds were observed and identified using binoculars. Calls were generally identified in the field by the observer. If an unknown call was heard it was recorded and identified using reference libraries.

2.5.5 Nocturnal Birds

The presence of the Grass Owl (*Tyto capensis*) Masked Owl (*Tyto novaehollandiae*) & the Barking Owl (*Ninox connivens*) were targeted by

broadcasting taped calls through a 15 watt Toa 'Fauna-tech' amplifier. Calls were played for 5-minute periods at 5-minute intervals during three site visits. This was followed with quiet listening and spotlighting. Nocturnal calls for birds were not played until nocturnal spotlight surveys were completed for nocturnal animals.

Searches for evidence of Owl roosts and potential Owl roosting / breeding hollows were made during surveys of the study area. Any whitewash, or regurgitated pellets found were noted.

2.5.6 Arboreal and Terrestrial Mammals

Assessment was made of 'found' scats, chew markings, diggings, runways and scratches during visits to the site.

Spotlighting for nocturnal mammalian fauna was carried out using a Led Lenser H14 Head torch (220 Lumens) & an X21 Led Lenser which emits 1050 lumens of light. This technique involved walking amongst the vegetated treed areas of the study area so that a maximum number of trees could be observed. This occurred for approximately 2.5 hours after dark during the three site visits.

2.5.7 Micro-chiropteran bats

Micro-chiropteran bats were surveyed by echolocation using an Anabat Mk 2 detector in fixed positions throughout the study area for five nights (Figure 2-1). Mega-chiropteran bat species, such as Grey-headed Flying-fox (*Pteropus poliocephalus*), were surveyed by targeting flowering / fruiting trees during spotlighting activities.

2.5.8 Amphibians

Frog searches were completed at all locations where frogs were heard vocalising to confirm species identification. Species were recorded by sightings, captures and call characteristics.

Amphibians were surveyed by vocal call identification, by using a tape recorder to record male calls in suitable places and then comparing these to known calls. Amphibians were also surveyed by habitat searches. This technique is particularly useful on sites with large or elongated areas of suitable habitat such as along a stream or creek bank and can be conducted while doing a nocturnal search.

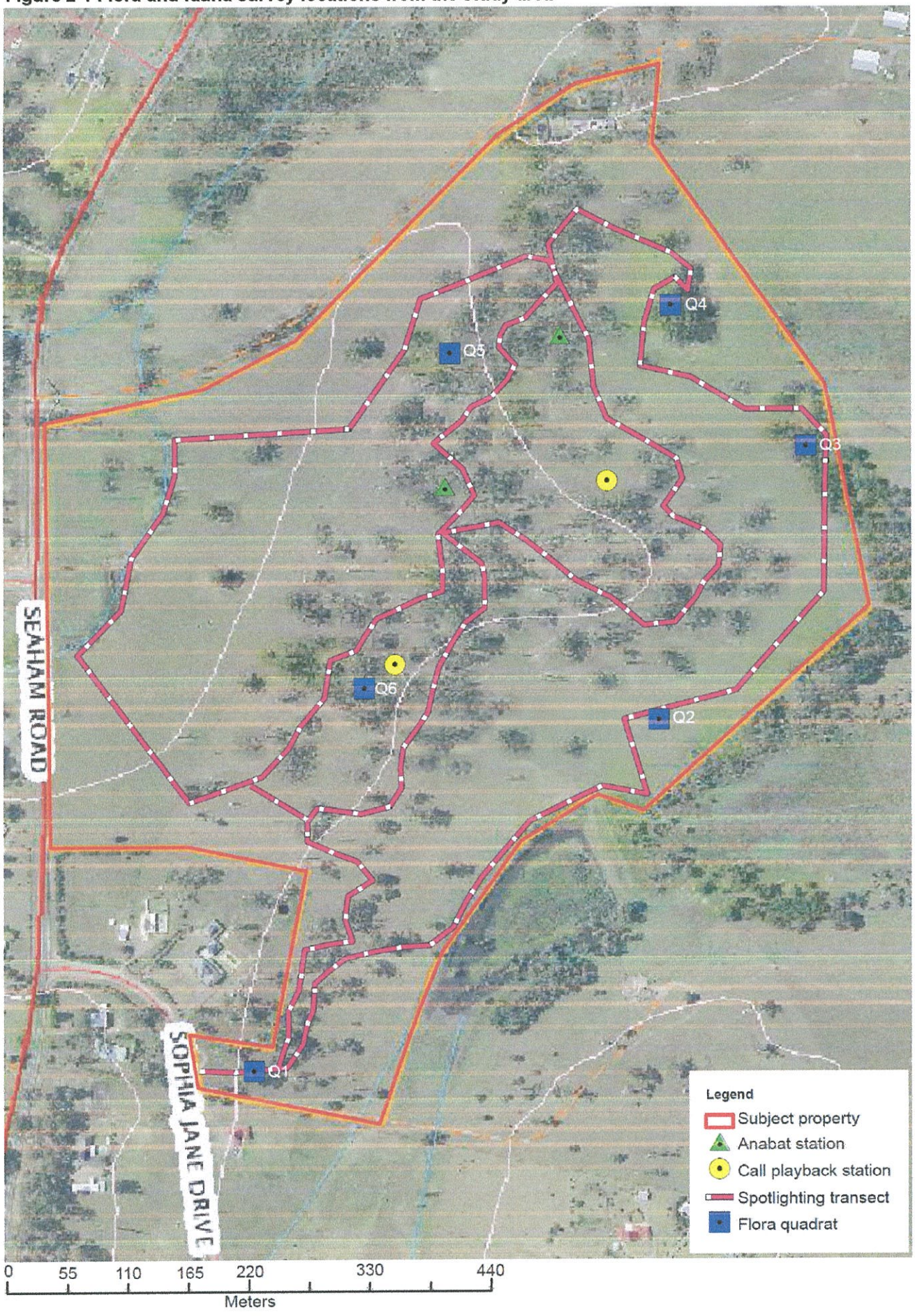
Any amphibians found are visually identified and when required to be examined are handled with Latex gloves and kept moist until release. Spotlighting for nocturnal amphibians was also carried out using a Led Lenser H14 Head torch (220 Lumens) & an X21 Led Lenser which emits 1050 lumens of light. This technique involved walking amongst the open forest/woodland areas of the study area.

Species of herpetofauna were also opportunistically recorded whilst completing vegetation surveys and habitat assessments

2.5.9 Reptiles

Searches for reptiles in likely localities such as under logs, rubbish debris, leaf litter, basal tree hollows and beneath bark within the study area. Surveys were undertaken during diurnal visits to the site. Spotlighting of terrestrial habitats suitable for reptiles also occurred during nocturnal amphibian surveys.

Figure 2-1 Flora and fauna survey locations from the study area



2.6 Significant Assessments

Significance assessments were carried out for threatened species, populations or communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* that were known or predicted to occur in the project locality (10 kilometres from the study area) and that had a low/moderate, moderate to high likelihood of occurring within the study site based on suitable habitat or observation in the field.

For species, populations and communities listed under the *Threatened Species Conservation Act 1995* significance assessments were completed in accordance with threatened species assessment guidelines (Department of Environment and Climate Change 2007).

For species or communities listed under the *Environment Protection and Biodiversity Conservation Act 1999,* significance assessments were completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment and Heritage 2006).

2.7 Limitations

Within the study area varying degrees of non-uniformity of flora and fauna habitats are encountered. Hence no sampling technique can entirely eliminate the possibility that a species is present within a study area (e.g. species of plant present in the seed bank). The conclusions in this report are based upon data acquired for the study area and the environmental field surveys and are, therefore, merely indicative of the environmental condition of the study area at the time of survey, including the presence or otherwise of species. It should also be recognised that conditions of the study area, including the presence of threatened species, can change with time.

Habitat assessments were completed for all threatened fauna species identified as a result of the database searches (Table 2-1) to determine whether or not suitable habitat for threatened fauna species occurred within the study area. This is a more conservative approach and is likely to include species that are difficult to detect.

3. Results

3.1 Vegetation mapping

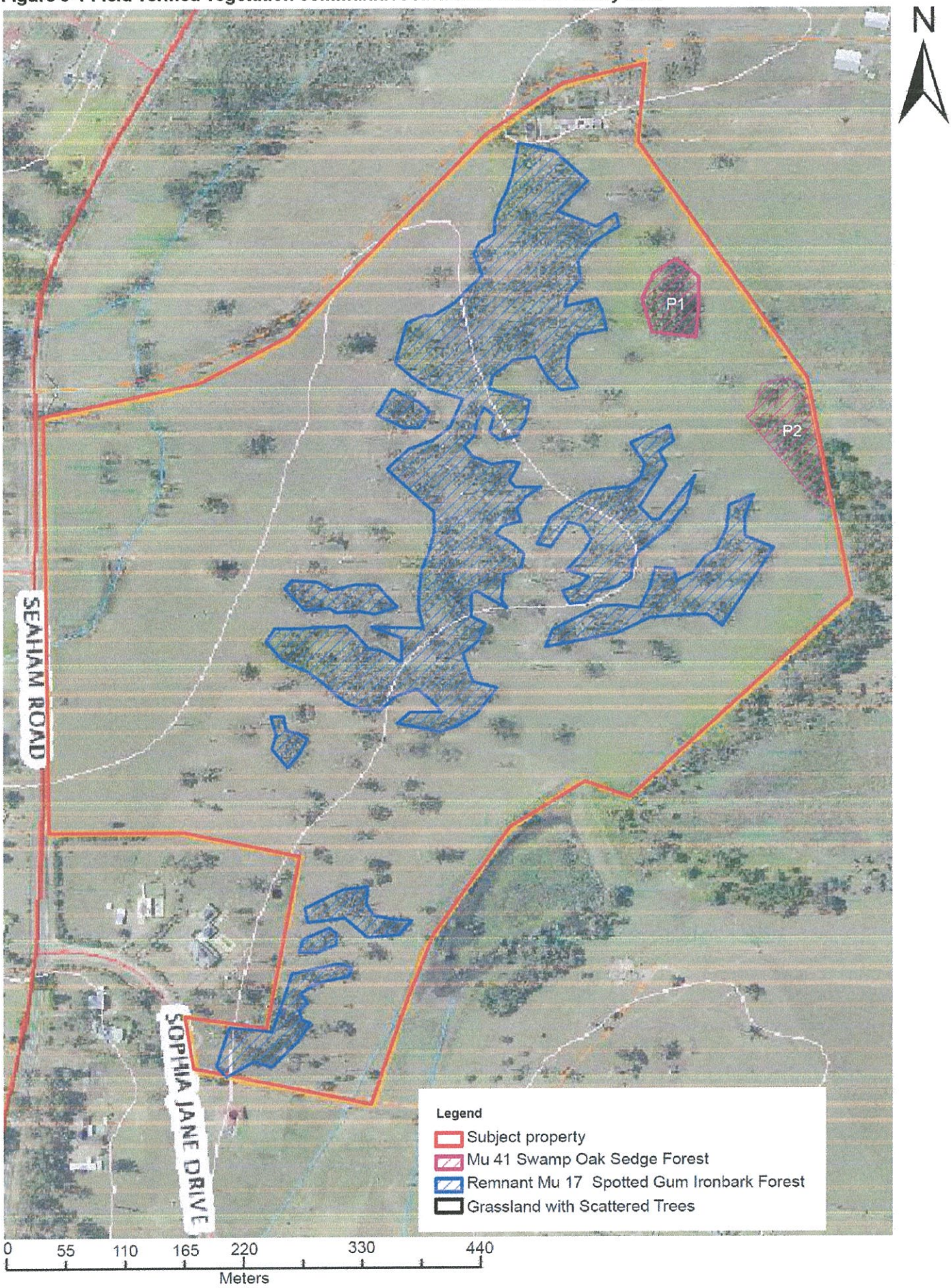
One vegetation mapping project has mapped vegetation within the Port Stephens LGA, Lower Hunter and Central Coast Regional Environment Management Strategy Vegetation Survey, Classification and Mapping; Lower Hunter and Central Coast Region (LHCCREMS) (Lower Hunter and Central Coast Regional Environmental Management Strategy 2000).

The vegetation within the study area was ground-truthed and vegetation was assigned to vegetation map unit identified under the vegetation mapping project (LHCCREMS) (NPWS 2002).

3.2 Vegetation communities

Three vegetation communities were identified within the study area during the site surveys: Mu 41 Swamp Oak Sedge Forest, Remnant Map unit 17 Spotted Gum Ironbark Forest & Grassland with Scattered Trees. Detailed descriptions of these communities have been provided below.

Figure 3-1 Field verified vegetation communities identified from the study area



3.2.1 Remnant Mu 17 Spotted Gum-Ironbark Forest

In order to determine the occurrence of the Remnant Mu 17 Spotted Gum-Ironbark Forest (RSGIF) within the study area which was restricted to remnant trees and residual native species within the canopy drip line the tree protection zones of all canopy trees was calculated. The RSGIF community was found to occupy approximately 4.6ha or 10% of the study area (Figure 3-1).

This community has been subject to past clearing of canopy, shrub and ground vegetation. Quadrats 1, 5 & 6 are considered to be representative of this community (Appendix A). The understorey within this community is regularly maintained through cattle grazing & slashing ; despite this the RSGIF community still retains native groundcover species within a highly modified landscape. This community was assessed as being in a poor/moderate condition (Table 2-4).

Community Description

Canopy

Tree species commonly encountered were *Corymbia maculata* (Spotted Gum) and *Eucalyptus paniculata* (Grey Ironbark) with the occasional occurrence of *Eucalyptus globoidea* (White Mahogany).

White Stringybark . The canopy ranged in height from approximately 12-28m tall with a projected foliage cover of >5%-25%.

Shrub layer

Shrubs were sparse to absent within this community with two *Daviesia ulicifolia* (Gorse Bitter Pea), two *Gonocarpus teucrioides* & four *Goodenia heterophylla* (Variable-leaved Goodenia) being recorded. One noxious weed *Lantana camara* (Lantana) was occasionally recorded; most specimens were small to a height of 0.5m. The shrub layer ranged in height from approximately 0.5-1.5m with a projected foliage cover of >5%.

Ground understorey

The understorey was dominated by exotic *Paspalum dilatatum* (Paspalum), *Verbena brasiliensis* (Veined Verbena), Kikuyu (*Pennisetum clandestinum*), *Conyza albida* (Tall Fleabane), *Plantago lanceolata* (Lamb's Tongues), *Sida rhombifolia* (Paddy's Lucerne) & *Taraxacum officinale* (Dandelion).

The following native species: *Imperata cylindrica* (Blady Grass), *Dichondra repens* (Kidney Weed), *Pratia purpurascens* (Whiteroot), *Oplismenus imbecillus* (Basket Grass), *Cynodon dactylon* (Common Couch) and climbing species *Hardenbergia violaceae* (Native Violet) & *Glycine clandestina* were frequently recorded around the trunk of remnant trees.

Native species recorded scattered sparsely within the understorey of this community include: *Cymbopogon refractus* (Barbed Wire Grass), *Arthropodium milleflorum* (Vanilla Lily), *Commelina cyanea* (Native Wandering Jew), *Convolvulus erubescens, Entolasia stricta* (Wiry Panic), *Lobelia anceps, Vittadinia cuneata* (Fuzzweed), *Bulbine bulbosa* (Bulbine Lily). *Laxmannia gracilis, Hypoxis hygrometrica* (Golden Weather-grass) & *Oxalis perennans.*

The ground layer was to a height of approximately 0.1-1.5m with a projected foliage cover of 65-85%. Over 90% of the understorey of this community was dominated by exotic grasses and herbaceous weed species.

Photograph 3-1 Remnant Mu 17 Spotted Gum-Ironbark Forest within the study area

Photograph 3-2 Remnant Mu 17 Spotted Gum-Ironbark Forest within the study area

3.2.2 Mu 41 Swamp Oak Sedge Forest

Mu 41 Swamp Oak Sedge Forest community (SOSF) community was found to occupy approximately 0.7ha or 1.75% of the study area (Figure 3-1). Swamp Oak Sedge Forest community occupied two patches identified as patches 1 & 2 (Figure 3-1). Quadrats 3 & 4 are considered to be representative of this community (Appendix A). This community was assessed as being in a poor/moderate condition (Table 2-4).

Canopy

The canopy within patch 1 (P1) was dominated by *Eucalyptus tereticornis* (Forest Red Gum) (Photograph 3-1) whilst the canopy within patch 2 (P2) was dominated by *Casuarina glauca* (Swamp Oak) (Photograph 3-2) with the occasional occurrence of *Melaleuca linarifolia* (Snow in Summer) & *Melaleuca styphelioides* (Prickly Paperbark). Canopy trees ranged in height from 17-5m with a projected foliage cover of the canopy ranged from 25-40%, with a higher projected foliage cover (PFC) within P1 which had numerous stems of Forest Red Gums clumped together.

Shrub

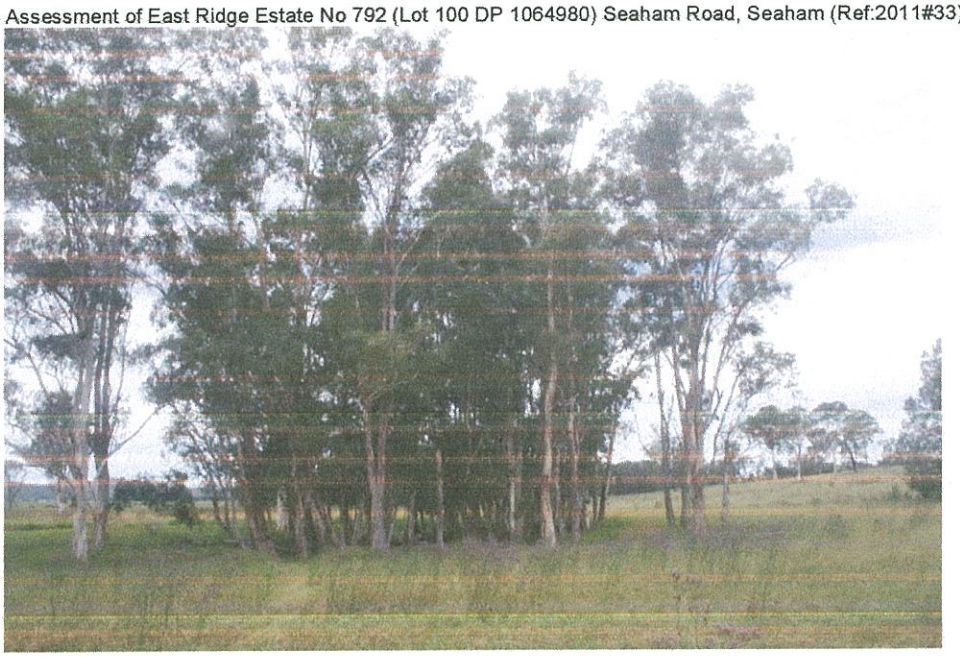
Shrubs were sparse to absent within this community with only the occasional occurrence of *Einadia hastata* (Berry Saltbush) being recorded from P2. Scattered shrubs were to a height of 0.4m with a PFC >5%.

Groundcover

The groundcover within P1 was dominated by a monoculture of *Carex appressa* (Tussock Sedge), *Paspalum dilatatum* (Paspalum) & *Verbena brasiliensis* (Veined Verbena) occurring at the edge of the patch. P1 was inundated with water at the time of the survey & contained areas dominated by *Eichhornia crassipes* (Water Hyacinth). Water Hyacinth dominated the dam which is located on the eastern side of P1.

P2 was dominated by the following exotic grasses and herbaceous weed species: *Paspalum dilatatum* (Paspalum), *Conyza albida* (Tall Fleabane), *Sida rhombifolia* (Paddy's Lucerne), *Ehrharta erecta* (Panic Veldtgrass), *Verbena brasiliensis* (Veined Verbena) & *Solanum nigrum* (Black Nightshade). The following native species: were recorded at times however were in low number: Dichondra repens (Kidney Weed), *Commelina cyanea* (Native Wandering Jew), & *Alternanthera denticulata* (Lesser Joyweed).

The following native climbing species: *Marsdenia suaveolens* (Scented Marsdenia) & *Parsonsia straminea* (Common Silkpod) were also recorded from this community.



Photograph 3-3 Mu 41 Swamp Oak Sedge Forest within patch 1

Photograph 3-4 Mu 41 Swamp Oak Sedge Forest within patch 2

3.2.3 Grassland with Scattered Trees

The Grassland with Scattered Trees (GST) community was found to occupy approximately 38.7 ha or 88% of the study area (Figure 3-1). This community is a result of past clearing works which has resulted in large areas once occupied by forest now dominated by exotic pasture grasses or weeds. Quadrat 2 was considered to be representative of this community (Appendix A). This community was assessed as being in a poor condition (Table 2-4).

Community Description

Canopy

Tree species commonly encountered were *Corymbia maculata* (Spotted Gum) and *Eucalyptus paniculata* (Grey Ironbark). The canopy ranged in height from approximately 19-28m tall with a projected foliage cover of >5%.

Shrub layer

No native shrub layer was recorded from this community.

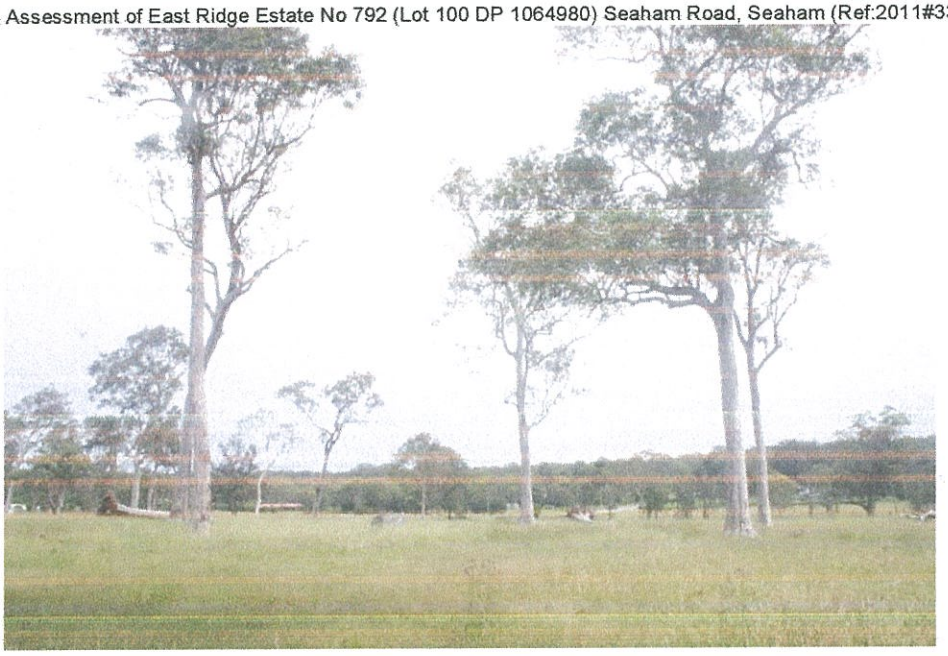
Ground understorey

The understorey was dominated by *Paspalum dilatatum* (Paspalum), *Verbena brasiliensis* (Veined Verbena), Kikuyu (*Pennisetum clandestinum*), *Conyza albida* (Tall Fleabane), *Senecio madagascariensis* (Fireweed), *Plantago lanceolata* (Lamb's Tongues), *Sida rhombifolia* (Paddy's Lucerne), *Taraxacum officinale* (Dandelion) and *Bidens pilosa* (Cobbler's Pegs).

The following native species: *Dichondra repens* (Kidney Weed), *Pratia purpurascens* (Whiteroot), *Oplismenus imbecillus* (Basket Grass), *Cynodon dactylon* (Common Couch) and climbing species *Hardenbergia violaceae* (Native Violet) & *Glycine clandestina* were occasional recorded around the trunk of remnant native trees.

Native species recorded scattered sparsely within the exotic grassland include: *Cymbopogon refractus* (Barbed Wire Grass), *Arthropodium milleflorum* (Vanilla Lily), *Commelina cyanea* (Native Wandering Jew), *Convolvulus erubescens, Lobelia anceps, Vittadinia cuneata* (Fuzzweed), *Bulbine bulbosa* (Bulbine Lily). *Laxmannia gracilis, Hypoxis hygrometrica* (Golden Weather-grass) & *Oxalis perennans.*

The ground layer was to a height of approximately 0.1-1.5m with a projected foliage cover of 80-100%.



Photograph 3-5 Grassland with Scattered Trees Community within the study area

Photograph 3-6 Grassland with Scattered Trees Community within the study area

3.3 Species of plant

A total of 102 species of plant was recorded from the study area, of which 70 species (68%) were native (Appendix A). The most diverse families recorded from the study area were Poaceae with 12 species & Myrtaceae with 8 species (Appendix A).

Thirty-two species of weed were recorded from the study area, only one of these weed species (*Lantana camara*) Lantana is listed under the *Noxious Weeds Act 1993.* Lantana (*Lantana camara*) is also listed as a Weed of National Significance (Thorp and Lynch 2000).

Table 3-1 Noxious weed recorded within the study area

Weed	Class	Legal requirements
Lantana (*Lantana) species)**	5	The requirements in the *Noxious Weeds Act* 1993 for a notifiable weed must be complied with. This is an All of NSW declaration. The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed.

Note: * Weeds of National Significance (Thorp and Lynch 2000)

3.4 Species of animal

3.4.1 Amphibians

Four common species of frog were identified from calls outside the area subject to tree thinning works during targeted surveys. The Dwarf Tree Frog (*Litoria fallax*), Pearson's Tree Frog (*Litoria peronii),* Striped-marsh Frog (*Limnodynastes peronii*) and the Common Eastern Froglet (*Crinia signifera*) were all recorded from the study area. All frogs were heard calling within and around Little Jilliby Creek within the eastern portion of the study area. No amphibious breeding habitats were identified within the area subject to impacts from the proposal.

The threatened Green & Golden Bell Frog (*Litoria aurea*) & Wallum Froglet (*Crinia tinnula*) were both targeted despite the absence of suitable habitats within the study area, no suitable amphibian habitat is proposed to be removed as a result of the proposed development. All frogs were recorded calling from Map unit 41 Swamp Oak Sedge Forest community, the greater number of frogs were recorded from the small dam on the eastern side of patch 1 (Figure 3-1).

3.4.2 Reptiles

Three common species of reptile were identified within the study area these were the Garden Skink (*Lampropholis guichenoti*), the Eastern Water Skink (*Eulamprus quoyii*) & the Red-bellied Black Snake (*Pseudechis porphyriacus*) which was observed within patch 1 adjacent to the dam.

3.4.3 Birds

Thirty species of bird were identified within the study area (Appendix B).

The vegetation within the site provides a limited range of foraging opportunities for birds but despite this at the time of the bird survey a number of bird species were recorded from the study area. The majority of birds identified during the surveys were recorded within large Spotted Gums from the Remnant Spotted Gum Ironbark Forest & Grassland within Scattered Trees communities.

The large over-mature Spotted Gums contained numerous hollows which provided suitable breeding habitat for numerous Sulphur Crested Cockatoo (*Cacatua galerita*), Rainbow Lorikeet (*Trichoglossus haematodus*) and the Short-billed Corella (*Cacatua sanguinea*) which were observed in high numbers at the time of the site inspections.

No Glossy Black-cockatoo (*Calyptorhynchus lathami*) chew sites were identified during the surveys within the study area despite the presence of fruiting *Casuarina glauca* (Swamp Oak) within the Swamp Oak Sedge Forest community more specifically within patch 2 (Figure 3-1).

3.4.4 Mammals

The targeted surveys resulted in the identification of seven species of mammal within the study area these were the Introduced Black Rat (*Rattus rattus*), Cow (*Bos taurus*) & the Horse (*Equus caballus*).

Native mammal recorded during the surveys was the eastern grey kangaroo (*Macropus giganteus*), White-striped freetail bat (*Austronomus australis*), Chocolate Wattled Bat (*Chalinolobus morio*), Gould's Wattled Bat (*Chalinolobus gouldii*).

The blossoms of the canopy trees within the study area provides suitable foraging resources for the Grey-headed Flying-fox (*Pteropus poliocephalus*), this species was however not recorded within the study area at the time of the surveys.

No suitable cave site for threatened cave dwelling bats was recorded from the study area. No Threatened microbats were recorded within the study area despite targeted surveys being conducted. A number of hollow-bearing trees were identified within the study area which would provide suitable roosting habitat for the following microbat species: the Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) & the Greater Broad-nosed Bat, (*Scoteanax rueppellii*).

3.4.5 Fauna habitat types

The suitability, size and configuration of the terrestrial fauna habitats were found to correlate broadly with the structure, floristics, connectivity and quality of the local vegetation communities described above.

The condition class of the habitats within the majority of the Map unit 41 Swamp Oak Sedge Forest, Remnant Map unit 17 Spotted Gum Ironbark Forest & the Grassland with Scattered Trees was assessed as being in poor condition and provided limited habitat value, whilst it is recognised that large remnant Spotted Gums do provide suitable nesting habitat for common species of bird and potential rooting sites for threatened species of microbats.

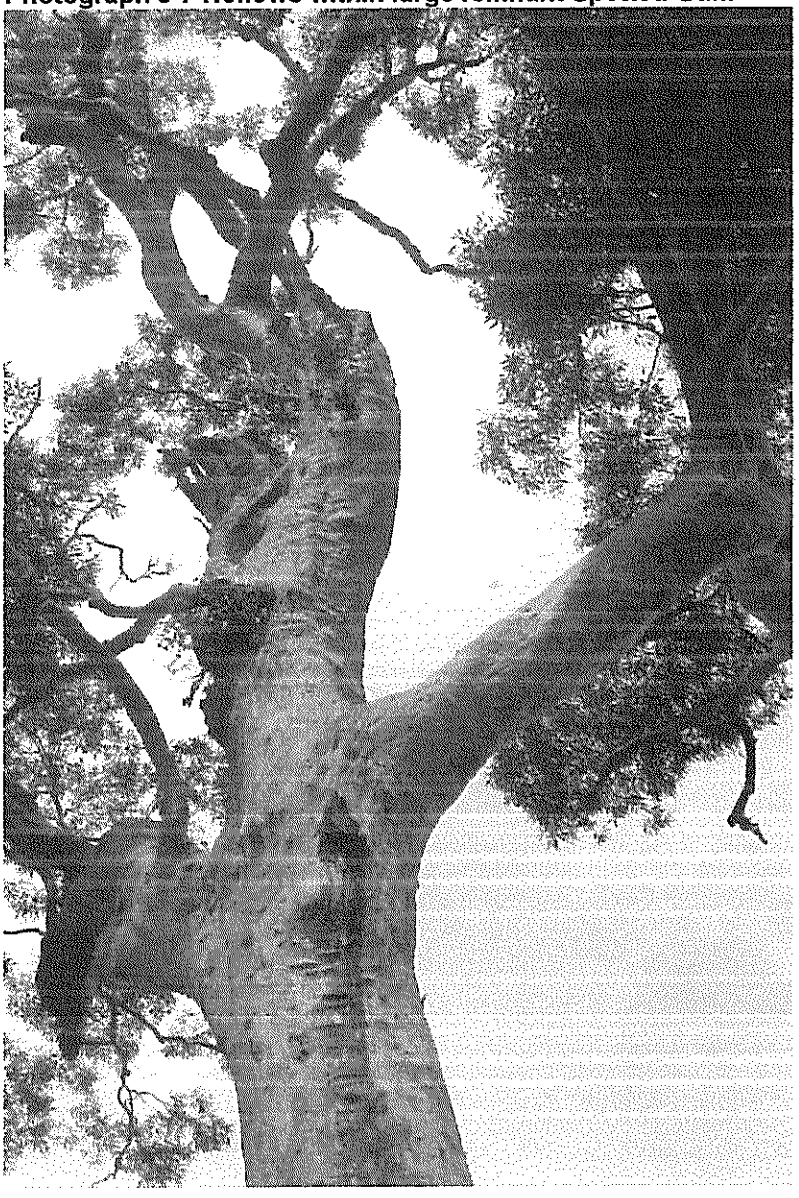
3.4.6 Fauna microhabitat features

Tree hollows

Hollows develop in *Eucalypts* when the tree is under some form of stress, heartwood decay is present and the tree is sufficiently large to persist when decayed (Gibbons and Lindenmayer 2002). As such, hollows are more likely to occur in older and larger trees; however the abundance and size of hollows may vary within and between species.

Tree hollows typically provide den and nesting habitat for a range of common birds and arboreal mammal species (Gibbons and Lindenmayer 2002), including providing potential habitat for a number of Threatened species including microchiropteran bats and large forest owls. Whether or not tree hollows are used by animals, and which species use them, depends on a number of factors, including hollow characteristics (diameter, height, depth), the number of hollows in a tree, tree health, size, location and spacing (Gibbons and Lindenmayer 2002).

Photograph 3-7 Hollows within large remnant Spotted Gum



Feeding resources

Fauna occurring in the project locality are likely to use a range of foraging resources including both native and exotic species. A number of floral feeding resources were found to be available that would provide important foraging resources for a range of fauna including many of the species of bird recorded and the Threatened Grey-headed Flying-fox.

Flora feeding resources can be divided into blossoms, fruits (casuals, berries and drupes) and seeds. The dominant families providing these resources within the study area include:

- Blossoms (nectar and pollen): Myrtaceae
- Fruits: Pittosporaceae, Solanaceae, Verbenaceae.
- Seed: Poaceae, Lomandraceae, Casuarinaceae, Myrtaceae, Fabaceae (Faboideae and Mimosoideae).

The low diversity of species across these families provides very limited foraging opportunities and would not support fauna species seasonally due to low diversity. At most foraging habitat would be transient for most species of animal. During spring and summer when floral resource availability peaks, it is likely that other migratory and more transient species also frequent the locality for foraging.

The floral resources within the study area (including vegetative matter) are also likely to support invertebrates, which in-turn provide an addition foraging resource for insectivorous fauna (e.g. birds and microbats).

Fallen timber & bark

Fallen branches and bark occur at time within the Remnant Spotted Gum Ironbark Forest community and provide a potential refuge habitat for small garden skinks and invertebrates which rely on these moisture-retaining micro-habitats.

3.5 Koala Habitat Assessment

One Koala food tree (*Eucalyptus tereticornis*) Forest Red Gum listed on Schedule 2 of State Environmental Planning Policy No. 44 - Koala Habitat Protection, was observed within the study area. Patch 1 (Figure 3-1) which comprises part of the Swamp Oak Sedge Forest community contained Forest Red Gums however the presence of this species across the entire study area was less than the 15% density of food trees indicated by SEPP 44 for classification as Potential Koala Habitat. Therefore the study area is not considered to contain 'Potential Koala Habitat' as defined by SEPP 44. All Forest Red Gums are to be retained within the study area.

No Koalas were observed during the fauna survey and there was no evidence (Scats or scratches) of previous Koala habitation in the area. The study area is also not considered to be 'Core Koala Habitat' as defined by SEPP 44.

As such the study area is not considered to comprise Potential Koala Habitat as defined under SEPP 44 and no further assessment under this Policy is required.

3.6 Threatened biodiversity

This section details the threatened biodiversity recorded or likely to occur within the study area. This is based on those species recorded or predicted to occur within the locality from database searches (Table 2-1) and the nature of the habitats observed within the vicinity of the proposed works during field surveys (Appendices C and D).

For those species, populations and communities with a low/medium, medium or high likelihood of occurrence within the study area, an impact of significance assessment has been prepared (Appendices E & F).

3.6.1 Threatened ecological communities

Eleven endangered ecological communities were identified from desktop review to occur within the Port Stephens LGA (Table 3-2).

Table 3-2 Endangered Ecological Communities known from the Locality

Scientific Name	Common Name
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Coastal Saltmarsh
Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Freshwater wetlands on coastal floodplains
Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions	Hunter Lowland Redgum Forest
Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions
Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion	Lower Hunter Spotted Gum - Ironbark Forest
Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	Lowland Rainforest
River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	River-Flat Eucalypt Forest on Coastal Floodplains
Sub-tropical Coastal Floodplain Forest of the NSW North Coast Bioregion	Sub-tropical Coastal Floodplain Forest
Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	Swamp oak floodplain forest
Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Swamp sclerophyll forest on coastal floodplains
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Sydney Freshwater Wetlands in the Sydney Basin Bioregion

Two endangered ecological communities listed under the TSC Act under were identified from the study area. Map unit 41 Swamp Oak Sedge Forest community was considered to be commensurate with the EEC River-Flat Eucalypt Forest on Coastal Floodplains. The remnant Map unit 17 Spotted Gum Ironbark Forest community was considered to be representative of Lower Hunter Spotted Gum Ironbark Forest EEC.

No impact assessment is considered to be warranted for the River-flat Eucalypt Forest EEC which is to be retained wholly within the study area. Due to impacts upon Lower Hunter Spotted Gum Ironbark Forest EEC an impact assessment has been prepared (Appendix E)

No endangered ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* was recorded from the study area or immediately adjacent.

3.6.2 Endangered populations

One threatened populations was identified within the Port Stephens LGA from the desktop review:

- Koala population in the Hawks Nest and Tea Gardens area

The endangered Koala population listing is only for the Hawks Nest and Tea Gardens area. No endangered populations were identified nor were the habitats which were identified within the study area considered to be suitable for the aforementioned populations.

3.6.3 Threatened Flora

Fourteen threatened flora species were identified as a result of the database searches within the locality of the study area (Table 7-3 of Appendix A).

Four Rare or Threatened Australian Plants (ROTAP) species were identified within a 10km locality of the study area (Royal Botanic Gardens 2011). No ROTAP species were identified within the study area despite targeted surveys being undertaken.

Table 3-3 ROTAP species recorded within a 10km locality of the study area

Family Name	Species Name	Suitable Habitat within the Study Area
Myrtaceae	*Eucalyptus glaucina*	Yes, however this species was not detected despite targeted surveys being undertaken.
Polygonaceae	*Persicaria elatior*	Yes, however this species was not detected despite targeted surveys being undertaken.
Proteaceae	*Persoonia daphnoides*	No
Zamiaceae	*Macrozamia flexuosa*	No

3.6.4 Threatened fauna

Fifty threatened fauna species were identified as a result of the database searches (Table 2-1) as occurring or having potential to occur within the locality of the study area (Table 7-4 of Appendix D).

Based on the habitat assessment and targeted surveys undertaken throughout the study area there is potential habitat within the study area for ten threatened fauna species that may be impacted through the removal of foraging/roosting habitat (Appendix D). Impact assessments have been prepared for these species (Appendices E & F).

3.6.5 Migratory species

Migratory species are protected under the international agreement to which Australia is a signatory, including the Japan-Australia Migratory Bird Agreement, the China-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered Matters of National Environmental Significance and are protected under the *Environment Protection and Biodiversity Conservation Act 1999.*

Seven migratory species were identified from the Department of Sustainability Environment Water Population and Communities Protected Matters Search Tool (Department of Sustainability, Environment, Water, Population and Communities 2011) within the locality (Appendix D). None were recorded during the site inspections. Only the Swift Parrot (*Lathamus discolor*) was considered to have suitable habitat from the study area.

The study area is not considered to provide important habitat for any Migratory species in accordance with the EPBC Act.

3.7 Critical habitat

Critical habitat is listed under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999.* Critical habitat is the whole or any part or parts of an area or areas of land comprising the habitat of an endangered species, an endangered population or an endangered ecological community that is critical to the survival of the species, population or ecological community (Department of Environment and Conservation 2004).

The Directors-Generals of both the State and Federal departments of environment (Office of Environment & Heritage and the Department of Sustainability Environment Water Population and Communities respectively) maintain a register of critical habitat. Habitat that is not listed on these register, however consistent with the definition above, may also be considered as critical habitat.

No listed critical habitat occurs within the study area and no critical habitat is likely to be affected by the proposal.

4. Impacts

The following discussion presents an assessment of the potential impacts of the proposal on biodiversity within the study area.

4.1 Impacts on threatened species or populations

One threatened flora species-*Melaleuca biconvexa*, two endangered ecological-River Flat Eucalypt Forest on Coastal Floodplains & Lower Hunter Spotted Gum Ironbark Forest and ten threatened fauna species listed under the *TSC Act* and/ or the *EPBC Act* were recorded, predicted to occur, or have habitat within the vicinity (10 km radius) of the study area. Impact assessments have been prepared which has concluded that the proposal is not likely to have a significant impact upon threatened species, endangered populations or endangered ecological communities (Appendices E & F).

4.2 Key threatening processes

Key Threatening Process under the *Threatened Species Conservation Act* (NSW National Parks and Wildlife Service 2003) that are likely to further increase within the study area are:

- Clearing of native vegetation.
- Invasion of native plant communities by exotic perennial grasses.
- Removal of hollow-bearing trees
- Removal of Dead Wood.
- Infection of native plants by *Phytophthora cinnamomi* - key threatening process listing. The proposal has potential to introduce or spread *Phytophthora cinnamomi* within the development area and into adjacent bushland. Mitigations measures are to be implemented to prevent spread of *Phytophthora cinnamomi*. Mitigation measures have been put in place to reduce the chance of infection of *Phytophthora cinnamomi* into the study area.
- Human Caused Climate Change.

The proposal is unlikely to exacerbate the following key-threatening processes within the site such that they are likely to result in detrimental impacts upon threatened species, endangered populations or endangered ecological communities listed under the TSC Act.

4.3 Mitigation measures

4.3.1 Nest boxes

A range of next boxes should be installed within trees which are to be retained, to compensate for the loss of hollow-bearing trees from within the study area. Hollows should be replaced at 1 nest box per hollow removed. A number of wildlife nest boxes e.g. rnicrobat, possum and bird nest boxes are required. Designs and commercially made boxes are available on the web.

4.3.2 Fencing of the construction zone

When accessing the site, contractors are to use only the designated access roads. Suitable fixed fencing (e.g. three strand stock fencing) and colour tape or Para-webbing should be used to delineate the maximum allowable extent of areas of tree protection zones (TPZ) to be impacted upon by roads during construction. If any tape is disturbed, it is to be immediately replaced along the appropriate alignment.

Fences and para-webbing delineating the areas of vegetation subject property subject to impacts from the installation of roads. If any of these barriers are disturbed, they are to be repaired or replaced as soon as practicable.

4.3.3 Animal welfare

Animal injury has potential to occur throughout various construction operations. In the event that any sick, injured or orphaned native animals are located during construction, WIRES should be contacted to assist in capture, handling and welfare of the animal (contact No: 13000 WIRES or 1300 094 737).

A suitably qualified ecologist or wildlife handler should be on site during the felling of trees. Where possible, dead wood should be salvaged from felled trees and mounted into retained vegetation within the study area.

4.3.4 Truck and machine wash down areas

Vehicles and other equipment to be used in clearing works (such as excavators, bull dozer, chipper etc) are to be received completely free of soil, seeds and plant material before entering the subject property to prevent the introduction of exotic plant species and pathogens. Equipment failing inspection should be sent away for cleaning. Appropriate records of inspections shall be maintained.

Build ups of mud, soil and organic matter present on vehicles during wet and muddy conditions shall be manually removed prior to vehicles entering/leaving the subject property.

4.3.5 Vegetation Management Plan

A vegetation management plan should be prepared to compensate the loss of vegetation and promote habitat for threatened species within the study area. The VMP should focus on regeneration of drainage lines to the east and west and contain an area within the Open Space area to be regenerated as Lower Hunter Spotted Gum Ironbark Forest. Regeneration areas should be planted out using plant material propagated from the site and locality (5km). The VMP should be prepared prior to the release of the subdivision certificate as a condition of consent for the proposed development. Plant material should be sourced prior to the CC being released for the subdivision.

The VMP will address specifically the following items below:

- Preparation of a site plan at an appropriate scale, showing the location of various management zones & dominant weed infestations in each zone.
- Production of a VMP stating the background, for a three year schedule of VMP works including methodology for future re-vegetation, regeneration and maintenance weed control of areas.
- Species selection for replanting
- Minimum diversity of species to be replanted, by strata (below)
- Unique density requirements for each strata (groundcovers, midstorey and canopy)
- Provenance of plantings
- Weed removal and control program
- Ways to incorporate habitat enhancing features for wildlife e.q, microbat, possum and bird nest boxes into the design of the project, including numbers and locations for these structures, are required. Designs and commercially made boxes are available on the web,

5. Significance Assessments

Projects assessed under the *Environmental Planning and Assessment Act 1979* should consider the significance of impacts and the Department of Environment and Climate Change's *Threatened species assessment guidelines- The assessment of significance* (2007). The factors for consideration under this assessment address the likelihood and significance of the impacts on threatened species life cycle, habitat and recovery.

Threatened biodiversity listed under the *Environment Protection and Biodiversity Conservation Act 1999* are required to be assessed following the *Principal Significant Impact Guidelines* (Department of the Environment and Heritage 2005). The factors for consideration under this assessment include considerable overlap with the state significance assessments. This assessment however also addresses conservation status, population size and area of occupancy, likelihood of the establishment of invasive species of introduction of disease in addition to species life cycle, habitat and recovery.

No endangered populations were identified within the study area during the current surveys that would be directly or indirectly affected by the proposal.

Ten threatened species of animal are considered likely to occur or utilise the foraging habitat intermediately within the study area (Appendices C & D).

Two endangered ecological communities both of which are under the TSC Act under were identified from the study area, Map unit 41 Swamp Oak Sedge Forest River-Flat was considered to be commensurate with the EEC Eucalypt Forest on Coastal Floodplains listed. The remnant Map unit 17 Spotted Gum Ironbark Forest community was considered to be representative of Lower Hunter Spotted Gum Ironbark Forest EEC.

Significance assessments for the EEC and threatened species concluded that the proposal is unlikely to result in a significant impact (refer Appendices E & F).

6. Conclusions

Two endangered ecological communities both of which are under the TSC Act under were identified from the study area, Map unit 41 Swamp Oak Sedge Forest River-Flat was considered to be commensurate with the EEC Eucalypt Forest on Coastal Floodplains listed. This EEC is to be retained wholly within the study area and is unlikely to be impacted upon from the upslope development. The remnant Map unit 17 Spotted Gum Ironbark Forest community was considered to be representative of Lower Hunter Spotted Gum Ironbark Forest EEC.

No suitable habitat for threatened flora species is to be impacted upon as a result of the proposal and no threatened flora species were detected despite targeted searches being undertaken throughout the study area.

Habitats within the study area are considered likely to support ten threatened species of animal including three species of bird & seven species of bat.

Significance assessments in accordance with section 5A of the *Environmental Planning and Assessment Act 1979* and *EPBC Act - Principal Significant Impact Guidelines 1.1. Matters of National Environmental Significance* (Department of the Environment and Heritage 2005) determined that the project was unlikely to result in a significant impact to any threatened biodiversity listed under the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999*.

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Appendix A

Species of flora recorded within the study area

Table 7-1 Flora species recorded within the study area

Family Name	Scientific Name	Common Name	Native	Q1	Q2	Q3	Q4	Q5	Q6	RM
Acanthaceae										
	Brunoniella australis	Blue Trumpet	Y	-	-	-	-	-	-	X
	Pseuderanthemum variabile	Pastel Flower	Y	-	-	-	-	-	-	X
Amaranthaceae										
	Alternanthera denticulata	Lesser Joyweed	Y	-	-	-	-	-	-	X
Anthericaceae										
	Arthropodium milleflorum	Vanilla Lily	Y	-	-	-	-	-	-	X
	Laxmannia gracilis		Y	-	-	-	-	-	-	X
	Thysanotus sp.		Y	-	-	-	-	-	-	X
	Tricoryne elatior	Yellow Autumn-lily	Y	-	-	-	-	-	-	X
Apiaceae										
	Centella asiatica	Pennywort	Y	-	-	-	-	-	-	X
	Hydrocotyle bonariensis		N	-	-	-	-	-	-	X
	Trachymene incisa		Y	-	-	-	-	-	-	X
Apocynaceae										
	Parsonsia straminea	Common Silkpod	Y	-	-	-	-	-	-	X
Asclepiadaceae										
	Marsdenia suaveolens	Scented Marsdenia	Y	-	-	-	-	-	-	X
Asparagaceae										
	Asparagus asparagoides		N	-	-	-	-	-	-	X
Asphodelaceae										
	Bulbine bulbosa	Bulbine Lily	Y	-	-	-	-	-	-	X
Asteraceae										
	Bidens pilosa	Cobbler's Pegs	N	-	-	-	-	-	-	X
	Brachycome angustifolia		Y	-	-	-	-	-	-	X
	Conyza albida	Tall Fleabane	N	-	-	-	-	-	-	X
	Hypochaeris radicata	Catsear	N	-	-	-	-	-	-	X
	Senecio madagascariensis	Fireweed	N	-	-	-	-	-	-	X
	Sonchus oleraceus	Common Sowthistle	N	-	-	-	-	-	-	X
	Vittadinia cuneata	Fuzzweed	Y	-	-	-	-	-	-	X
Campanulaceae										
	Wahlenbergia communis	Tufted Bluebell	Y	-	-	-	-	-	-	X
Casuarinaceae										
	Casuarina glauca	Swamp Oak	Y	-	-	-	-	-	-	X
Chenopodiaceae										
	Einadia hastata	Berry Saltbush	Y	-	-	-	-	-	-	X
Commelinaceae										
	Commelina cyanea	Native Wandering Jew	Y	-	-	-	-	-	-	X
	Murdannia graminea		Y	-	-	-	-	-	-	X
Convolvulaceae										
	Convolvulus erubescens		Y	-	-	-	-	-	-	X
	Dichondra repens	Kidney Weed	Y	-	-	-	-	-	-	X
Cyperaceae										
	Carex appressa	Tussock Sedge	Y	-	-	-	-	-	-	X
	Cyperus brevifolius		N	-	-	-	-	-	-	X
	Cyperus eragrostis	Umbrella Sedge	N	-	-	-	-	-	-	X
Fabaceae (Faboideae)										
	Daviesia leptophylla		Y	-	-	-	-	-	-	X
	Desmodium rhytidophyllum		Y	-	-	-	-	-	-	X
	Desmodium varians	Slender Tick-trefoil	Y	-	-	-	-	-	-	X
	Glycine clandestina		Y	-	-	-	-	-	-	X
	Glycine tabacina		Y	-	-	-	-	-	-	X
	Kennedia rubicunda	Red Kennedy Pea	Y	-	-	-	-	-	-	X
	Trifolium arvense	Haresfoot Clover	N	-	-	-	-	-	-	X
	Trifolium repens	White Clover	N	-	-	-	-	-	-	X

Family Name	Scientific Name	Common Name	Native	Q1	Q2	Q3	Q4	Q5	Q6	RM
Gentianaceae										
	Centaurium erythraea	Common Centaury	N	-	-	-	-	-	-	X
Geraniaceae										
	Geranium homeanum		Y	-	-	-	-	-	-	X
Goodeniaceae										
	Goodenia heterophylla	Variable Goodenia	Y	-	-	-	-	-	-	X
Haloragaceae										
	Gonocarpus micranthus		Y	-	-	-	-	-	-	X
	Gonocarpus teucrioides		Y	-	-	-	-	-	-	X
Hypoxidaceae										
	Hypoxis hygrometrica	Golden Weather-grass	Y	-	-	-	-	-	-	X
Iridaceae										
	Patersonia sericea		Y	-	-	-	-	-	-	X
Juncaceae										
	Juncus acutus		N	-	-	-	-	-	-	X
	Juncus cognatus		N	-	-	-	-	-	-	X
Lamiaceae										
	Lycopus australis	Australian Gipsywort	Y	-	-	-	-	-	-	X
Lobeliaceae										
	Lobelia anceps		Y	-	-	-	-	-	-	X
	Lobelia dentata		Y	-	-	-	-	-	-	X
	Pratia purpurascens	Whiteroot	Y	-	-	-	-	-	-	X
Lomandraceae										
	Lomandra longifolia	Spiny-headed Mat-rush	Y	-	-	-	-	-	-	X
Luzuriagaceae										
	Eustrephus latifolius	Wombat Berry	Y	-	-	-	-	-	-	X
Malvaceae										
	Sida rhombifolia	Paddy's Lucerne	N	-	-	-	-	-	-	X
Myrtaceae										
	Angophora costata	Sydney Red/Rusty Gum	Y	-	-	-	-	-	-	X
	Corymbia maculata		Y	-	-	-	-	-	-	X
	Eucalyptus crebra	Narrow-leaved Ironbark	Y	-	-	-	-	-	-	X
	Eucalyptus globoidea	White Mahogany	Y	-	-	-	-	-	-	X
	Eucalyptus paniculata	Grey Ironbark	Y	-	-	-	-	-	-	X
	Eucalyptus tereticornis	Forest Red Gum	Y	-	-	-	-	-	-	X
	Melaleuca linariifolia		Y	-	-	-	-	-	-	X
	Melaleuca styphelioides	Prickly-leaved Tea Tree	Y	-	-	-	-	-	-	X
Oleaceae										
	Olea europaea ssp. africana		N	-	-	-	-	-	-	X
Oxalidaceae										
	Oxalis corniculata	Creeping Oxalis	N	-	-	-	-	-	-	X
	Oxalis perennans		Y	-	-	-	-	-	-	X
Phormiaceae										
	Dianella caerulea		Y	-	-	-	-	-	-	X
Pittosporaceae										
	Pittosporum undulatum	Sweet Pittosporum	Y	-	-	-	-	-	-	X
Plantaginaceae										
	Plantago lanceolata	Lamb's Tongues	N	-	-	-	-	-	-	X
Poaceae										
	Bromus catharticus	Prairie Grass	N	-	-	-	-	-	-	X
	Cymbopogon refractus	Barbed Wire Grass	Y	-	-	-	-	-	-	X
	Echinopogon caespitosus		Y	-	-	-	-	-	-	X
	Echinopogon ovatus	Forest Hedgehog Grass	Y	-	-	-	-	-	-	X
	Ehrharta erecta	Panic Veldtgrass	N	-	-	-	-	-	-	X
	Entolasia stricta	Wiry Panic	Y	-	-	-	-	-	-	X
	Imperata cylindrica	Bladey Grass	Y	-	-	-	-	-	-	X

Family Name	Scientific Name	Common Name	Native	Q1	Q2	Q3	Q4	Q5	Q6	RM
	Lolium perenne	Perennial Ryegrass	N	-	-	-	-	-	-	X
	Microlaena stipoides		Y	-	-	-	-	-	-	X
	Oplismenus imbecillus	Basket Grass	Y	-	-	-	-	-	-	X
	Panicum simile	Two-colour Panic	Y	-	-	-	-	-	-	X
	Paspalum dilatatum	Paspalum	N	-	-	-	-	-	-	X
	Paspalum distichum	Water Couch	Y	-	-	-	-	-	-	X
	Pennisetum clandestinum	Kikuyu Grass	N	-	-	-	-	-	-	X
	Setaria sp.		Y	-	-	-	-	-	-	X
	Themeda australis	Kangaroo Grass	Y	-	-	-	-	-	-	X
Polygonaceae										
	Persicaria decipiens	Slender Knotweed	Y	-	-	-	-	-	-	X
	Persicaria hydropiper	Water Pepper	Y	-	-	-	-	-	-	X
	Rumex conglomeratus	Clustered Dock	N	-	-	-	-	-	-	X
	Rumex crispus	Curled Dock	N	-	-	-	-	-	-	X
Pontederiaceae										
	Eichhornia crassipes	Water Hyacinth	N	-	-	-	-	-	-	X
Primulaceae										
	Anagallis arvensis	Scarlet/Blue Pimpernel	N	-	-	-	-	-	-	X
Ranunculaceae										
	Ranunculus inundatus		Y	-	-	-	-	-	-	X
	Ranunculus plebeius		Y	-	-	-	-	-	-	X
Rubiaceae										
	Richardia brasiliensis	Mexican Clover	N	-	-	-	-	-	-	X
Scrophulariaceae										
	Veronica cineria	Trailing Speedwell	Y	-	-	-	-	-	-	X
Solanaceae										
	Solanum nigrum	Black-berry Nightshade	N	-	-	-	-	-	-	X
Verbenaceae										
	Lantana camara	Lantana	N	-	-	-	-	-	-	X
	Verbena bonariensis	Purpletop	N	-	-	-	-	-	-	X
	Verbena brasiliensis		N	-	-	-	-	-	-	X
	Verbena rigida	Veined Verbena	N	-	-	-	-	-	-	X
Violaceae										
	Viola hederacea		Y	-	-	-	-	-	-	X

KEY: **RM = Random Meander, (Cover/abundance scale 1-6)** 1=<5% - Rare or few individuals, 2=<5% - Common, 3= Cover >5% and <25%, 4= Cover <25% and <50%, 5= Cover >50% and <75%, 6= Cover >75%

APPENDIX D EPBC PROTECTED MATTERS SEARCH REPORT

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

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

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

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

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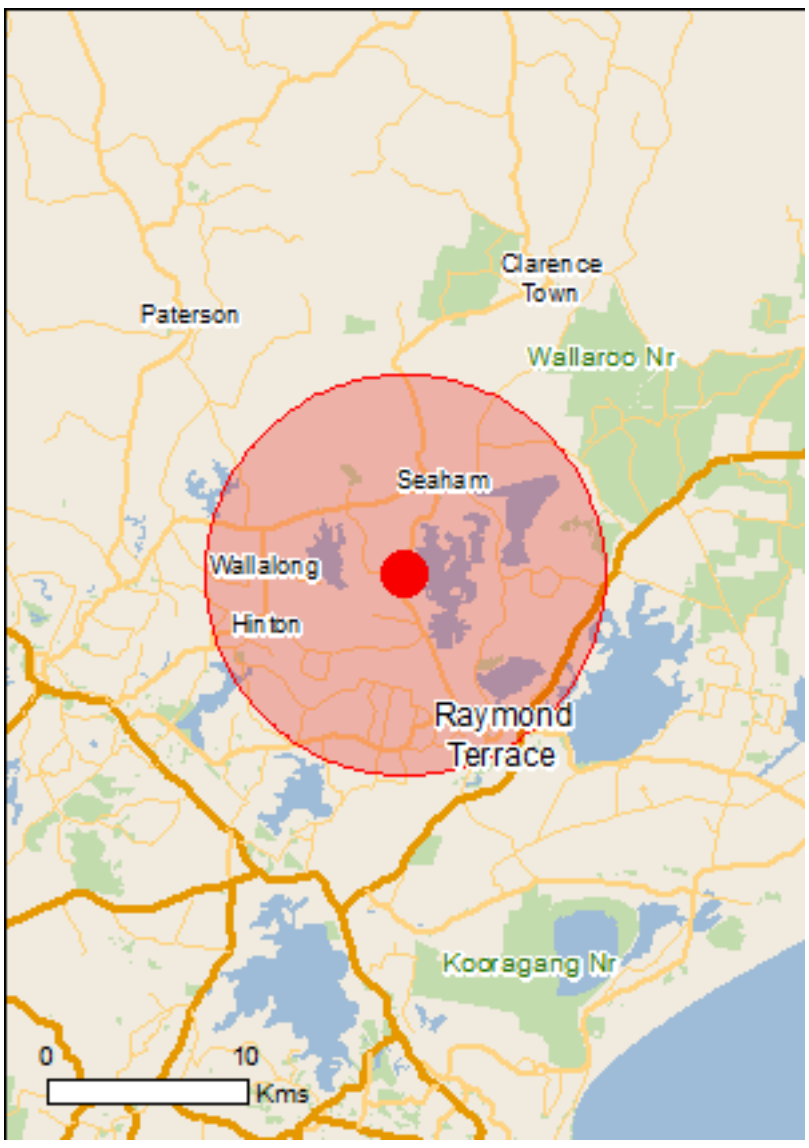

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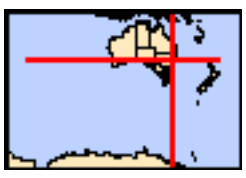

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	69
Listed Migratory Species:	40

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	7
Commonwealth Heritage Places:	None
Listed Marine Species:	46
Whales and Other Cetaceans:	1
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	2
Regional Forest Agreements:	1
Invasive Species:	44
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Hunter estuary wetlands	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus		
Hooded Plover (eastern), Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemelii		
Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus		
Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes balbus		
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Angophora inopina		
Charmhaven Apple [64832]	Vulnerable	Species or species habitat may occur within area
Arthraxon hispidus		
Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat known to occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat may occur within area
Commersonia prostrata Dwarf Kerrawang [87152]	Endangered	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus camfieldii Camfield's Stringybark [15460]	Vulnerable	Species or species habitat may occur within area
Eucalyptus glaucina Slaty Red Gum [5670]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus parramattensis subsp. decadens Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat known to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat may occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
[Tetratheca juncea](#) Black-eyed Susan [21407]	Vulnerable	Species or species habitat likely to occur within area
[Thesium australe](#) Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardenna grisea](#) Sooty Shearwater [82651]		Species or species habitat likely to occur within area
[Calonectris leucomelas](#) Streaked Shearwater [1077]		Species or species habitat known to occur within area
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea sanfordi](#) Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
[Thalassarche bulleri](#) Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita		
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Manta alfredi		
Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris		
Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sousa chinensis		
Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus		
Spectacled Monarch [610]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of War Service Homes
Commonwealth Land - Telstra Corporation Limited

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
[Thalassarche salvini](#)		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Thalassarche sp. nov.](#)		
Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
[Thalassarche steadi](#)		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Thinornis rubricollis rubricollis](#)		
Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat may occur within area
[Tringa nebularia](#)		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Reptiles		
[Caretta caretta](#)		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
[Chelonia mydas](#)		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
[Dermochelys coriacea](#)		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
[Eretmochelys imbricata](#)		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
[Natator depressus](#)		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
[Sousa chinensis](#)		
Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Seaham Swamp	NSW
Wallaroo	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
[North East NSW RFA](#)	New South Wales

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.69734 151.71309

Acknowledgements

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

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

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

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

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APPENDIX E PRELIMINARY BAM ASSESSMENT

The following provides details on the preliminary BAM assessment conducted for the site.

Native Vegetation

Pot-based Floristic Vegetation Surveys

Plot-based floristic vegetation surveys were conducted, in accordance with s.5.2.1.9 of the BAM. One 20 m x 20 m plot was sampled for the presence of flora species. At this preliminary stage, one plot was chosen to be representative of the entire plant community type, additional plots will be undertaken at the subdivision stage in accordance with the BAM.

According to the NSW PCT classifications in the BioNet Vegetation Classification, the site's vegetation communities would be most consistent with:

- PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest
    - Vegetation Formation: Dry Sclerophyll Forests (Shrub / grass sub-formation)
    - Vegetation Class: Hunter-Macleay Dry Sclerophyll Forests
    - TEC: Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions
    - Estimated cleared value: 48%

See previous Figure 3-2, in this report, for the distribution of the PCTs in the site.

Note that PCT 1731 Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley occurs within the site, however this plant community type will not be impacted by future development in the future because it will be retained due to it occurring in flood prone land. Plot-based floristic vegetation surveys will be undertaken in this plant community type in the future.

Vegetation Integrity Assessment

Vegetation Zones

For the purposes of the BAM, a vegetation zone is an area of native vegetation on the site that is the same PCT and has a similar broad condition state. The site's PCTs have been classed into the following vegetation zones (See previous Figure 3-2, in this report, for their distribution in the site):

- PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest

- Vegetation Zone 1 – Cleared and grazed understorey

Patch Sizes

A patch size area has been assigned to each vegetation zone, as a class. Patch size classes are provided in the table F1.

Table F1: Patch Size Classes

PCT	Vegetation Zone	Patch Size Class
PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	Vegetation Zone 1 – Cleared and grazed understorey	≥50 ha

Vegetation Integrity Scores

Each vegetation zone identified on the site has been surveyed to obtain a quantitative measure for each zone, of the composition, structure and function attributes listed in Table 3 of the BAM. These attributes are listed below:

- Growth form groups used to assess composition and structure:
  - Tree
  - Shrub
  - Grass and grass like
  - Forb
  - Fern
  - Other
- Attributes used to assess function:
  - Number of large trees
  - Tree regeneration
  - Tree stem size class
  - Total length of fallen logs
  - Litter cover
  - High threat exotic vegetation cover
  - Hollow-bearing trees

A Plot-based survey were conducted, in accordance with s.5.3.4 of the BAM. The survey plot was established around a central 50 m transect and included:

- One 400 m² (20 m x 20 m) plot to assess the composition and structure attributes listed above.

- One 1000 m² (20 m x 50 m) plot to assess the function attributes: number of large trees, stem size class, tree regeneration and length of logs.
- Five 1 m² sub-plots to assess average litter cover (and other optional groundcover components).

Table F2: Vegetation Integrity Scores

PCT	Vegetation Zone	Composition Condition Score	Structure Condition Score	Function Condition Score	Vegetation Integrity Score
PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	Vegetation Zone 1 – Cleared and grazed understorey	6.9	0.8	37.3	5.8

Threatened Species

Ecosystem Credit Species

Ecosystem credit species are those where the likelihood of occurrence of the species or elements of the species' habitat, can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. The Threatened Biodiversity Data Collection (TBCD) has identified several ecosystem credit species as requiring assessment, for the proposal; these are listed in Table F3.

Table F3: Habitat Suitability for Ecosystem Credit Species

Ecosystem Credit Species	Habitat Constraints / Geographic Limitations	Vegetation Zone (VZ) - Confirmed predicted species	Justification
Anthochaera phrygia Regent Honeyeater (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Callocephalon fimbriatum Gang-gang Cockatoo (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Calyptorhynchus lathami Glossy Black-Cockatoo (Foraging)	1. Presence of Allocasuarina and Casuarina species	Yes – PCT 1590 VZ1	N/A
Chthonicola sagittata Speckled Warbler	Nil	Yes – PCT 1590 VZ1	N/A
Climacteris picumnus victoriae	Nil	Yes – PCT 1590 VZ1	N/A

Brown Treecreeper (eastern subspecies)			
Daphoenositta chrysoptera Varied Sittella	Nil	Yes – PCT 1590 VZ1	N/A
Dasyurus maculatus Spotted-tailed Quoll	Nil	Yes – PCT 1590 VZ1	N/A
Glossopsitta pusilla Little Lorikeet	Nil	Yes – PCT 1590 VZ1	N/A
Grantiella picta Painted Honeyeater	1. Mistletoes present at a density of greater than five mistletoes per hectare	Yes – PCT 1590 VZ1	N/A
Haliaeetus leucogaster White-bellied Sea Eagle (foraging)	1. Waterbodies 2. Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	No - PCT 1590 VZ1	Habitat constraint absent
Hieraaetus morphnoides Little Eagle (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Lathamus discolor Swift Parrot (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Lophoictinia isura Square-tailed Kite (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Melanodryas cucullata cucullata Hooded Robin (south-eastern form)	Nil	Yes – PCT 1590 VZ1	N/A
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies)	Nil	Yes – PCT 1590 VZ1	N/A
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	Nil	Yes – PCT 1590 VZ1	N/A
Miniopterus australis Little Bentwing-bat (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Miniopterus orianae oceanensis Large Bentwing-bat (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Neophema pulchella Turquoise Parrot	Nil	Yes – PCT 1590 VZ1	N/A

Ninox connivens Barking Owl (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Ninox strenua Powerful Owl (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Petroica boodang Scarlet Robin	Nil	Yes – PCT 1590 VZ1	N/A
Phascolarctos cinereus Koala (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)	Nil	Yes – PCT 1590 VZ1	N/A
Pteropus poliocephalus Grey-headed Flying-fox (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	Nil	Yes – PCT 1590 VZ1	N/A
Stagonopleura guttata Diamond Firetail	Nil	Yes – PCT 1590 VZ1	N/A
Tyto novaehollandiae Masked Owl (Foraging)	Nil	Yes – PCT 1590 VZ1	N/A

Species Credit Species (Candidate Species)

Species credit species (or candidate species) are those where the likelihood of occurrence of the species or elements of suitable habitat for the species, cannot be confidently predicted by vegetation surrogates and landscape features and can be reliably detected by survey. The TBDC has identified several candidate species as requiring assessment, for the proposal. The habitat suitability for these candidate species has been assessed in accordance with s.6.4 of the BAM. See Table F4 for this assessment.

Table F4: Habitat Suitability for Candidate Species

Species Credit Species	Habitat Constraints / Geographic Limitations	Confirmed Candidate Species	Justification
Anthochaera phrygia Regent Honeyeater (Breeding)	1. As per mapped areas	No	Site not within mapped breeding area.
Burhinus grallarius Bush Stone-curlew	1. Fallen/standing dead timber including logs	No	Habitat degraded: the site is predominately cleared of native vegetation and consists of scattered remnant eucalypt paddock trees with a non-native pasture grass understory. The site is lacking fallen/standing timber.
Callistemon linearifolius Netted Bottlebrush	Nil	No	Was not recorded on site. The site is completely lacking any shrub layer.
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	1. Hollow bearing trees 2. Eucalypt tree species with hollows greater than 9 cm diameter	Yes – assumed presence	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	1. Hollow bearing trees 2. Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground	Yes – assumed presence	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Cercartetus nanus Eastern Pygmy-possum	Nil	Yes – assumed presence	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Cryptostylis hunteriana Leafless Tongue Orchid	Nil	No	Habitat degraded: the site is predominately cleared of native vegetation and consists of scattered remnant eucalypt paddock trees with a non-native pasture grass understory. The site lacks suitable habitat for this species.
Cynanchum elegans White-flowered Wax Plant	Nil	No	Was not recorded within the site
***Dromaius novaehollandiae* - endangered population**	1. Component of Subregion that occurs within NSW	Yes – assumed presence	Assumed presence for now - Targeted surveys will be undertaken to determine its presence

Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	North Coast Bioregion or Port Stephens LGA only		
Eucalyptus glaucina Slaty Red Gum	Nil	No	Was not recorded within the site
Grevillea parviflora subsp. parviflora Small-flower Grevillea	Nil	No	Was not recorded within the site
Hieraaetus morphnoides Little Eagle (Breeding)	1. Nest trees – live (occasionally dead) large old trees within vegetation	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Haliaeetus leucogaster White-bellied Sea Eagle (Breeding)	1. Living or dead mature trees within suitable vegetation within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines	No	Habitat constraints not present
Hoplocephalus bitorquatus Pale-headed Snake	Nil	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Lathamus discolor Swift Parrot (Breeding)	1. As per mapped areas	No	Habitat constraint not present – not within mapped area
Litoria aurea Green and Golden Bell Frog	1. Semi-permanent/ephemeral wet areas 2. Within 1km of wet areas|Swamps 3. Within 1km of swamp|Waterbodies 4. Within 1km of waterbody	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Litoria brevipalmata Green-thighed Frog	Nil	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence

Lophoictinia isura Square-tailed Kite (Breeding)	1. Nest Trees	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Miniopterus australis Little Bentwing-bat (Breeding)	1. Caves 2. Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' 3. observation type code 'E nest-roost' 4. with numbers of individuals >500	No	Habitat constraints not present: this species requires caves or similar structures (such as stormwater drains) for breeding (OEH, 2018). The site and immediate surrounding area do not contain caves or cave-like structures. The site does not contain breeding habitat.
Miniopterus orianae oceanensis Large Bentwing-bat (Breeding)	1. Caves 2. Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' 3. observation type code 'E nest-roost' 4. with numbers of individuals >500	No	Habitat constraints not present: this species requires caves or similar structures (such as stormwater drains) for breeding (OEH, 2018). The site and immediate surrounding area do not contain caves or cave-like structures. The site does not contain breeding habitat.
Myotis macropus Southern Myotis	1. Hollow bearing trees 2. Within 200 m of riparian zone	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence

	3. Bridges, caves or artificial structures within 200 m of riparian zone		
Ninox connivens Barking Owl (Breeding)	1. Hollow bearing trees 2. Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Ninox strenua Powerful Owl (Breeding)	1. Hollow bearing trees 2. Living or dead trees with hollow greater than 20cm diameter	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Ozothamnus tesselatus Ozothamnus tesselatus	Nil	No	Was not recorded within the site
Persoonia pauciflora North Rothbury Persoonia	1. Within 10 km of North Rothbury	No	Habitat constraint – The site is not within 10 km of North Rothbury
Petaurus norfolcensis Squirrel Glider	Nil	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Phascogale tapoatafa Brush-tailed Phascogale	Nil	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Phascolarctos cinereus Koala (Breeding)	Areas identified via survey as important habitat	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Planigale maculata Common Planigale	Nil	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Prostanthera cineolifera Singleton Mint Bush	Nil	No	Habitat degraded - Was not recorded within the site. The site is predominately cleared of native vegetation and consists of scattered remnant eucalypt paddock trees with a non-native pasture grass understory. The site lacks suitable habitat for this species.

Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	1. Breeding camps	No	Habitat constraints not present: no breeding camps occur in or immediately near the site.
Pterostylis chaetophora Pterostylis chaetophora	Nil	No	Was not recorded within the site
Rutidosis heterogama Heath Wrinklewort	Nil	No	Was not recorded within the site
Tetratheca juncea Black-eyed Susan	Nil	No	Was not recorded within the site
Tyto novaehollandiae Masked Owl (Breeding)	1. Hollow bearing trees 2. Living or dead trees with hollows greater than 20cm diameter	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence
Vespadelus troughtoni Eastern Cave Bat	1. Caves 2. Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, within 2 km of old mines, tunnels, old buildings or sheds	Yes	Assumed presence for now - Targeted surveys will be undertaken to determine its presence

Impacts Which Require an Offset

Tables F6 provide a summary of the impacts that require an offset, under the BAM.

Note that this is based on a preliminary flora plot and may be subject to change in the future; however, the vegetation is consistent across the entire site so it is likely that the below table will be very similar to the final BDAR.

Table F6: Vegetation Zones Requiring an Offset

PCT	Vegetation Zone	Area Impacted (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Number of Ecosystem Credits Required
PCT 1590 Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest	Vegetation Zone 1 – Cleared and grazed understorey	26	5.8	0	0

To note; impacts for candidate species (if any) will be determined following the final targeted surveys for candidate species.