Fraser Ecological Consulting

abn 797 637 40114

665 Scenic Road

Macmasters Beach NSW 2257

telephone 042323 8193

email alohafraser@gmail.com

Flora and Fauna Assessment

172-182 Boundary Road

GLOSSODIA

6th December 2015

SUMMARY

Fraser Ecological Consulting has been contracted by Premier Mushrooms Pty Ltd (on behalf of Urban City Consulting) to prepare an impact assessment of a proposed development on the terrestrial ecology located at 172-182 Boundary Road Glossodia in the Hawkesbury City local government area.

The assessment has been conducted in accordance with Commonwealth and State legislation.

Commonwealth legislation (Environment Protection and Biodiversity Conservation (EPBC) Act 1999) requires that actions judged to significantly impact upon matters of National Environmental Significance are to be assessed via a formal referral process. This assessment report determines whether a referral to be made to the Department of the Environment, Water, Heritage and the Arts for further assessment is required.

State legislation (*Environmental Planning and Assessment Act 1979*) requires that actions judged to significantly impact upon threatened species, populations or ecological communities, or their habitats listed under the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* trigger the preparation of a Species Impact Statement.

The subject site comprises cleared or modified rural land with occurrence of remnant trees that are consistent with a highly disturbed form of Shale Sandstone Transition Forest which is listed as a Critically Endangered Ecological Community and River Flat Eucalypt Forest Endangered Ecological Community, both of which are listed under the NSW *Threatened Species Conservation Act 1995*.

The major conclusion arising from this Flora and Fauna Impact Assessment is that the proposed works are unlikely to result in a significant impact on any listed species or communities. Therefore, in accordance with the EPA Act (1979), TSC Act (1995) and FM Act (1994), a Species Impact Statement is not required.

Disclaimer

This document may only be used for the purposes for which it was commissioned.

Fraser Ecological Consulting accepts no liability or responsibility in respect of any use or reliance upon this report by any third party.

Unauthorised use of this report in any form is prohibited.

Licensing

When conducting flora and fauna surveys, consultants are required to possess licences to ensure that works are completed in an appropriate manner. Fraser Ecological Consulting is licensed under s.132c and s.91 of the NSW National Parks and Wildlife Act (1974) from the NSW NPWS. This allows Alex Fraser to undertake scientific investigations, collect specimens of protected flora and fauna across NSW in service and non-service areas and undertake bushland restoration works in EECs. This licence requires that all survey results are reported to the NSW NPWS for inclusion into the Atlas of NSW Wildlife.

Alex Fraser also holds an Animal Research Authority under the Animal Research Act (1995), as administered by NSW Agriculture. Surveys are approved and supervised by an Animal Care and Ethics Committee, applying the standards as detailed in the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (NHMRC 1997).

Table of Contents

1. Introduction 6
1.1 Site characteristics 6
1.2 Climate 9
1.3 Geology 10
1.4 The proposed development 12
1.3.1. Description of the proposed development 12

2. Statutory Framework 13
2.1. Commonwealth 13
2.2 State 14

3. Methodology 18
3.1 Existing records 18
3.2 Desktop survey 18
3.3 Field Surveys 18
3.4 Assessment of conservation value 20

4. Site ecological values 21
4.1. Native vegetation community and plant species 21
4.3 Corridors and connectivity 36
4.4 Threatened species 36
4.4.1 Threatened flora 36
4.4.2 Threatened Fauna 36
4.4.3 SEPP 44 Koala Habitat Protection assessment 37
4.5 Consideration of threatening processes 39

5. Impacts of the proposed development 41

6. Environmental Protection Measures 43

7. Conclusion 46

8. References 47

APPENDIX 1: Threatened flora previously recorded within 10km of the site (Source: NSW Bionet accessed 19 June 2015) 50

APPENDIX 2: Threatened fauna previously recorded within 10km of the site (Source: NSW Bionet accessed 19 June 2015) 52

APPENDIX 3: Seven Part Tests 61

APPENDIX 4: NSW OEH information on Shale Sandstone Transition Forest Endangered Ecological Community 87

APPENDIX 5: NSW OEH information on River Flat Eucalypt Forest Endangered Ecological Community 88

APPENDIX 6: Results from EPBC Protected Matters Search Tool database 89

APPENDIX 7: QUALIFICATIONS & EXPERIENCE OF THE AUTHOR 90

1. Introduction

This flora and fauna assessment was commissioned by Premier Mushrooms Pty Ltd (on behalf of Urban City Consulting) to accompany the development application lodged with Hawkesbury City Council for 172-182 Boundary Road Glossodia (Lot 1 & 2 within DP 603811).

The data contained within this report was collected on the 24th May and 9th September 2015.

The flora and fauna assessment:

- Identifies key flora and fauna habitats within the subject site;
- Reviews literature and databases relevant to the subject site;
- Describes the methodology and results of the survey;
- Addresses potential impacts on flora and fauna and their habitats resulting from the proposed development;
- Proposes appropriate mitigation measures; and
- Provides an assessment of the likelihood of significant impacts on threatened species and populations, and endangered ecological communities, according to Section 5A of the NSW EPA Act, TSC ACT, Commonwealth EPBC Act. This was done to determine the need for an SIS or an application under the EPBC Act.

Activities specifically related to the preparation of this report included:

- Identification of weed and indigenous native species recorded from the subject site
- Assessment of impacts of the proposed development
- Outlining the applicant's responsibilities including weed control and environmental safeguards before, during and post construction.

The information within this report relies upon the survey and design plans to determine the full impacts of the proposal.

1.1 Site characteristics

The study site is located approximately 40km north-west of the Sydney CBD within the Sydney Basin Bioregion and the Hawkesbury City Council local government area (Figure 1).

The site is described as Lots 1 and 2 DP 603811, 172 - 182 Boundary Road, Glossodia. It is an irregular L-shaped allotment that falls from Boundary Road towards the east and north.

Lot 1 DP603811

The existing mushroom production facility 'Premier Mushrooms' including associated ancillary buildings and parking areas;

- Entry and exit driveways to Boundary Road;
- An existing dwelling house;
- Areas of native and exotic vegetation.

The site adjoins a watercourse at the rear (north) of the site (Howes Creek).

Lot 2 DP603811

- Two dwelling houses;
- Single driveway access Boundary Road;
- Areas of native and exotic vegetation.

The wider catchment is typified by rural residential development. The zoning of the site is mixed agriculture.

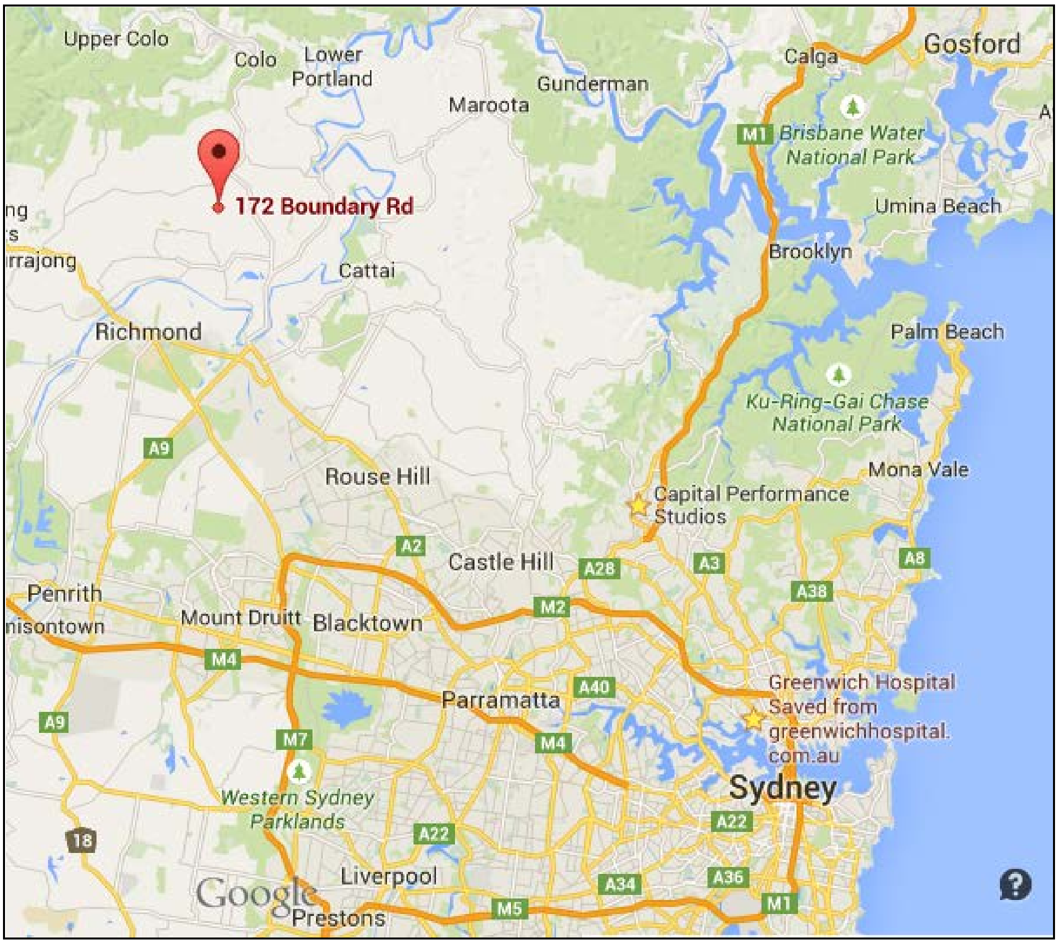


Figure 1: The site in context of the Sydney Basin bioregion

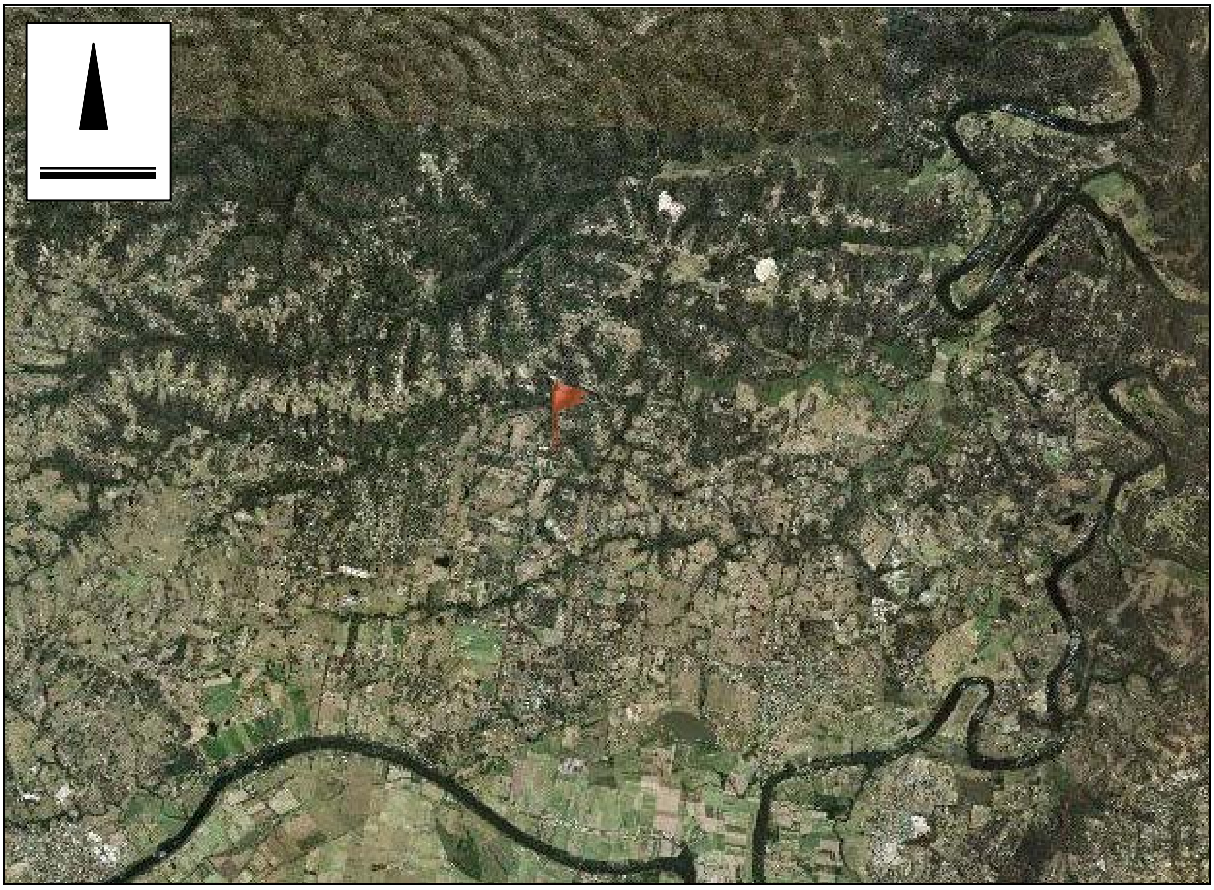


Figure 2: Aerial map of the site showing remnant bushland in the wider catchment (Source: Google Maps)

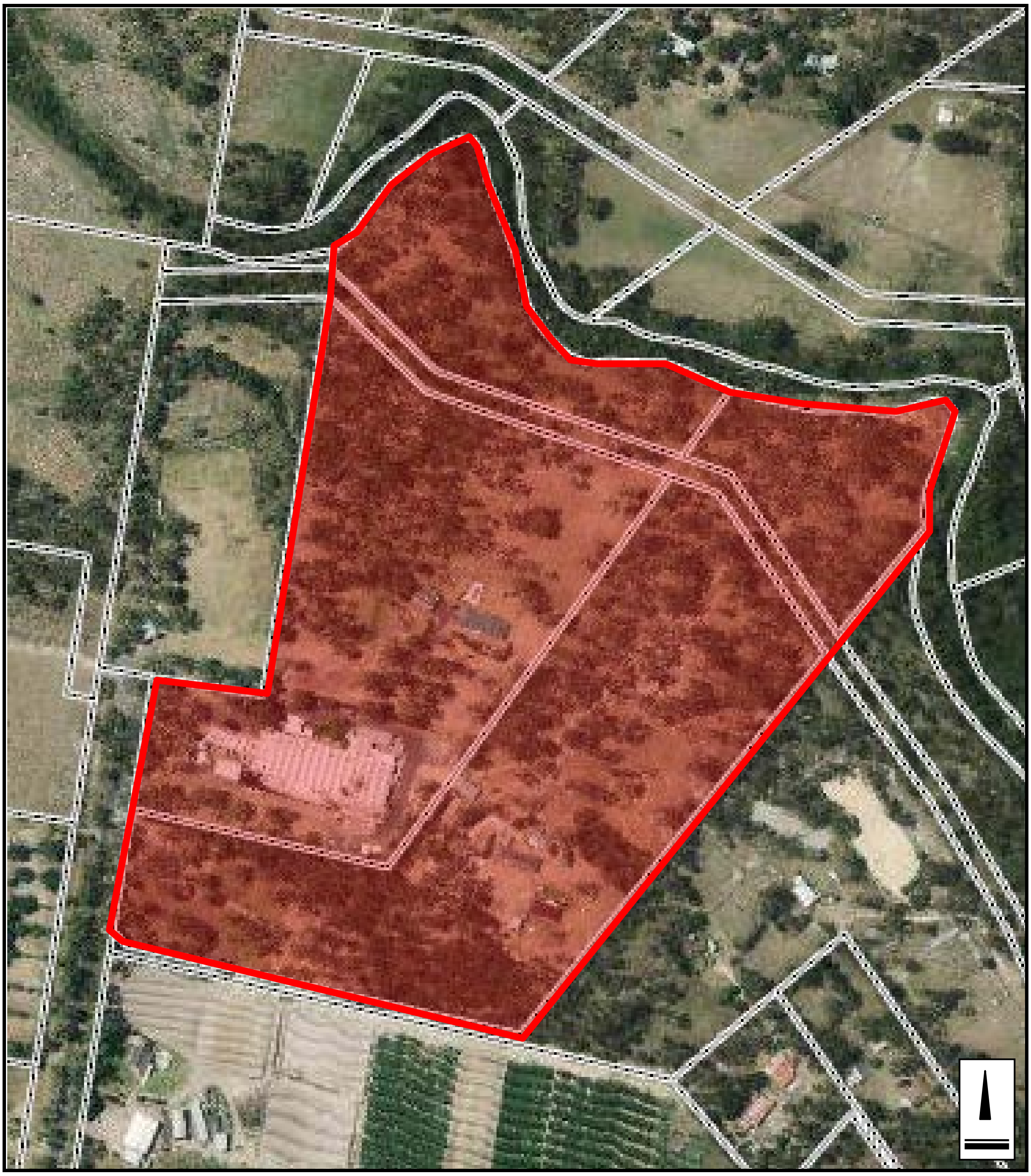


Figure 3: Aerial map of the site showing existing propertyboundaries (Source: Google Maps)

1.2 Climate

The climate of the area is temperate with mild to hot summers and cool to cold winters. The Bureau of Meterology summary statistics for rainfall for all years at the nearest weather station (Richmond) is provided in Figure 4. The local rainfall patterns influence the vegetation and habitat presents on site.

Summary statistics for all years Information about climate statistics

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	87.8	131.6	73.1	42.2	40.0	51.6	29.6	30.1	31.9	54.5	85.2	54.6	716.1
Lowest	19.2	15.2	18.4	1.8	4.0	3.0	4.2	0.0	4.2	4.6	13.0	26.2	501.0
5th %ile	20.3	21.1	21.6	3.8	4.2	5.9	5.5	0.4	4.4	5.6	13.5	27.8	532.1
10th %ile	22.0	33.0	24.2	8.8	7.4	13.1	8.3	1.2	12.9	6.5	13.9	29.3	543.2
Median	106.8	136.2	51.8	35.0	27.2	35.4	19.2	18.8	25.9	49.2	67.0	51.4	711.2
90th %ile	153.0	247.8	148.1	89.9	90.4	98.9	59.8	83.2	69.1	82.2	157.2	83.4	880.1
95th %ile	159.4	267.1	152.9	90.7	101.4	113.3	72.8	108.8	76.1	95.8	174.2	89.0	921.6
Highest	195.4	274.8	186.0	93.6	150.2	226.0	82.0	161.2	93.6	256.2	206.2	96.2	1013.4

Figure 4: Bureau of Meterology summary statistics for rainfall for the Richmond Weather Station

1.3 Geology

Vegetation within the catchment is a result of the interaction of many environmental factors including the underlying geology, soil, rainfall, temperature, aspect and fire regime.

The geology of the catchment area is dominated by the Gymea Soil Landscape as described by Hazerton et al (1989) in the *Soil Landscapes of the Penrith 1:100000 Sheet Report* published by the Soil Conservation Service NSW.

The Gymea Landscape which are undulating to rolling rises and low hills on Hawkesbury Sandstone. Local relief is 20-80m with slopes ranging from 10-25% and rocky outcrops are greater than 25%. The landscape from comprises broad convex crests, moderately inclined side slopes with wide benches, localised rock outcrop on low broken scarps. The fertility of these soils are usually very poor and are generally shallow, stony, moderately acid and highly permeable with low available water capacities with very low phosphorous and nitrogen levels (Hazerton and Tile 1990).

North of the site is mapped as the Lucas Heights Soils landscape. This soil landscape comprises gently undulating crests and ridges on plateau surfaces of the Mittagong Formation (alternating bands of shale and fine –grained sandstones). Local relief to 30m, slopes <10%, rocky outcrops are absent. Low open forest and woodland (dry sclerophyll).. The soils are moderately deep (50cm-150cm), hard setting yellow podzolic soils.

The site occurs near the transition of the Gymea and Lucas Heights Soil Landscape (Figure 5).

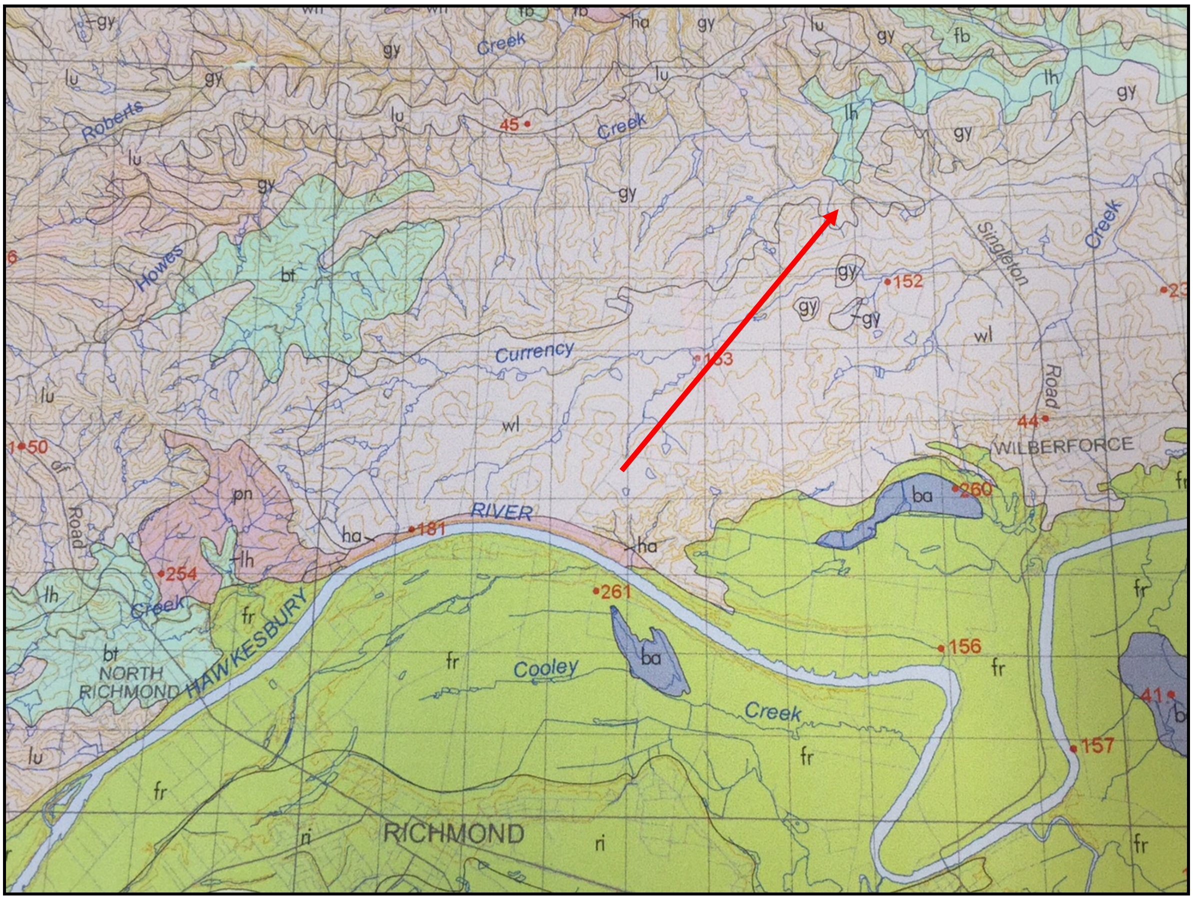


Figure 5: Soil landscape of the locality as depicted mapped the NSW Soil Conservation (1989) with approximate location of site shown at red arrow

1.4 The proposed development

1.3.1. Description of the proposed development

The current proposal involves the expansion of the existing mushroom growing facility to incorporate an adjoining property to the east (Lot 2 DP603811).

The proposal involves the staged construction of new buildings, roads, dam, OSD, batter, associated landscaping and drainage works to expand the production of the existing facility.

Earthworks including battered slopes (up to 1:3) will be required to provide a level building platform where required. Please refer to the proposed plans for detailed site layout and engineering plans.

The development footprints associated with the proposal are as follows:

1. **Building construction of shed (new mushroom growing rooms, storage , packing shed and amenities):**

- Stage 1 building: 60metres x 90 metres (5,400m^2) including additional areas required for fill batter along the south and north side of the building;
- Stage 2 and 3 buildings (future works):approximately 90 metres x 160 metres (14,400m^2)) with additional areas required for 3:1 fill batter that will occupy a footprint of approximately 5200 square metres
- Stage 2 and 3 buildings (future works) will largely occur within Lot 2 DP603811

2. **Extension of existing dam and level spreader**

- Located west of metal shed and single storey residence on Lot 1 DP603811
- This will assist in current erosion problems occurring from overland flow
- Will occupy a footprint of approximately 200 square metres

3. **Creation of two new dams**

- Located north-west of metal shed and single storey residence on Lot 1 DP603811
- This will assist in current erosion problems occurring from overland flow
- The new dams will occupy a footprint of approximately 10 000 m^3 and 4400m^3
- The 4400m^3 was designed to avoid trees where possible

The proposed plans are provided on the following page.

A1

SITE PLAN
SCALE 1:1000

20 0 20 40 60 80 100 METRES 1:1000

DIAL BEFORE YOU DIG
www.1100.com.au

No	DATE	AMENDMENT
C	03/12/15	REVISED DRAINAGE LAYOUT & OSD AND DAM SIZE
B	26/10/15	ISSUED FOR COMMENTS
A	04/09/15	ISSUED FOR COMMENTS

BarkerRyanStewart
Sydney P: 02 9659 0005
Central Coast P: 02 4325 5255
Hunter P: 02 4966 8388
ABN: 26 134 067 842
barkerryanstewart.com.au
mail@barkerryanstewart.com.au

Client: PREMIER MUSHROOMS

PROPOSED MUSHROOM FARM
182 BOUNDARY ROAD, GLOSSODIA

SITE PLAN

Designed: GJ/RW
Drawn: CM
Checked: GJ

Scales: Plan 1:1000
Horiz.
Vert.
X-Sect.

Datum: A.H.D.

Plan No. SY15051C102
File Ref. SY15051C1_C.dwg
REV. C
SHEET 2 OF 8 SHEETS

2. Statutory Framework

The criteria used to assess likely impacts upon threatened species, populations or endangered ecological communities vary between Commonwealth and State jurisdictions. The following describes the legislative requirements for each level.

2.1. Commonwealth

The *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC Act) is a nationally applicable Act that is administered by the Department of the Environment, Water, Heritage and the Arts. This Act requires approval for actions that are likely to have a significant impact on matters of National Environmental Significance (NES).

There are seven matters of NES that are triggers for Commonwealth assessment and approval. These are:

1. World Heritage properties;
2. National Heritage places;
3. Ramsar wetlands of international importance;
4. Nationally threatened species and communities;
5. Migratory species;
6. Nuclear actions; and
7. Commonwealth marine environment.

Threatened species and ecological communities are listed under Part 13, Division 1, Subdivision A of the EPBC Act 1999. Migratory species are listed under part 13, Division2, Subdivision A of the Act.

The Department of the Environment and Water Resources identifies the following:

"*Under the EPBC Act a person must not take an action that has, will have or is likely to have significant impact on any of these matter of NES without approval from the Commonwealth Environment Minister. There are penalties for taking such an action without approval.*

In general, an action that may need approval under the Act will involve some physical interaction with the environment, such as clearing native vegetation, building a new road, discharging pollutants into the environment, or offshore seismic survey.

If, following a referral, it is determined that that an action is likely to have a significant impact, and approval is therefore required, the action is called a 'controlled action'. The proposal will then undergo a formal assessment and approval process, and cannot proceed unless approval is granted.

If it is determined that an action is not likely to have a significant impact, then the action is not a controlled action. Approval under the EPBC Act is not required and the action may proceed, subject to obtaining any other necessary permits or approvals."

2.2 State

Threatened Species Conservation Act 1995

Section 5A of the (Environmental Planning and Assessment) EPA Act (1979) sets out seven factors that require consideration in terms of the likely significance of the impact of an action.

For the purposes of this Act and, in particular, in the administration of sections 78A, 79C (1) and 112, these seven factors must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats listed under the *Threatened Species Conservation (TSC) Act (1995)*.

If the proposed works are on land that is, or is a part of, critical habitat, or is likely to significantly affect threatened species, populations or ecological communities, or their habitats, a Species Impact Statement (SIS) must be prepared.

An SIS provides an more detailed assessment of threatened biota issues and proposes measures to manage and mitigate adverse impacts on threatened species, populations or ecological communities, or their habitats, resulting from the proposal.

This assessment considers these factors in accordance with the aforementioned legislative requirements. It also provides conclusions in regard to the necessity for a Species Impact Statement.

Water Management Act 2000

The WM Act provides a number of mechanisms for protection of water sources via the water management planning process. If a ‘controlled activity' is proposed on ‘waterfront land', an approval is required under Section 91 (2) of the WM Act. ‘Controlled activities' include; the construction of buildings or carrying out of works; the removal of material or vegetation from land by excavation or any other means; the deposition of material on land by landfill or otherwise. ‘Waterfront land' is defined as ‘*the bed of any river or lake, and any land lying between the river or lake and a line drawn parallel to and 40m inland from either the highest bank or shore*’.

State Regional Environmental Plan No. 20 – Hawkesbury-Nepean River (No 2 – 1997)

The State Regional Environmental Plan No 20 – Hawkesbury-Nepean River (No 2 – 1997) applies to certain lands in the Greater Metropolitan Region that are within a number of Local Government Areas, including the Hawkesbury LGA. The aim of this plan is to protect the environment of the Hawkesbury Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.

Specific planning policies and recommended strategies for the plan have been set out under the broad areas of total catchment management, environmentally sensitive areas, water quality, water quantity, cultural heritage, flora and fauna, riverine scenic quality, agriculture/aquaculture and fishing, rural residential development, urban development, recreation and tourism, and metropolitan strategy.

Local Government Act 1993

The Act sets out the responsibilities of Councils including public land management, activity approvals, corporate and operation planning, orders and enforcement powers, setting rates and charges (LGSA 2009). Section 7(e) of the Act requires Councils, Councillors and Council employees to have regard to the principles of ecologically sustainable development in carrying out their responsibilities. The Charter (Section 8) also requires Councils to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically sustainable development. Under this Act, Councils are required to have Plans of Management for all Council owned land.

Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) regulates vegetation clearing in non-urban areas. This Act applies to Hawkesbury Council in all areas, except where land is zoned “residential” (but not “rural residential”), “village”, “township”, “industrial” or “business” under an environmental planning instrument (Schedule 1, part 3 of the Act). A range of specific Routine Agricultural Management Activities (RAMAs) and some other types of clearing are also exempt from this Act. These activities could however, still require consent for clearing under a Council’s LEP. A person seeking to clear native vegetation under the NV Act needs to apply to the relevant Catchment Management Authority. They may also simultaneously need consent by the local Council. The CMA may require a Property Vegetation Plan (PVP) to be developed. A PVP is a negotiated, legally binding agreement between the landholder and the local Catchment Management Authority. Development consent or an approved PVP is required to clear remnant native vegetation and protected regrowth. Clearing of other regrowth (post 1 January 1990) does not require consent or a PVP. Approval of clearing will only be given if clearing of the vegetation will improve or maintain environmental outcomes as assessed by the PVP Developer, the decision support tool used by the CMAs.

The NSW Native Vegetation Act 2003 (NV Act) provides for, encourages, and promotes the management of native vegetation on a regional basis in the social, economic and environmental interests of the State. It aims to prevent broad-scale clearing unless it improves or maintains environmental outcomes, protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation, improve the condition of existing native vegetation, particularly where it has high conservation value, and encourage the revegetation and rehabilitation of land with appropriate native vegetation, in accordance with the principles of ecologically sustainable development.

The NV Act does, however, provide guidance in regard to offsetting (through the development of Property Vegetation Plans) and the requirements under the ‘improve or maintain’ principle in relation to development and activities under the EP&A Act.

Hawkesbury Nepean Catchment Action Plan

The Hawkesbury Nepean Catchment Action Plan (Hawkesbury Nepean CAP) sets the direction for the activities and investment of the Hawkesbury Nepean Catchment Management Authority

Hawkesbury Nepean CMA) over the next ten years. It was approved by the Minister for Environment and Climate Change in March 2008.

The Hawkesbury Nepean CAP is the first stage of managing the catchment in a way that will improve river health, protect biodiversity, and encourage best practice soil and land management. The goals of the CAP are underpinned by community and partnership programs which build community awareness and capacity, and support Indigenous community involvement.

The Hawkesbury Nepean CAP sets clear targets and a timetable for the Hawkesbury Nepean CMA's action and investment and is designed to be responsive to the changing needs of the catchment and the community. The Hawkesbury Nepean CAP operates across the same area as the Hawkesbury Nepean CMA's boundary.

Noxious Weeds Act 1993

Administered by Industry and Investment NSW (formerly the Department of Primary Industries), this Act allows for the listing of five categories of declared noxious weeds. It provides for the specification of control measures and public and private land responsibilities. Noxious weeds occurring in the Hawkesbury City Council LGA have been considered in this assessment.

Rural Fires Amendment (Vegetation Clearing) Bill 2014

The recent Rural Fires Amendment (Vegetation Clearing) Bill 2014 gives the relevant authorities a mechanism to clear certain vegetation for the purposes of preventing a bushfire. The bill seeks to authorise vegetation clearing work to be carried out in certain areas near residential accommodation or high-risk facilities to reduce bushfire risk. This bill will give residents living in bushfire-prone areas additional powers to protect their homes and to clear trees and vegetation from around their property. The new laws will provide for people with homes in bushfire zones to clear within 10 metres of their home and to clear shrubs and other vegetation, except for trees, within 50 metres of their home. The vegetation clearing entitlement area may carry out certain vegetation clearing work on that land, despite any requirement for an approval, consent or other authorisation for the work made by other legislation.

The bill provides that the Commissioner of the NSW Rural Fire Service is to determine what land is a 10/50 vegetation clearing entitlement area and to identify this land on a map published on the NSW Rural Fire Service website. The map has yet been published. However, it is understood that by accessing a portal on the Rural Fire Service website, home owners will be able to identify easily whether their home stands within an entitlement area. It is unknown when this map will be produced, however, given the location of the dwelling it is likely that site would be contained within the mapped area.

The bill states that vegetation clearing work must be carried out in accordance with the 10/50 clearing code of practice, which is to be prepared by the commissioner and is to deal with certain matters. Those matters are listed in the bill as follows:

(a) the type of vegetation that can and cannot be cleared, including the types of trees,
(b) the circumstances in which vegetation should be pruned and not entirely removed,

(c) the use of herbicides,
(d) managing soil erosion and landslip risks,
(e) protection of riparian buffer zones,
(f) protection of Aboriginal and other cultural heritage,
(g) protection of vegetation that the owner of the land on which vegetation clearing work may be carried out is under a legal obligation to preserve by agreement or otherwise

The code of practice has not yet been prepared. The bill further states the vegetation clearing work that can be carried out is the removal, destruction (by means other than by fire) or pruning of:

- any vegetation (including trees or parts of trees) within 10 metres of an external wall of a building containing habitable rooms that comprises or is part of residential accommodation or a high-risk facility, and
- any vegetation, except for trees or parts of trees, within 50 metres of an external wall of a building containing habitable rooms that comprises or is part of residential accommodation or a high-risk facility.

Of most relevance to the development application, the bill also makes consequential amendments to the *National Parks and Wildlife Act 1974* to expand the exemptions contained in sections 118A and 118D of that Act, provided there is compliance with the 10/50 Vegetation Clearing Code of Practice.

<u>State Environmental Planning Policy No.44 – Koala Habitat Protection</u>

Where Local Government Areas are listed on Schedule 1 of State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44) and the site is greater that 1ha, then the likelihood of koala habitat needs to be assessed as part of the environmental assessment process. The Hawkesbury LGA is listed as a Council to which SEPP 44 applies.

Under SEPP 44, potential koala habitat means 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. If potential koala habitat is identified then there is a requirement to assess the site for the occurrence of core koala habitat. Core koala habitat means an 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.

The site contains *Eucalyptus punctata* (Grey Gum) which is a known Koala feed tree listed under Schedule 2. Koalas have been previously recorded within 10km of the subject site according to the NSW Bionet database search. Therefore, SEPP 44 has been considered in this Flora and Fauna Assessment (refer to Section 4.4.3 below).

3. Methodology

This chapter presents the methods used in conducting the ecological survey and assessment of the conservation importance of the study area.

3.1 Existing records

Records of threatened flora and fauna species and populations, listed in the schedule of the TSC and EPBC Acts, were obtained and reviewed to document known locations threatened and regionally significant fauna within the locality. The source of these records was the NSW Office of Environment and Heritage Bionet and the Department of Environment online Protected Matters Search Tool database for an area covering approximately 10km radius of the subject site (Section 4.4).

A total of 7 threatened flora species and 28 threatened or migratory fauna (1 invertebrate, 2 frogs, 15 birds, and 11 mammals, 6 of which are bats), listed under the TSC or EPBC Acts, have been previously recorded within 10km the site (OEH 2015; DEWHA 2015).

Threatened species that have been considered in particular detail as part of this development application and those species that have been previously recorded near the site may be potentially affected by the proposal are described in Section 4.5, Appendix 1 and Appendix 2.

The vegetation occurring on site is consistent with an endangered ecological community (Shale Sandstone Transition Forest EEC).

3.2 Desktop survey

A desktop survey was performed to ensure all relevant documentation is considered when preparing the plan. Documents and other information resources utilised include:

- Aerial photographs (Google Maps, NearMaps & DPI Land Information)
- Vegetation maps (NSW OEH and Department of Lands, Tozer 2003 & NPWS 2003)
- Statement of Environmental Effects (Urban City Consulting)

3.3 Field Surveys

A visual inspection was undertaken on the 24th May and 9th September 2015 to identify and evaluate the current vegetation community occurring on the subject site, identify any threatened flora and fauna species and assess the current nature and extent of fauna habitats. Targeted fauna surveys were not undertaken as part of this assessment.

Features of the vegetation including floristics, structure, extent, type and projective foliage cover, presence of weed species and other significant features were noted and recorded). All flora recorded were predominantly identified to family, genus and species level with confirmation according to *Field Guide to the Native Plants of Sydney* (Robinson, 2003), *Weeds of the south-east: an identification guide for Australia* (Richardson, 2006*), Tree & Shrubs in Rainforest of New South*

Wales and Southern QLD (Williams et al 1984), *Native Plants of the Sydney District* (Fairly and Moore 2000) and the Botanic Gardens Trust (2009) *PlantNET* flora database.

It was not possible to determine with certainty all the fauna that utilise habitats in the subject site. This is because of the likely seasonal occurrences of some fauna species, the occasional occurrence of vagrant species, and because some species are difficult to detect because of their timid or cryptic behaviour. Therefore, fauna investigations comprised an assessment of fauna habitats present on site and an indication of their potential to support native wildlife populations and, in particular, threatened species.

The fauna habitat assessment criteria included:

Mammals: extent of ground cover, shrub layer and tree canopy, hollow-bearing trees, substrate type (for burrowing etc), evidence such as droppings, diggings, footprints, scratches on trees, nests, burrow paths and runways.

Birds: structural; features such as the extent and nature of the canopy, understorey and ground strata and flowering character

Reptiles and amphibians: cover shelter, suitable substrate, basking and breeding site availability, reptiles and frogs sough in likely sheltering places

Invertebrates: logs and other debris, leaf and bark accumulations around base of trees, grass clumps, loose soil for burrowing

Wildlife corridor values: Importance of the creek systems and riparian vegetation as movement corridors for fauna, especially birds, aquatic fauna, mammals (e.g. microchiropteran bats) & amphibians

Wildlife habitat, in its broadest definition, includes any vegetation or other physical structure that meets an animal's needs for food, shelter, and/or reproduction. Habitat provided by indigenous vegetation usually provide the best habitat, as they are richest in diversity and, resources for indigenous fauna species. However, disturbed and degraded areas can provide habitat for native flora and fauna species.

Wildlife habitat can be comprised of a number of elements. These include intact canopy, mid-storey and understorey layers in a vegetation community, particular plant species which may provide food or shelter resources for fauna species, hollows and cracks in living or dead trees, fallen logs and woody debris, deep leaf litter, exposed sandstone rocks supporting water seeps, and caves. Different resources for food, shelter, and reproduction occur in these habitat elements that may satisfy the varied needs of a particular species, or, more often, the needs of a number of different species.

3.4 Assessment of conservation value

Conservation value parameters

The conservation value of flora and fauna habitats on the subject site was determined by reference to the following criteria:

- Representativeness - whether the vegetation communities of the site are unique, typical or common in the bioregion. In addition the criteria takes into account whether or not such vegetation units are presently held in conservation reserves;
- the presence of threatened or regionally significant species on the site;
- the extent of human influence on the natural environment of the site and the condition of habitats (e.g. the presence of weeds, fire frequency, etc.);
- the uniqueness of the natural values of the site;
- the amount of native vegetation to be cleared or modified by the proposed development in relation to what remnant vegetation will remain in the locality; and
- the relative importance of the site as a corridor for the movement of wildlife.

4. Site ecological values

4.1. Native vegetation community and plant species

The site for the proposed development is predominantly cleared or highly modified largely absent of fully structured native vegetation (i.e. containing intact groundcover, shrub layer and canopy), however, it does comprise of remnant plant species that are consistent with:

1) 'Shale Sandstone Transition Forest' which is listed as a Critically Endangered Ecological Community under the NSW *Threatened Species Conservation Act 1995* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
2) 'River Flat Eucalypt Forest' which is listed an Endangered Ecological Community under the NSW *Threatened Species Conservation Act 1995*

Figure 6 (below) shows the broad-scale vegetation mapping undertaken by NPWS that maps a portion of the site as 'Shale Sandstone Transition Forest'. However, site surveys confirmed that the area for the proposed dam and OSD basin (comprising 5900 square metres) is in fact transitions into another vegetation community ('River Flat Eucalypt Forest') due to the dominance of *Eucalyptus amplifolia* trees.

These observations are consistent with the previous Flora and Fauna Assessment undertaken by *Conachers Environmental Group* (dated March 2011) as part of a different DA. An excerpt from that previous assessment showing refined vegetation mapping in relation to the proposed dam is provided in Figure 7.

1. **<u>Shale Sandstone Transition Forest</u>**

Shale Sandstone Transition Forest vegetation community occurs at the edges of the Cumberland Plain, where clay soils from the shale rock intergrade with earthy and sandy soils from sandstone, or where shale caps overlay sandstone. The boundaries are indistinct, and the species composition varies depending on the soil influences. The main tree species include Forest Red Gum (*Eucalyptus tereticornis*), Grey Gum (*E. punctata*), stringybarks (*E. globoidea, E. eugenioides*) and ironbarks *(E. fibrosa and E. crebra*). Areas of low sandstone influence (more clay-loam soil texture) have an understorey that is closer to Cumberland Plain Woodland.

Ground-truthing observations confirmed that Shale Sandstone Transition Forest plant species generally occur on-site as the following elements:

- Isolated remnant trees within proposed development footprint comprising of approximately which are combination of *Eucalyptus punctata* (predominant)*, Eucalyptus sclerophylla, Eucalyptus tereticornis, Eucalyptus eugenioides*, *Eucalyptus fibrosa* and *Acacia parramatensis*
- Relatively smaller areas of regrowth under-storey and mid-storey vegetation within previously cleared areas as shown in Photographs 1-3
- A smaller isolated patch of higher quality bushland on a small rocky outcrop occurring immediately north-east of the existing swimming pool/ residence of 182 Boundary Rd. This patch has some 'edge effects' with the presence of environmental weeds that have thrived from surrounding land uses (e.g. Trad and Mother of Millions) as shown Photograph 6 & 7.

- A majority of the understorey is dominated by exotic pasture grasses and weeds including Kikuyu, African Lovegrass and Paspalum. There are numerous planted trees including Callistemon cultivars and Pears planted as hedges/ groves.

Whilst some areas of the native vegetation community show some native resilience (evidence of the native soil seed bank), the overall condition of the vegetation proposed for removal is considered to be in poor condition for the following reasons:

- Isolated paddock trees indicative of SSTF shown no signs of regrowth especially in paddock areas that are dominated by introduced pasture grasses
- There is little evidence of native regeneration
- There is high presence of introduced environment and noxious weed species
- The connectivity of the native vegetation is poor , and therefore, soil seed bank from other sources of adjacent bushland (referred to as 'migratory resilience') is considered to be low
- The vegetation occurs within and adjacent to existing agricultural rural residential land uses that have historically occurred on site. This includes maintenance slashing and animal grazing on the understorey strata

2. **<u>River Flat Eucalypt Forest</u>**

River Flat Eucalypt Forest typically has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda (rough-barked apple) and A. subvelutina (broad-leaved apple). Eucalyptus baueriana (blue box), E. botryoides (bangalay) and E. elata* (river peppermint).

Typically a layer of small trees, shrubs and groundcovers may be present. Typical species recorded in this community is provided within Appendix 5. However, due to the disturbed nature of the understorey (as a result of grazing history) no native shrubs or groundcovers were recorded.

The overall condition of this type of vegetation proposed for removal is considered to be in poor condition for the following reasons:

- Isolated paddock trees indicative of River Flat Eucalypt Forest shown no signs of regrowth especially in paddock areas that are dominated by introduced pasture grasses
- There is little evidence of native regeneration
- There is high presence of introduced environment and noxious weed species

The full list of plants (native and exotic) recorded on site is shown Table 1. Refer to Photographs 1-13 over the next few pages shows these features.

No threatened plant species were recorded on site.

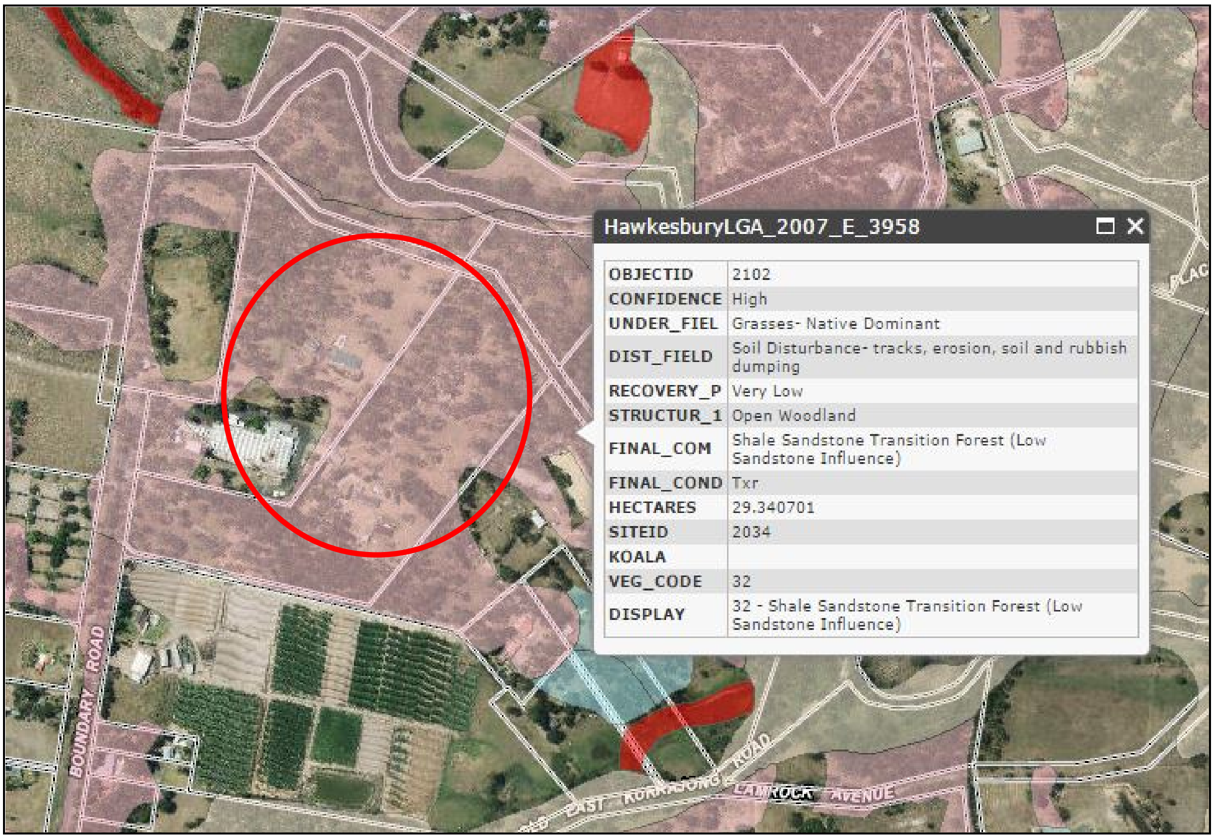


Figure 6: Broad-scale vegetation map showing mapping undertaken by Hawkesbury Council with the subject site shown in red (Source: SIX Maps.com)

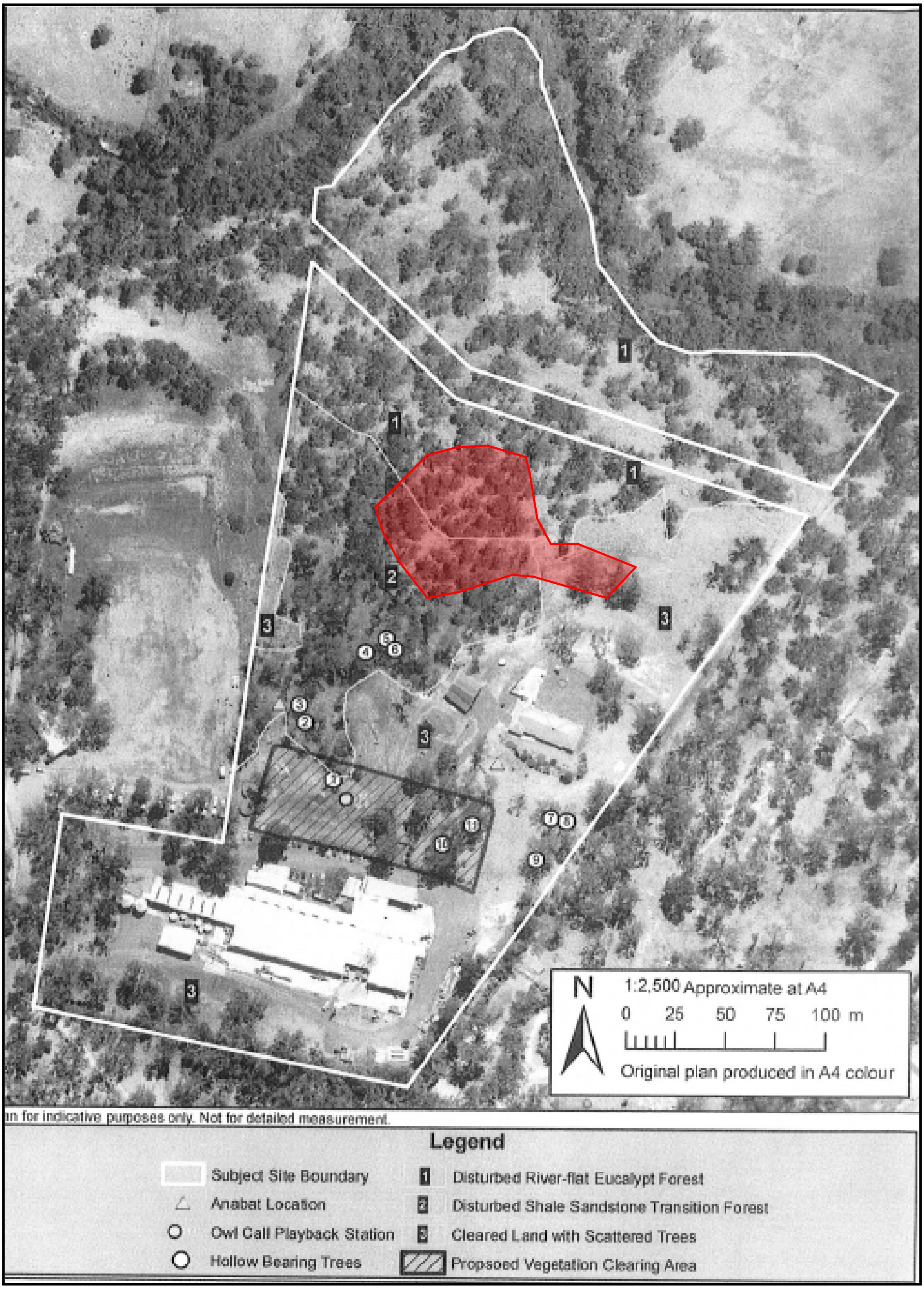


Figure 7: Finer scale vegetation mapping (indicated by numbers 1 and 2) undertaken by Conachers Environmental Group (dated March 2011) in relation approximate location of new dam and OSD (red)

Table 1: Plant species recorded on site

Species Name	Common Name	Exotic or Native
Ozothamnus diosmifolius	White Dogwood	Native
Goodenia hederacea	Forest Goodenia	Native
Eragrostis curvula ssp. curvula	African Lovegrass	Exotic
Pratia purpurascens	White Root	Native
Entolasia stricta	Wiry Panic	Native
Aristida vagans	Three Awn Grass	Native
Acacia parramatensis		Native
Bidens pilosa	Cobblers Pegs	Exotic
Sida rhombifolia	Paddys Lucerne	Exotic
Eucalyptus punctata	Grey Gum	Native
Eucalyptus tereticornis	Forest Redgum	Native
Eucalyptus sclerophylla	Hard-leaved Scribbly Gum	Native
Eucalyptus crebra	Narrow-leaved Ironbark	Native
Eucalyptus fibrosa	Broad-leaved Ironbark	Native
Angophora bakeri	Narrow-leaved Apple	Native
Eucalyptus amplifolia	Cabbage Gum	Native
Persoonia pinifolia	Pine-leaved Geebung	Native
Callistemon and Grevillea planted cultivar		Exotic
Allocasuarina cunninghamiana	River She Oak	Native
Bryophyllum sinense	Mother of Millions	Exotic
Acetosa sagitatta	Potato Vine	Exotic
Leptopsermum trinervium		Native
Lomnandra longifolia	Mat Rush	Native
Tradescantia flumiensis	Trad	Exotic
Lomandra filiformis subsp. coriacea		Native

Species Name	Common Name	Exotic or Native
Jacksonia scoparia		Native
Exocarpos cupressiformis	Ballarat Cherry	Native
Imperata cylindrical	Blady Grass	Native
Lambertia Formosa		Native
Kunzea ambigua	Tick Bush	Native
Einadia hastata		
Geranium homeanum		
Banksia spinulosa		Native
Lindsaea formosa	Giant Maidenhair Fern	Native
Acacia falcata		Native
Grevillea mucronulata	Green Flowered Grevillea	Native
Pimelea linifolia ssp. linifolia	Slender Rice Flower	Native
Acacia ulicifolia	Prickly Moses	Native
Tagetes minuta	Stinking Roger	Exotic
Bidens pilosa	Cobblers Pegs	Exotic
Cirsium vulgare	Spear Thistle	Exotic
Conyza bonariensis	Flaxleaf Fleabane	Exotic
Hypochaeris radicata	Catsear	Exotic
Senecio madagascarensis	Fireweed	Exotic
Trifolium repens	White Clover	Exotic
Paspalum dilatum	Paspalum	Exotic
Pennisetum clandestinum	Kikuyu Grass	Exotic
Cynodon dactylon	Couch	Exotic
Xanthium occidentale	Cockle Burr	Exotic

Photograph 1: Mowed under-storey with native canopy trees (northern portion of proposed growing room Stage 1)

Photograph 2: Regenerating native under-storey combined with weeds interspersed with native canopy trees (northern portion of proposed growing room Stage 2)

Photograph 3: Open under-storey combined with weeds interspersed with native canopy trees and grazing (northern portion of proposed growing room Stage 3)

Photograph 4: Existing hard stand areas with native remnant trees (southern portion of proposed growing room stage 1)

Photograph 5: Existing rural residences with mowed under-storey and remnant native remnant trees (southern portion of proposed growing room stage 2 & 3)

Photograph 6: Existing horse paddock with isolated remnant trees with small patch of intact bushland in the (central portion of proposed growing room stage 3)

Photograph 7: Close up view of small patch of intact bushland (central portion of proposed growing room stage 3)

Photograph 8: *E.sclerophylla* trees with mowed understorey near road frontage (Proposed parking Stage 3)

Photograph 9: Existing dam proposed for extension and adjacent level spreader

Photograph 10: Current state of rill erosion down slope of existing dam

<u>Photograph 11: Location of new dam – south extent - showing dominance of *E.amplifolia* trees (view south wards) indicative of River Flat Eucalypt Forest</u>

<u>Photograph 12: Location of new dam – northern extent (view north west from cleared area on east side of the proposed dam) within River Flat Eucalypt Forest vegetation</u>

Photograph 13: Location of OSD basin requiring the removal of 3 large paddock trees (trees numbered 495, 496 and 488)

4.2 Fauna habitat features

The main development impact area provides fauna habitat in the following forms:

- Seasonal foraging resources when eucalypts and other plants flower provide nectar and insect resources for mobile fauna including Grey-headed Flying Fox, possums, gliders, microchiropteran bats and a variety of woodland bird species
- sources of seed on the forest floor and grasses and acacias for parrots
- marginal foraging area for owl species that may periodically roost or glean prey items such as possums from the area
- refuge and transient area for reptiles including snakes, lizards and amphibians including the intermittent drainage line occurring at the rear of the site
- potential grazing grounds for macropods
- Hollow-bearing trees

The site does contain small number of hollow-bearing trees/ standing dead stags. These hollows/stags were also considered in the previous ecological assessment undertaken by Conachers Consulting. These habitats may provide marginal roosting or nesting resources for fauna species, however, no evidence of such activities observed during the site survey (Photographs 9 and 10). The impacts of the removal of this habitat have been considered in this assessment. It is considered that the removal of the trees/ stags would not have a significant impact upon the local population of fauna species (refer to Section 4.4.2). A significant number of these same habitats will be retained on-site.

Brown Antechinus and Bush Rat are likely to be present. The leaf litter was relatively thin or providing minimal foraging and refuge habitat for reptiles and amphibians. It is likely that a wide variety of woodland birds frequent the locality. Bird species observed during the site inspection parrots and nectivorous honeyeaters that forage and roost in the upper canopy of the trees. Blossoms from flowering canopy Myrtaceae would attract a variety of nectivores including possums, birds and threatened Grey-headed Flying Fox.

Nocturnal arboreal marsupials including Common Brushtail Possum and Sugar Gliders are likely to occasionally use the site for foraging. Reptiles likely to occur include a variety of snakes (Red-bellied Black Snake, Brown Snake and Tiger Snake). Other reptiles likely to occur on the property including Lace Monitor (*Varanus varanus*), Grass Skink (*Lampropholis delicata*), Blue-tongue Lizard (*Tiliqua scincoides*) and Gecko amongst many others.

Large Forest Owls including threatened Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*), Powerful Owl (*Ninox strenua*) and Sooty Owl (*Tyto tenebricosa*) may occasionally visit the site depending upon the availability of prey such as Common Ringtail Possum (*Pseudocheirus ringus*) and Brushtail Possum (*Trichosurus vulpecular*).

Appendix 2 provides a list of fauna previously recorded within 10km of the site. A detailed targeted fauna survey program was not considered necessary for this assessment due to the perceived minimal impacts likely to occur to fauna groups as a result of the development proposal. However, a habitat assessment and desktop threatened fauna assessment was undertaken as a precautionary measure.

Photograph 9: Standing dead tree stag occurring within proposed growing room Stage 1

Photograph 10: Standing dead tree stag occurring within proposed growing room Stage 2

4.3 Corridors and connectivity

The biodiversity value of corridor networks is well known. Landscapes that retain more connections between patches of otherwise isolated areas of vegetation are more likely to maintain more numerous and more diverse populations of various plant and animal species (Lindenmayer and Fischer, 2006). Conversely, a lack of landscape connectivity can have a range of negative impacts on species populations (Lindenmayer and Fischer, 2006). It is thought that if existing remnants are left to persist without sufficient immigration to maintain genetic diversity, continued losses of biodiversity are certain (Parker *et al.* 2008).

The site forms part of a local habitat corridor being continuous with surrounding bushland. The good connectivity of the site and its function as a regional corridor as means that a variety of mobile threatened fauna are likely to be seasonally transient through the site. However, the site does not contain unique or critical habitat features that would have a likely significant impact upon the local population of a threatened species.

Furthermore, the proposed development will not fragment bushland or significantly impact upon the corridor function of bushland on site as trees will be retained around the development site.

4.4 Threatened species

4.4.1 Threatened flora

No threatened flora species were recorded on site despite targeted plant searches surveys across the entire site. Threatened flora previously recorded within 10km of the site that have been considered in this assessment are shown in Appendix 1.

Despite targeted surveys these species were not recorded within the site or surrounding areas.

The proposal is unlikely to constitute a significant impact on threatened plant species given that:

- the proposed works would only remove poor quality habitat for these species
- other areas of better quality habitat will be retained immediately adjacent to within the subject site and surrounding landscape
- the proposal is not likely to fragment habitat to an extent that would prevent dispersal and/or pollination of the local viable population that exists within the sub-catchment

The proposal is unlikely to significantly impact on threatened flora listed under the NSW *Threatened Species Conservation Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

4.4.2 Threatened Fauna

No indirect evidence of threatened fauna species or habitats critical to survival of a local population of threatened fauna were recorded on site. Threatened fauna recorded previously within 10km of the site that have been considered in this assessment are shown in Appendix 2.

The proposal is unlikely to constitute a significant impact on threatened fauna species given that:

- the proposed works would only remove poor quality/marginal foraging habitat for these species
- other areas of better quality habitat will be retained immediately adjacent to within the subject site and surrounding landscape
- the proposal is not likely to fragment habitat to an extent that would prevent mobility of the local viable populations of any threatened fauna species that may potentially occur within the sub-catchment

The proposal is unlikely to significantly impact on threatened fauna listed under the NSW *Threatened Species Conservation Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

4.4.3 SEPP 44 Koala Habitat Protection assessment

In the north-eastern Blue Mountains, koalas occur in Wollemi National Park (N. Stone, National Parks and Wildlife Service (NPWS), pers. comm.) and in the Colo River area, in and around Yengo National Park (Curtin et al. 2002).

There is likely to be a population of Koalas in the wider locality based upon Bionet records. The Koala inhabits a range of eucalypt forest and woodland communities, including coastal forests, the woodlands of the tablelands and western slopes, and the riparian communities of the western plains (Phillips 2000b). Koalas also utilise isolated paddock trees (White 1999). Previous records of Koala recorded in the locality are provided below in Figure 5.

The quality of forest and woodland communities as habitat for koalas is influenced by a range of factors (Reed et al. 1990), such as:

- species and size of trees present
- structural diversity of the vegetation
- soil nutrients
- climate and rainfall
- size and disturbance history of the habitat patch.

The subject site was assessed for activity by Koalas using the following methods:

i. A search of the BioNet Atlas of NSW Wildlife (NSW OEH 2015) was undertaken to identify records of Koalas in the area;
ii. The site was surveyed on foot with any species of Koala food trees being inspected for signs of Koala usage. Trees were inspected and identified for presence of Koalas, scratch and claw marks on the trunk and scats around the base of each tree. The proportion of any trees showing signs of Koala use was calculated for the whole of the site. Additionally the location and density of droppings if found were documented;
iii. Identification and assessment of the density of tree species listed as Koala food trees in State Environmental Planning Policy No. 44 - Koala Habitat Protection was undertaken across the site as outlined in Table 5.

The Koala food tree species, *Eucalyptus punctata* (Grey Gum), as listed on Schedule 2 of State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44) were observed in the subject site. These areas constituted at least 15% of the total number of trees in the upper or lower strata of the tree component. Therefore, the site was considered to be potential Koala habitat as defined by SEPP 44.

No Koalas were observed during the fauna survey and no evidence of Koala habitation, such as scats, claw and scratch marks, were located on the site. Therefore, the subject site is considered to not form core koala habitat as defined by SEPP 44.

TABLE 5
SEPP-44 KOALA FEED TREE SPECIES (From SEPP-44 Schedule 2)

Scientific Name	**Common Name**	**Observed On Site**	**Percentage within each paddock (survey plot)**
Eucalyptus tereticornis	Forest Red Gum	No	0%
Eucalyptus microcorys	Tallowwood	No	0%
Eucalyptus punctata	Grey Gum	Yes	<15%
Eucalyptus viminalis	Ribbon or Manna Gum	No	0%
Eucalyptus camaldulensis	River Red Gum	No	0%
Eucalyptus haemastoma	Broad-leaved Scribbly Gum	No	0%
Eucalyptus signata	Scribbly Gum	No	0%
Eucalyptus albens	White Box	No	0%
Eucalyptus populnea	Bimble Box or Poplar Box	No	0%
Eucalyptus robusta	Swamp Mahogany	No	0%

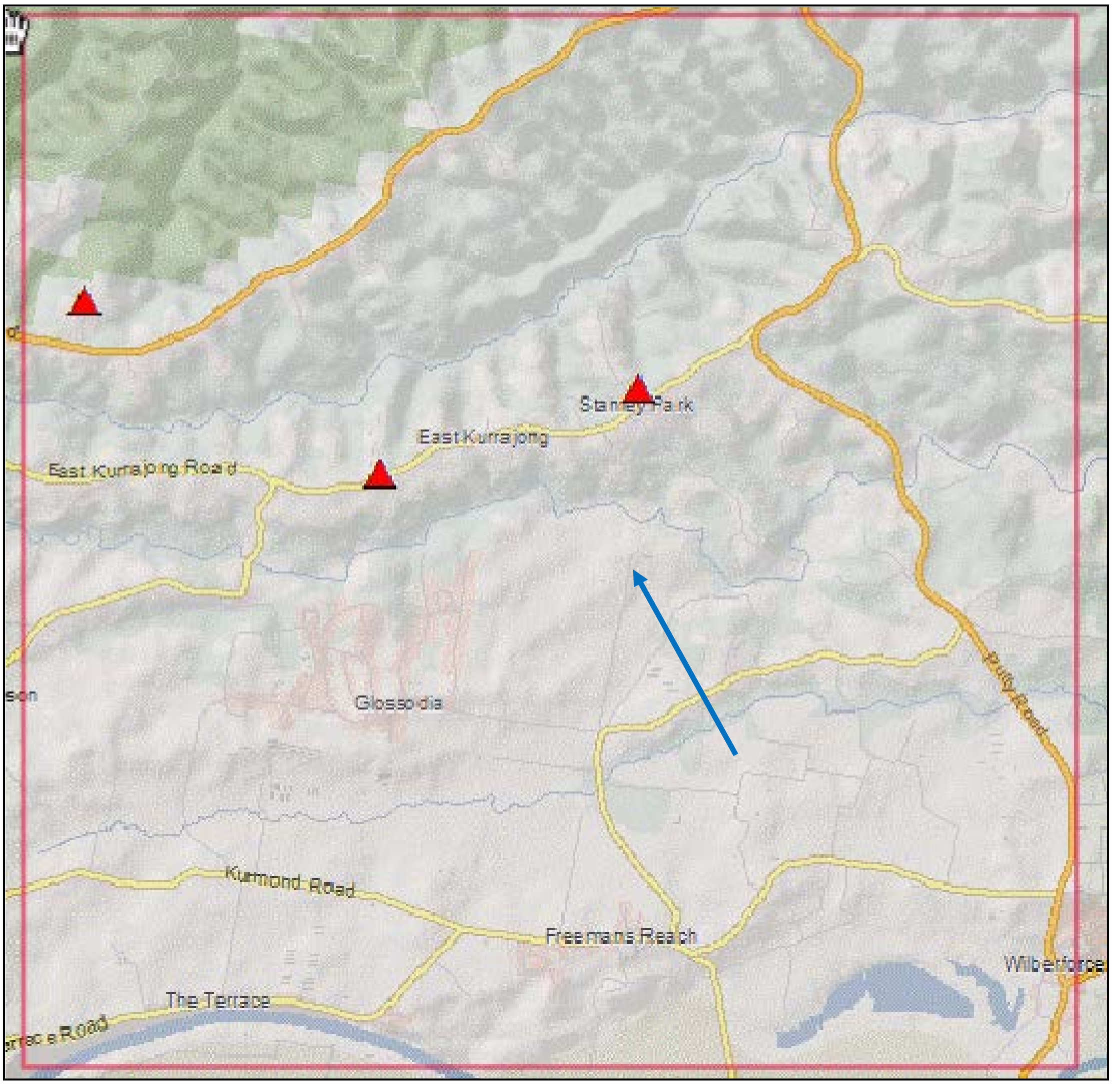


Figure 7: Records of Koala (red) previously recorded within 10km of the site shown in blue arrow (Source: Bionet)

4.5 Consideration of threatening processes

The proposal does require the removal of native vegetation which is consistent with the listed Key Threatening Process "Clearing of Native Vegetation" which has been considered as part of this assessment. This listed Key Threatening Process was considered within Assessment of significance (seven part test) undertaken for the Shale Sandstone Transition Forest Critically Endangered Ecological Community.

NSW OEH has identified the following actions to help in the recovery of this endangered ecological community in NSW:

1. Develop and implement Cumberland Plain Reservation Strategy and create a protected bushland network through targeted land acquisition as land becomes available (high priority).
2. Encourage and promote best-practice management of EECs on private land (medium priority).

3. Encourage planning authorities to address EECs in development of environmental planning instruments and, where possible, seek biodiversity certification (medium priority).
4. Ensure the consideration of impacts on EECs when enforcing noxious weed or pest species control in EECs (medium priority).
5. Finalise the multi-EEC recovery plan as a State priority in accordance with contractual obligations with DEH, by July 2007 (medium priority).
6. Incorporate consideration of EEC protection in regional open space planning (high priority).
7. Investigate the development of a regular monitoring program to assess the change in extent of vegetation across the Cumberland Plain (medium priority).
8. Investigate the preparation of a recommendation for the declaration of critical habitat (low priority).
9. Liaise with institutions to facilitate research relevant to the recovery of Cumberland Plain EECs (low priority).
10. Local Govt prepare plans of management in accordance with the Local Government Act for reserves containing EECs, which have conservation as a primary objective, or where conservation is compatible (high priority).
11. Manage, to best practice standards, areas of EECs which have conservation as a primary objective, or where conservation is compatible. Priorities are to be based on DEC conservation significance assessment (high priority).
12. Management of EECs is to be included in school environmental management plans where the school land contains EECs (medium priority).
13. Management of EECs to be included in the conditions for Crown land trusts, lease and licence holders (medium priority).
14. Prepare and implement community awareness, education and involvement strategy (medium priority).
15. Promote best practice management guidelines (medium priority).
16. Public authorities will promote management agreements to landholders through their ongoing land use planning activities (medium priority).

5. Impacts of the proposed development

The number following numbers of trees proposed for removal has been devised from field surveys and reference to the detailed site and engineering plans.

The approximate numbers of trees and canopy cover proposed for removal consistent with Endangered Ecological Communities are as follows:

- Stage 1 requires the removal of 42 trees occupying an area of 471 square metres of canopy cover largely absent of native understorey
- Stage 2 and 3 requires the removal of 43 trees occupying an area of 630 square metres of canopy cover largely absent of native understorey
- Extension of existing dam requires the removal of 2 trees occupying an area of 30 square metres of canopy cover largely absent of native understorey
- Creation of new dam and OSD require the removal of 47 trees occupying an area of 5900 square metres of canopy cover with no native understorey

Total number of trees proposed for removal is 134 trees.

The canopy cover of disturbed Shale Sandstone Transition Forest Critically Endangered Ecological Community proposed for removal is 4531 square metres (0.4531 ha).

The canopy cover of disturbed River Flat Eucalypt Forest Endangered Ecological Community proposed for removal is 2500 square metres (0.25 ha).

Figure 8 on the following page shows the distribution of native vegetation proposed for removal. This figure highlights that the EEC vegetation (disturbed Shale Sandstone Transition Forest and River Flat Eucalypt Forest) does not form part of a single stand of vegetation and generally comprises of five main groups of proposed clearings as described above.

Only a very small number of hollow-bearing trees are proposed for removal. These include the trees identified earlier within Section 4.2 of this report.

The proposed development will not sever connectivity of fauna habitat or flora populations including the EEC vegetation.

A significant area of EEC vegetation will be retained on the property and there are opportunities to rehabilitate this vegetation as part of native regeneration works or simple fencing systems to prevent grazing by sheep, cattle and horses in the future in order to offset the development impacts. This will also ensure that weeds are effectively controlled in response to intensified development of the site and also direct native revegetation works proposed on the fill batters.

The formalisation and control of overland flow that are currently causing erosion will also provide environmental benefit to the site.

Assessments of Significance ('seven part tests') provided within Appendix 3 of this report concluded that the proposal will not have a significant impact upon the local population of species, populations and communities listed under the NSW *Threatened Species Conservation Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Figure 8: Groups of trees proposed for removal shown in red (Aerial source: Nearmap.com)

6. Environmental Protection Measures

The current proposal is to be carried out in accordance with all policies, operational procedures and guidelines in place as part of consent conditions issued by Hawkesbury City Council relating to environmental management or impact minimisation for construction projects.

The following environmental safeguard measures have been recommended for all phases of the proposed development.

1) Bushland protection during construction

The following activities shall not be conducted within the remnant bushland on site (outside of the development):

- Ripping, cultivation, trenching or mechanical removal of vegetation or earth
- The placement of fill
- Movement, stockpiling or storage of plant, materials, waste, equipment or vehicles
- Any activity likely to damage the trunk, crown or root system of the protected vegetation

2) Erosion and Sediment Control

As a precautionary measure, a silt fence will be installed and maintained to EPA best practice standards during the entire construction of the proposal. The fence will remain in situ until the ground surface has stabilised.

All erosion and sediment controls (i.e. geotextile sediment fence and straw bales) shall be in place before any works begin. Techniques used for erosion and sediment control on building sites are to be adequately maintained at all times and must be installed in accordance with EPA guidelines. All techniques shall remain in proper operation until all development activities have been completed and the site fully stabilised. This condition must be complied with during building work.

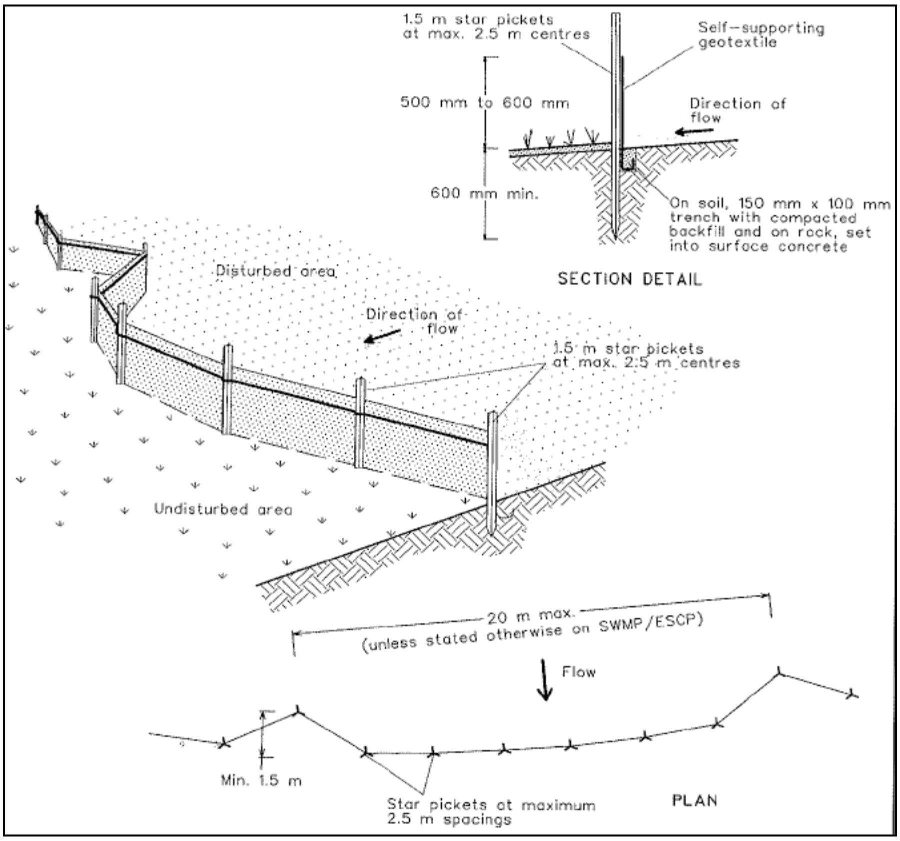


Figure 9: Best practice specifications of sediment and erosion control fencing (EPA 1994)

3) Weed management following construction works

Weeds are to be progressively removed within the transition zone between developed area and remnant bushland in accordance with the following techniques recommended by the National Trust, NSW National Parks and Wildlife Service and Australian Association of Bush Regenerators.

Weed control from areas of high resilience to low resilience, upper slope to lower slope in accordance with the Bradley Method (Buchanan 1989) is to be undertaken in 3 stages described below:

1) Primary weed control: The first step. Targets primary weeds but does not remove all weeds as the soil will be eroded (DEC 2005). Areas identified with the greatest resilience (e.g. around the base of remnant trees) should be cleared first to encourage regeneration from the soil seed bank. Involves getting rid of larger debris and raking up areas of invasive creepers.

2) Secondary weed control: Intensive follow up weeding straight after primary weeding and treating weed seedlings as they germinate (Buchanan 1989). The weeds progress is monitored and some are allowed a month or two of annual weed growth before they are treated. Sites in good condition require little follow-up while others in worse condition require more effort.

3) Maintenance weeding: Maintain and controlling low weed levels ensuring new weeds that have moved into the area or have had the chance to germinate are eliminated.

A Vegetation Management Plan could be possibly implemented to assist in the regeneration of disturbed Shale Sandstone Transition Forest and River Flat Eucalypt Forest to be retained on-site in order to offset the development impacts.

Landscaping fill batters will include indigenous native species of Shale Sandstone Transition Forest.

4) General Environmental Management

The site must be managed in accordance with the *Protection of the Environment Operations Act 1997* by way of implementing appropriate measures to prevent sediment run-off, excessive dust, noise or odour emanating from the site during the construction of the development.

7. Conclusion

Based on the detailed field survey and information provided in this report it is concluded that:

i. No threatened flora species listed within the TSC Act (1995) or the EP&BC Act (1999)were observed during surveys;

ii. The impact on the threatened flora and fauna species are considered minimal given the low value of habitat proposed for removal.

iii. Disturbed Shale Sandstone Transition Forest Critically Endangered Ecological Community and River Flat Eucalypt Forest Endangered Ecological Community proposed for removal is in poor condition.

iv. A referral to the Australian Government Department of the Environment is not likely to be required as it was determined that the proposal would not have a significant impact on nationally listed threatened or migratory species listed under the EPBC Act (1999).

v. A Species Impact Statement is not required for the proposed development. The proposed development is not likely to have a significant effect on threatened species, populations or ecological communities or their habitats listed under the TSC Act (1995) with the implementation of recommended environmental protection measures.

8. References

Auld, R.A & Medd, R.W 19897. Weeds – an illustrated guide the weeds of Australia. Inkata Press Melbourne

ARBOR 1996. Garden plants that go feral in the Sydney Bushland, Sydney.

Benson, D and Howell, J., Cunninghamia Volume 3 (4), National Herbarium of NSW, Royal Botanic Gardens Sydney 1994.

Benson, D. and Howell, J. (1994) The natural vegetation of the Sydney 1:100 000 map sheet Cunninghamia 3(4):677-995.

Buchanan, R. 1989. Bush Regeneration. TAFE Publications.

Bureau of Meterology 2014. Climate and Rainfall Averages. http://www.bom.gov.au

Department of the Environment, Water, Heritage and the Arts 2014. Weeds of National Significance. Canberra ACT.

Fairley, A. Moore, P; Native Plants of the Sydney District and identification guide: New Holland Sydney 2002

Matheney, N.P and Clark, J.R Trees and Development: A technical guide to preservation of trees during land development. International Society of Arboriculture 1998

McInnes S.K., 1997, *Soil Landscapes of the St Albans 1:100,000 Sheet* map and report, NSW Department of Land and Water Conservation, Sydney.

NPWS Native Vegetation of the Cumberland Plain Map 1 to 16; NPWS Sydney 2002

NSW Department Infrastructure Planning and Natural Resources 2007*. Guidelines for the preparation of Vegetation Management Plans*, Parramatta.

NSW Rural Fire Service (2006) Planning for Bushfire Protection A Guide for Councils, Planners, Fire Authorities, Developers and Homeowners NSW Rural Fire Service, Sydney.

Robinson, L. Field Guide to the Native Plants of Sydney; Kangaroo Press, Sydney 2004

Ryan, K., Fisher, M., and Shcaeper., L. 1996. Natural Vegetation of the St Albans Map Sheet. *Cunninghamia* Volume 4(3). Royal Botanic Gardens.

Tozer, M. (2003) The Native Vegetation of the Cumberland Plain, western Sydney: Systematic classification and field identification of communities *Cunninghamia* 8(1):1-75

Wrigley, J.W Fagg, M.A Australian Native Plants Cultivation, Use in Landscaping and Propagtaion; Kangaroo Press, Sydney 2003

Hazelton, P.A ., Bannerman, S.M and Tillie, P.J. 1989. *Soil landscapes of the Penrith 1:100 000 sheet*. Soil Conservation Service of NSW. NSW Department of Lands.

<u>Fauna references:</u>

Allison, F.R. and Hoye, G.A. (1995) Eastern Freetail-bat. In: Strahan, R (Ed.) (1995) The Mammals of Australia. Reed New Holland, Australia

Benson, D. and McDougall, L. (1995) Ecology of Sydney plant species. Part 3: Dicotyledon families Cabombaceae to Eupomatiaceae. Cunninghamia 4(2):143-431

Benson, D.H. and Howell, J. (1990) Taken for Granted: The Bushland of Sydney and Its Suburbs. Kangaroo Press, Sydney

Benson, D.H. and Howell, J. (2000) Sydney's Bushland — More than Meets the Eye. Royal Botanic Gardens, Sydney

Churchill, S. (1998) Australian Bats. Reed New Holland, Sydney Australia

Churchill, S. (2008) Australian Bats. Second Edition. Allen and Unwin, Sydney Australia

City of Ryde (2008) City View Newsletter 2(3):1-6

Department of Environment, Climate Change and Water (2009) Threatened Species Profiles (http://www.threatenedspecies.environment.nsw.gov.au)

Fairley, A. (2004) Seldom Seen: Rare Plants of Greater Sydney. Reed New Holland, Australia

Hoye, G.A. and Hall, L.S. (2008) Eastern Bent-winged Bat Miniopterus schreibersii oceanensis in Van Dyck, S. and Strahan, R. (eds) The Mammals of Australia Third edition. Reed New Holland, Sydney

Hoye, G.A. and Spence, J. (2004) The Large Bent-wing Bat Miniopterus schreibersii in Urban Environments: a survivor? in Lunney, D. and Burgin, S. (eds) Urban Wildlife: more than meets the eye. Royal Zoological Society of New South Wales, Mosman, NSW

Hoye, G.A., Law, B.S. and Allison, F.R. (2008) East-coast Free-tailed Bat Mormopterus norfolkensis in Van Dyck, S. and Strahan, R. (eds) The Mammals of Australia Third edition. Reed New Holland, Sydney

James, T. McDougall, L. and Benson, D.H. (1999) Rare Bushland Plants of Western Sydney, second edition, Royal Botanic Gardens, Sydney

Kingdom, R. (2009) Arboricultural Assessment of Trees and Impact Assessment for Development Application 96-98 Brush Road West Ryde. Unpublished report, Advanced Treescape Consulting

NSW Department of Environment and Conservation (2005) Threatened Species Information –Eastern Bent-wing Bat

NSW National Parks and Wildlife Service (1997) Urban Bushland Biodiversity Survey. Native Flora of Western Sydney. NSW NPWS, Hurstville

NSW National Parks and Wildlife Service (2002) Native Vegetation of the Cumberland Plain - Final Edition. NPWS, Sydney

NSW Scientific Committee (1998) Sydney turpentine-ironbark forest - Endangered ecological community listing. Final Determination

NSW Scientific Committee (2001) Yellow-bellied Sheathtail-bat – Vulnerable Species Listing. Final Determination

NSW Scientific Committee (No Date) Eastern Bent-wing-bat – Vulnerable Species Listing. Final Determination

NSW Scientific Committee (No Date) Eastern Freetail-bat – Vulnerable Species Listing. Final Determination

Richards, G.C. (2008) Yellow-bellied Sheath-tailed Bat Saccolaimus flaviventris. In: Van Dyck, S. and Strahan, R. (Eds.) (2008) The Mammals of Australia. Third Edition. Reed New Holland, Sydney

Strahan, R. (1995) A Photographic Guide to Mammals of Australia. New Holland, Sydney Australia

Strahan, R. (Ed.) (1995) The Mammals of Australia. Reed New Holland, Australia

APPENDIX 1: Threatened flora previously recorded within 10km of the site (Source: NSW Bionet accessed 19 June 2015)

Scientific Name	Common Name	TSC Act	EPBC Act	ROTAP	Habitat	Seven Part Test Required?
Dillwynia tenuifolia		V	V	2Vi	Occurs on the Cumberland Plain from the Blue Mountains to Howes Valley area where it grows in dry sclerophyll woodland on sandstone, shale or laterite {Harden, 2002 #5}. Specifically, occurs within Castlereagh woodlands, particularly in shale gravel transition forest. Associated species include Eucalyptus fibrosa, E. sclerophylla, Melaleuca decora, Daviesia ulicifolia, Dillwynia juniperina and Allocasuarina littoralis {James, 1997 #69}.	No. Potential habitat for this species will not be impacted by the proposal
Tetratheca glandulosa		V			Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridgetop Woodland (Map Unit 10ar). Common woodland tree species include: Corymbia gummifera, C. eximia, Eucalyptus haemastoma, E. punctata, E. racemosa, and/or E. sparsifolia, with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae. Flowers July-November however residual flowers may persist until late December. Flowering influenced by seasonal weather conditions and/or the microclimate effects (eg. exposure) of each particular site.	No. Potential habitat for this species will not be impacted by the proposal.
Persoonia hirsuta		E	E		The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. It is usually present as isolated individuals or very small populations. It is probably killed by fire (as other Persoonia species are) but will regenerate from seed.	No. Potential habitat for this species will not be impacted by the proposal.
Pimelea curviflora var. curviflora		V	V		Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowalnd Grassy Woodland habitat at Albion Park on the Illawaraa coastal plain. Flowers October to May. Has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots. Likely to be fire tolerant species capable of resprouting following fire due to the presence of a tap root. Seedlings	No. Potential habitat for this species will not be impacted by the proposal.

Scientific Name	Common Name	TSC Act	EPBC Act	ROTAP	Habitat	Seven Part Test Required?
					have been observed following fire.	
Pultenaea parviflora		E1	V	2E	Restricted to the Cumberland Plain where it grows in dry sclerophyll forest on Wianamatta shale, laterite or alluvium {Harden, 2002 #5}. Locally abundant within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. Also occurs in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland {NSW National Parks and Wildlife Service, 2002 #82; James, 1997 #69}.	No. Potential habitat for this species will not be impacted by the proposal
Pimelea spicata	Spiked Rice Flower	E1	E		Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). In both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils. On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. The co-occurring species in the Cumberland Plain sites are grey box (Eucalyptus moluccana), forest red gum (E. tereticornis) and narrow-leaved ironbark (E. crebra). Blackthorn (Bursaria spinosa) is often present at sites (and may be important in protection from grazing) and kangaroo grass (Themeda australis) is usually present in the groundcover (also indicative of a less intense grazing history).	No. Potential habitat for this species will not be impacted by the proposal
Pterostylis saxicola		E1	E		Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where Pterostylis saxicola occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils. All species of Pterostylis are deciduous and die back to fleshy, rounded underground tuberoids. The time of emergence and withering has not been recorded for this species, however flowering occurs from October to December and may vary due to climatic conditions. The above ground parts of the plant whither and die following seed dispersal and the plant persists as a tuberoid until the next year. Typically occurs as scattered individuals or in small groups	No. Potential habitat for this species will not be impacted by the proposal

TSC Act (*Threatened Species Conservation Act 1995*): E1 =Critically Endangered E= Endangered V= Vulnerable **EPBC Act (*Environment Protection Biodiversity Conservation Act 1999*):** E1 =Critically Endangered E= Endangered V= Vulnerable **ROTAP CODES *Source: Briggs, J.D. & Leigh J.H. (1988) Rare or threatened Australian plants.*** Plant Codes: **Distribution** 1: Known from type collection only. 2: Geographic range < 100km. 3: Geographic range > 100km. **Conservation** E: Endangered (at risk of disappearing in 1 or 2 decades) V: Vulnerable (at risk of disappearing in 20 - 50 years). R: Rare (rare in Australia but currently not endangered or vulnerable). K: Poorly known Reservation. C: Population reserved adequately reserved (>1000 plants). I: Inadequately reserved (<1000 plants) - Adequacy of reservation unknown.

APPENDIX 2: Threatened fauna previously recorded within 10km of the site (Source: NSW Bionet accessed 19 June 2015)

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Seven Part Test Required?
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. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs. Preyed upon by various wading birds and snakes.	No. Potential habitat for this species will not be impacted by the proposal.
Helioporus australicus	Giant Burrowing Frog	V	V	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size. Individuals move into the breeding site either immediately before or following heavy rain and occupy these sites for up to 10 days. Most individuals will not attempt to breed every year. The Giant Burrowing Frog has a generalist diet and studies to date indicate that they eat mainly invertebrates including ants, beetles, cockroaches, spiders, centipedes and scorpions. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water.	No. Potential habitat for this species will not be impacted by the proposal.
Pseudophryne australis	Red-crowned Toadlet	V		Occurs within 160 km of Sydney where it is restricted to Hawkesbury Sandstone. It breeds in deep grass and debris adjacent to ephemeral drainage lines. When not breeding individuals are found scattered on sandstone ridges under rocks and logs {Cogger, 2000 #20}.	No. Potential habitat for this species will not be impacted by the proposal
Callocephalon fimbriatum	Gang-gang Cockatoo	V		Occurs in wetter forests and woodland from sea level to an altitude over 2000 metres, timbered foothills and valleys, coastal scrubs, farmlands and suburban gardens {Pizzey, 1997 #24}.	No. Potential habitat for this species will not be impacted by the proposal
Calyptorhynchus lathami	Glossy Black-	V		Occurs in eucalypt woodland and forest with Casuarina/Allocasuarina spp. Characteristically inhabits forests on sites with low soil nutrient status, reflecting the distribution of key Allocasuarina species. The drier forest types	No. Potential habitat for this species will not be impacted by

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Seven Part Test Required?
	Cockatoo			with intact and less rugged landscapes are preferred by the species. Nests in tree hollows {Garnett, 2000 #21; NSW National Parks and Wildlife Service, 1999 #55}.	the proposal
Circus assimilis	Spotted Harrier	V		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. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Preys on terrestrial mammals (eg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion.	Marginal foraging habitat present, however, seven part test not required. Potentially important habitat for this species will not be impacted by the proposal.
Falco subniger	Black Falcon	V		The Black Falcon inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees. The Black Falcon is usually associated with streams or wetlands, visiting them in search of prey and often using standing dead trees as lookout posts. Habitat selection is generally influenced more by prey densities than by specific aspects of habitat floristics or condition, although in agricultural landscapes the Black Falcon tends to nest in healthy, riparian woodland remnants with a diverse avifauna (Debus et al. 2005). Much of the best habitat of the Black Falcon in New South Wales is likely to occur on private land (i.e. agricultural or pastoral land), rather than in reserves (e.g. Debus et al. 2005; Debus & Olsen 2011; Debus & Tsang 2011).	Marginal foraging habitat present, however, seven part test not required. Potentially important habitat for this species will not be impacted by the proposal.
Ninox connivens	Barking Owl	V		Occurs in dry sclerophyll woodland. In the south west it is often associated with riparian vegetation while in the south east it generally occurs on forest edges. It nests in large hollows in live eucalypts, often near open country. It feeds on insects in the non-breeding season and on birds and mammals in the breeding season {Garnett, 2000 #21}.	May occur on-site. Seven Part Test undertaken as a precautionary measure.
Ninox strenua	Powerful Owl	V		Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine Syncarpia glomulifera, Black She-oak Allocasuarina littoralis, Blackwood Acacia melanoxylon, Rough-barked Apple Angophora floribunda, Cherry Ballart Exocarpus cupressiformis and a number of eucalypt species. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For	May occur on-site. Seven Part Test undertaken as a precautionary measure.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Seven Part Test Required?
				example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls. Flying foxes are important prey in some areas; birds comprise about 10-50% of the diet depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl.	
Tyto novaehollandiae	Masked Owl	V		Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	May occur on-site. Seven Part Test undertaken as a precautionary measure.
Hieraaetus morphnoides	Little Eagle	V		Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	Marginal foraging habitat present, however, seven part test not required. Potentially important habitat for this species will not be impacted by the proposal.
Lophoictinia isura	Square-tailed Kite	V		Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Appears to occupy large hunting ranges of more than 100km2. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	Marginal foraging habitat present, however, seven part test not required. Potentially important habitat for this species will not be impacted by the proposal.
Burhinus grallarius	Bush Stone-curlew	E1		Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.	Marginal foraging habitat present, however, seven part test not required. Potentially important habitat for this species will not be impacted by the proposal.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Seven Part Test Required?
Chthonicola sagittata	Speckled Warbler			The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter. A side entrance allows the bird to walk directly inside. A clutch of 3-4 eggs is laid, between August and January, and both parents feed the nestlings. The eggs are a glossy red-brown, giving rise to the unusual folk names 'Blood Tit' and 'Chocolatebird'. Some cooperative breeding occurs. The species may act as host to the Black-eared Cuckoo. Speckled Warblers often join mixed species feeding flocks in winter, with other species such as Yellow-rumped, Buff-rumped, Brown and Striated Thornbills.	Marginal foraging habitat present, however, seven part test not required. Potentially important habitat for this species will not be impacted by the proposal.
Stictonetta naevosa	Freckled Duck	V		Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Generally rest in dense cover during the day, usually in deep water. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates. Nesting usually occurs between October and December but can take place at other times when conditions are favourable. Nests are usually located in dense vegetation at or near water level.	Marginal foraging habitat present, however, seven part test not required. Potentially important habitat for this species will not be impacted by the proposal.
Botaurus poiciloptilus	Ausralasian BIttern	E1	E	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch.	No. Potential habitat for this species will not be impacted by the proposal
Irediparra gallinacea	Comb-crested Jacana	V		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. Forage on floating vegetation, walking with a characteristic bob and flick. They feed primarily on insects and other invertebrates, as well as some seeds and other vegetation. Breed mainly in spring and summer in NSW, with clutches recorded from September to April. The nest is a platform or shallow cup of vegetable material, though eggs sometimes laid directly onto a large leaf with no nest built. The male builds the nest, incubates the eggs and broods the young. Eggs that roll into the water from a nest are usually retrieved. The young are precocial, but the	No. Potential habitat for this species will not be impacted by the proposal

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Seven Part Test Required?
				adult male can carry one or two under each wing if they are threatened and drop them in separate places. Young birds will dive and stay submerged with just their nostrils exposed for a very long time. Adults will also dive for safety on occasion. Comb-crested Jacanas are dispersive, moving about in response to the condition of wetlands, and occasionally turn up well beyond normal range.	
Rostratula australis	Australian Painted Snipe	E1	E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally occurs from September to December. Incubation and care of young is all undertaken by the male only. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	No. Potential habitat for this species will not be impacted by the proposal
Calidris ferruginea	Curlew Sandpiper	E		It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores. Curlew Sandpipers are omnivorous, feeding on worms, molluscs, crustaceans, insects and some seeds. Birds breed at 2 years of age and the oldest recorded bird is 19 years old. Most birds caught in Australia are between 3 and 5 years old.	No. Potential habitat for this species will not be impacted by the proposal
Petroica boodang	Scarlet Robin	V		The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. The Scarlet Robin is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. The Scarlet Robin is a quiet and unobtrusive species which is often quite tame and easily approached. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer. Scarlet Robin pairs defend a breeding territory and mainly breed between the months of July and January; they may raise two or three broods in each season. This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub. Eggs are pale greenish-, bluish- or brownish-white, spotted with brown; clutch size ranges from one to four. Birds usually occur singly or in pairs, occasionally in small	May occur on-site. Seven Part Test undertaken as a precautionary measure.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Seven Part Test Required?
				family parties; pairs stay together year-round. In autumn and winter, the Scarlet Robin joins mixed flocks of other small insectivorous birds which forage through dry forests and woodlands.	
Petroica phoenicea	Flame Robin			Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). Often occurs in recently burnt areas; however, habitat becomes unsuitable as vegetation closes up following regeneration. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. In winter, occasionally seen in heathland or other shrublands in coastal areas. Birds forage from low perches, from which they sally or pounce onto small invertebrates which they take from the ground or off tree trunks, logs and other coarse woody debris	May occur on-site. Seven Part Test undertaken as a precautionary measure.
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Occurs from the Bundaberg area in south-east Queensland, south through NSW to western Victoria and Tasmania. In NSW, it occurs on both sides of the Great Dividing Range and north-east NSW represents a national stronghold {NSW National Parks and Wildlife Service, 1999 #502}. Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large unfragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges. Nests in rock caves and hollow logs or trees. Feeds on a variety of prey including birds, terrestrial and arboreal mammals, small macropods, reptiles and arthropods {NSW National Parks and Wildlife Service, 1999 #27; NSW National Parks and Wildlife Service, 1999 #502}.	No. Potential habitat for this species will not be impacted by the proposal
Limosa limosa	Black-tailed Godwit	V		Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps. Individuals have been recorded in wet fields and sewerage treatment works. Forages for insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water. Roosts and loafs on low banks of mud, sand and shell bars. Frequently recorded in mixed flocks with Bar-tailed Godwits.	Marginal foraging habitat present, however, seven part test not required. Potentially important habitat for this species will not be impacted by the proposal.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high {Churchill, 1998 #26}.	May occur on-site. Seven Part Test undertaken as

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Seven Part Test Required?
					a precautionary measure.
Miniopterus schreibersii	Eastern Bent-wing Bat	V	C	Usually found in well timbered valleys where it forages on small insects above the canopy. Roosts in caves, old mines, stormwater channels and sometimes buildings and often return to a particular nursery cave each year {Churchill, 1998 #26}.	May occur on-site. Seven Part Test undertaken as a precautionary measure.
Mormopterus norfolkensis	Eastern Freetail-bat	V		Thought to live in sclerophyll forest and woodland. Small colonies have been found in tree hollows or under loose bark. It feeds on insects above the forest canopy or in clearings at the forest edge {Churchill, 1998 #26}.	May occur on-site. Seven Part Test undertaken as a precautionary measure.
Myotis macropus	Southern Myotis	V		Colonies occur in caves, mines, tunnels, under bridges and buildings. Colonies always occur close to bodies of water where this species feeds on aquatic insects {Churchill, 1998 #26}.	May occur on-site. Seven Part Test undertaken as a precautionary measure.
Petaurus australis	Yellow-bellied Glider	V		Restricted to tall, mature eucalypt forest in high rainfall areas of temperate to sub-tropical eastern Australia. Feeds on nectar, pollen, the sap of eucalypts and sometimes insects. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide helter and nesting hollows and year round food resources are available from a mixture of eucalypt species {NSW National Parks and Wildlife Service, 1999 #44; NSW National Parks and Wildlife Service, 2003 #45}.	No. Suitable absent.
Petaurus norfolcensis	Squirrel Glider	V		Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	No. Suitable absent.
Phascolarctos cinereus	Koala	V		Found in sclerophyll forest. Throughout New South Wales, Koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species. However, in any one area, Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis. Some preferred species in NSW include Forest Red Gum Eucalyptus tereticornis, Grey Gum E. punctata, Monkey Gum E. cypellocarpa and Ribbon Gum E. viminalis. In coastal areas, Tallowwood E. microcorys and Swamp Mahogany E. robusta are important food species, while in inland areas White Box E. albens, Bimble Box E. populnea and River Red Gum E. camaldulensis are favoured {NSW National Parks and Wildlife Service, 1999	May occur on-site. Seven Part Test undertaken as a precautionary measure.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Seven Part Test Required?
				#43; NSW National Parks and Wildlife Service, 2003 #31}.	
Cercartetus nanus	Eastern Pygmy Possum	V		Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (Pseudocheirus peregrinus) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. Young can be born whenever food sources are available, however most births occur between late spring and early autumn. Agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal. Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.	No. Potential habitat for this species will not be impacted by the proposal
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Urban gardens and cultivated fruit crops also provide habitat for this species. Feeds on the flowers and nectar of eucalypts and native fruits including lilly pillies. It roosts in the branches of large trees in forests or mangroves {NSW National Parks and Wildlife Service, 2001 #56; Churchill, 1998 #26}.	May occur on-site. Seven Part Test undertaken as a precautionary measure.
Scoteanax rueppellii	Greater Broad-nosed Bat	V		The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically it forages at a height of 3-6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow-flying insects and small vertebrates. It generally roosts in tree hollows but has also been found in the roof spaces of old buildings {Churchill, 1998 #26}.	May occur on-site. Seven Part Test undertaken as a precautionary measure.
Daphoenositta chrysoptera	Varied Sitella	V		Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. Generation length is estimated to be 5 years.	May occur on-site. Seven Part Test undertaken as a precautionary measure.
Xanthomyza phrygia	Regent Honeyeater	E1		The Regent Honeyeater builds a cup-shaped nest of fibres located in forks in live eucalypt (including Angophora) or she-oak canopy. The Regent Honeyeater mostly feeds on nectar from flowering eucalypts, especially boxes and ironbarks, and from Amyema cambagei. They also feed on the sugary exudates of insects (e.g. lerps) which	May occur on-site. Seven Part Test undertaken as

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat	Seven Part Test Required?
				become an important part of their diet when breeding. Within NSW, breeding sub-populations are fragmented and now occur mainly around the Capertee Valley in central-eastern NSW and the Bundarra-Barraba region in northern inland NSW. Minor and sporadic breeding occurs in other areas such as Warrumbungle National Park, Pilliga forests, Mudgee-Wollar region, and the Hunter and Clarence Valleys.	a precautionary measure.
Melithreptus gularis gularis	Black-chinned Honeyeater	V		Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (Eucalyptus sideroxylon), White Box (E. albens), Inland Grey Box (E. microcarpa), Yellow Box (E. melliodora), Blakely's Red Gum (E. blakelyi) and Forest Red Gum (E. tereticornis). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. A gregarious species usually seen in pairs and small groups of up to 12 birds. Feeding territories are large making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares. Moves quickly from tree to tree, foraging rapidly along outer twigs, underside of branches and trunks, probing for insects. Nectar is taken from flowers, and honeydew is gleaned from foliage. Breeds solitarily or co-operatively, with up to five or six adults, from June to December. The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. It is a compact, suspended, cup-shaped nest. Two or three eggs are laid and both parents and occasionally helpers feed the young	No. Potential habitat for this species will not be impacted by the proposal
Neophema pulchella	Turquoise Parrot	V		Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	No. Potential habitat for this species will not be impacted by the proposal

TSC Act (*Threatened Species Conservation Act 1995*): E1 =Critically Endangered E= Endangered V= Vulnerable

EPBC Act (*Environment Protection Biodiversity Conservation Act 1999*): E1 =Critically Endangered E= Endangered V= Vulnerable

APPENDIX 3: Seven Part Tests

Commonwealth Assessment of Significance

The *Environment Protection and Biodiversity Conservation Act, (1999)* requires that Commonwealth approval be obtained for certain actions. The Act provides an assessment and approvals systems for actions that have a significant impact on matters of National Environment Significance (NES). These may include:-

- Wetlands protected by international treaty (the Ramsar Convention);
- Nationally listed threatened species and ecological communities;
- Nationally listed migratory species.

Actions are projects, developments, undertakings, activities, series of activities or alteration of any of these. An action that needs Commonwealth approval is known as a controlled action. A controlled action needs approval where the Commonwealth decides the action would have a significant effect on a NES matter.

Where a proposed activity is located in an area identified to be of NES, or such that it is likely to significantly affect threatened species, ecological communities, migratory species or their habitats, the matter needs to be referred to the Australian Government Department of the Environment (AGDE).

The following assessment in accordance with the EP&BC Act Policy Statement 1.1 *Significant Impact Guideline (AGDE 2013)* is provided:

i. Are there any Matters of National Environmental Significance located in the area of the proposed action?

A search of the Protected Matters Search Tool (AGDE 2015) was conducted for EPBC Listed threatened and migratory species recorded within 5 km of the subject site(Appendix A).

Suitable habitat is present for the following nationally listed threatened species recorded from the Protected Matters Search (AGDE 2015) which occur or which may occur within 10 km of the subject site:

Threatened Fauna Species

- Spotted-tailed Quoll
- Koala
- Large-eared Pied Bat
- Regent Honeyeater

Suitable habitat is present for the following nationally listed migratory species recorded from the Protected Matters Search (AGDE 2015) which occur or which may occur within 5 km of the subject site:

Migratory Species

- White-throated Needletail (*Hirundapus caudacutus*)
- Fork-tailed Swift (*Apus pacificus*)
- Rufous Fantail (*Rhipidura rufifrons*)
- Satin Flycatcher *(Myiagra cyanoleuca*)
- Black-faced Monarch (*Monarcha melanopsis*)

Threatened ecological communities

'Shale Sandstone Transition Forest of the Sydney Basin Bioregion' is a listed as an Critically Endangered Ecological community under the EPBC Act 1999. The canopy cover of disturbed Shale Sandstone Transition Forest Critically Endangered Ecological Community proposed for removal is 4531 square metres (0.4531 ha).

ii. Considering the proposed action at its broadest scope, is there potential for impacts on Matters of National Environmental Significance?

The proposal will require the removal of a relatively small area of suitable habitat for nationally listed locally occurring threatened and migratory species which are highly mobile species.

The canopy cover of disturbed Shale Sandstone Transition Forest Critically Endangered Ecological Community proposed for removal is 4531 square metres (0.4531 ha). A significantly higher portion of the same community will be retained and enhanced on site in order to offset these impacts.

iii. Are there any proposed measures to avoid or reduce impacts on Matters of National Environmental Significance?

No, as no matters of national environmental significance were observed during surveys.

A Vegetation Management Plan may be implemented to assist in the regeneration of disturbed Shale Sandstone Transition Forest and River Flat Eucalypt Forest to be retained on-site in order to offset the development impacts.

Landscaping fill batters will include indigenous native species of Shale Sandstone Transition Forest.

iv. Are any impacts of the proposed action on Matters of National Environmental Significance likely to be significant impacts?

With regard to nationally listed threatened species it is considered that the proposal is not likely to:

• 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 threatened species becoming established in the threatened species' habitat;

• introduce disease that may cause a species to decline; or

• interfere with the recovery of the species.

The following reasons are provided:

• There are larger areas of higher quality habitat for locally occurring nationally listed threatened and migratory species present within the locality, including lands reserved for conservation such as Blue Mountains National Park; and

• No nationally listed threatened species were observed within the subject site during surveys.

With regard to nationally listed migratory species it is considered that the proposal is not likely to:

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

• result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or

• seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The following reasons are provided:

• The subject site has not been identified as containing important habitat for a nationally listed migratory species; and

• No nationally listed migratory species have been recorded within the subject site during surveys.

CONCLUSION

It is considered that the proposed action is not likely to have a significant impact on nationally listed threatened or migratory species.

NSW Assessment of Significance ('seven part test')

Section 78A of the *Environmental Planning and Assessment Act*, 1979 (EP&A Act) enables a person to apply to a consent authority to carry out development that is permissible under an environmental planning instrument. In assessing a development application a consent authority must, pursuant to 79C of the EP&A Act take into consideration, where relevant, the likely impacts of the development on the natural and built environments.

Section 5A subsection 1 of the *Environmental Planning and Assessment Act 1979* states that **each** of the factors in subsection 2 must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats, and any **assessment guidelines**.

Species Impact Statement (SIS) is required if an activity is on land that is, or is part of critical habitat; or there is likely to be a significant effect as determined under s.5A of the EP&A Act, the seven part assessment of significance.

Definitions:

- *Critical habitat: the whole or any part or parts of the area or areas of land comprising the habitat of an endangered species, population or ecological community that is critical to the survival of the species, population or ecological community.*
- *Significant impact: if the Assessment of Significance determines that a there will be a significant effect on threatened species, populations or ecological communities, or their habitats a SIS will be required.*
- *Assessment guidelines means assessment guidelines issued and in force under section 94A of the Threatened Species Conservation Act 1995 or, subject to section 5C, section 220ZZA of the Fisheries Management Act 1994.*

- *Key threatening process means a threatening process specified in Schedule 3 of the Threatened Species Conservation Act 1995 or, subject to section 5C, Part 7A of the Fisheries Management Act 1994*

Shale Sandstone Transition Forest Endangered Ecological Community

Assessment of Significance ('Seven Part Test')

QUESTION A

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

The question is not relevant to an endangered ecological community

QUESTION B

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

The question is not relevant to an endangered ecological community

QUESTION C

In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

Response:

The canopy cover of disturbed Shale Sandstone Transition Forest Critically Endangered Ecological Community proposed for removal is 4531 square metres (0.4531 ha). A significantly higher portion of the same community will be retained and enhanced on site in order to offset these impacts.

Shale Sandstone Transition Forest EEC specifically proposed for removal includes only:

Ground-truthing observation on the site confirmed that Shale Sandstone Transition Forest plant species generally occur on-site as either:

- Isolated remnant trees within proposed development footprint which are combination of *Eucalyptus punctata* (predominant)*, Eucalyptus sclerophylla, Eucalyptus tereticornis, Eucalyptus eugenioides*, *Eucalyptus fibrosa* and *Acacia parramatensis*
- Relatively smaller areas of regrowth under-storey and mid-storey vegetation within

previously cleared areas

- A smaller isolated patch of higher quality bushland on small rocky outcrop occurring immediately north-east of the existing swimming pool on 182 Boundary Rd. This patch has some ‘edge effects’ with the presence of environmental weeds that have thrived from surrounding land uses (e.g. Trad and Mother of Millions).

Whilst some areas of the native vegetation community show some native resilience (evidence of the native soil seed bank), the overall condition of the vegetation proposed for removal is considered to be in poor condition for the following reasons:

- Isolated paddock trees indicative of SSTF shown no signs of regrowth especially in paddock areas that are dominated by introduced pasture grasses
- There is little evidence of native regeneration
- There is high presence of introduced environment and noxious weed species
- The connectivity of the native vegetation is poor , and therefore, soil seed bank from other sources of adjacent bushland (referred to as ‘migratory resilience’) is considered to be low
- The vegetation occurs within and adjacent to existing agricultural rural residential land uses that have historically occurred on site. This includes maintenance slashing and animal grazing on the understorey strata

A majority of the understorey is dominated by exotic pasture grasses and weeds including Kikuyu, African Lovegrass and Paspalum. There are numerous planted trees including Callistemon cultivars and Pears planted as hedges/ groves.

As result, the proposal will not increase extinction of Shale Sandstone Transition Forest EEC on site. Vast areas of this same community remain in the locality and even within the property.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction?

The extent of modification proposed would not place the local occurrence of the EEC (including areas forming the local population of this EEC that extends outside the property) at risk of extinction.

<u>QUESTION D</u>

In relation to the habitat of a threatened species, population or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

<u>Response:</u>

The canopy cover of disturbed Shale Sandstone Transition Forest Critically Endangered Ecological Community proposed for removal is 4531 square metres (0.4531 ha).

Ground-truthing observations confirmed that Shale Sandstone Transition Forest plant species generally occur on-site as either:

- Isolated remnant trees within proposed development footprint comprising of approximately which are combination of *Eucalyptus punctata* and *Eucalyptus sclerophylla*

- Relatively smaller areas of regrowth under-storey and mid-storey vegetation within previously cleared areas
- A smaller isolated patch of higher quality bushland on small rocky outcrop occurring immediately north-east of the existing swimming pool on 182 Boundary Rd. This patch has some 'edge effects' with the presence of environmental weeds that have thrived from surrounding land uses (e.g. Trad and Mother of Millions).

The habitat of this EEC proposed for removal equates a relatively small area in relation to similar vegetation that will be retained on site. The extent of habitat proposed for removal is not considered a significantly large area.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

Response:

The site forms part of a local habitat corridor being continuous with surrounding bushland. The good connectivity of the site and its function as a regional corridor as means that dispersal of genetic material via insect and other fauna cross pollination as well as wind dispersal. A variety of mobile threatened fauna are still likely to be seasonally transient through the site.

The proposed development will not fragment bushland or significantly impact upon the corridor function of bushland on site as trees will be retained around the development site.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality?

Response:

The habitat surveyed as part of this assessment was in modified state with the under-storey considered to be low in resilience.

The condition of the vegetation community proposed for removal was in poor condition. The habitat proposed for removal to facilitate the proposed development is not considered to have a detrimental effect to the availability of food, roosting and other habitat resources for native fauna in the study area and locality. It does not provide habitat resources that are critical to the survival of threatened species or other local areas of this same EEC.

Local vegetation mapping studies and aerial photographs have been checked, and the action will not break the connectivity between, or otherwise fragment or isolate, the remaining trees may be part of the stepping stones of canopy within urban areas.

The vegetation proposed for removal does not provide a vital ecological function or genetic bank to such an extent that its potential removal would place the local population at risk of extinction.

Therefore, the habitat potentially removed as result of the development would not further exacerbate the decline in ecological function of Shale Sandstone Transition Forest EEC in the locality.

QUESTION E

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)?

Response:

No critical habitat has been declared for this endangered ecological community.

QUESTION F

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan?

Response:

The action is not inconsistent with a recovery or threat abatement plan or the actions in the Priorities Action Statement (PAS).

The mitigation measures are consistent with the PAS for Threatened Spp/Pop/Communities in the Hawkesbury City Council LGA.

QUESTION G

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process?

Response:

The proposal does require the removal of native vegetation which is consistent with the listed Key Threatening Process "Clearing of Native Vegetation" which has been considered as part of this assessment. This listed Key Threatening Process was considered within this Assessment of significance (seven part test) undertaken for the Shale Sandstone Transition Forest Endangered Ecological Community.

However, the development footprint is consistent with the permissible land use zoning of the site and surrounding existing rural residential properties.

CONCLUSION

The proposed development will **not** have a significant impact upon the local population Shale Sandstone Transition Forest Critically Endangered Ecological Community.

7.2.1 Large Forest Owls (Powerful Owl, Sooty Owl, Masked Owl and Barking Owl)

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

A total of three (3) hollow-bearing trees of low potential breeding habitat for these species. Significant areas of foraging habitat will remain available within the property.

Given that this species is highly mobile/migratory and the insignificant amount of -potential foraging habitat proposed for removal (in relation to what will remain on the property), it is considered unlikely that the proposal would impact on this species such that it would place a local population at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

This is not an Endangered Population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
   i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
   ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction?

This is not an Endangered Ecological Community.

d) in relation to the habitat of a threatened species, population or ecological community:
   i) the extent to which habitat is likely to be removed or modified as a result of the action proposed?

A total of three (3) hollow-bearing trees of low potential breeding habitat for these species Significant areas of foraging habitat will remain available within the property.

These species will continue to be able to utilise vast areas of foraging and potential breeding available within the subject property.

   ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action?

The proposed development will not fragment or isolate habitat for this species.

The subject species potentially utilising the subject site for foraging, is highly mobile. Thus, the loss of what is considered a relatively small amount of native vegetation in relation to their territorial range is unlikely to increase the fragmentation or isolation of habitat for these species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality?

The importance of the habitat proposed for removal is not considered significant.

It comprises of a total of three (3) hollow-bearing trees of low potential breeding habitat for these species. Significant areas of foraging habitat will remain available within the property.

The areas of potential habitat for large forest owl species to be removed under the current proposal is not considered critical to the survival of the local population of these species, particularly in proportion to the area of similar and better quality habitats that will be retained on the property and locality and throughout the region.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)?

No critical habitats have been declared for this species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan?

A recovery plan has been prepared for the Large Forest Owls including Powerful Owl was produced by the former Department of Environment and Conservation (2006) with the following objectives or actions:

- Update and refine existing owl habitat models using the best available information. Map the amount of modelled habitat across forested land in NSW.
- Design a sampling strategy to test the modelled habitat for the presence of owls and locate identified sites.
- Field validation of modelled habitat for the presence of owls.
- Estimate the areal amount of mapped modelled habitat for each owl species that is occupied (based on the proportion of sample sites with owls in them) and use this estimate to further estimate the number of owl territories present within different land tenures (based on home range data).

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process?

"Clearing of Native Vegetation" is a Key Threatening Process listed in Schedule 3 of the *Threatened Species Conservation Act, 1995*.

Conclusion

The proposal is unlikely to constitute a significant impact on the subject owl species given that:

- the proposed works would only remove marginal foraging resources for these species
- other areas of potential foraging habitat are present within the property and surrounding landscape
- the proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by these highly mobile species

7.2.2 Grey-headed Flying Fox (*Pteropus poliocephalus*)

(a) "…in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction…"

Numerous canopy trees occur throughout the locality; these trees are likely to be utilised by the Grey-headed Flying fox as food when these Myrtaceae species.

The Proposal would thus not significantly reduce the extent of any Grey-headed Flying-fox foraging or sheltering opportunities, nor would it result in the erection of any barriers to the dispersal, foraging or interbreeding needs of this species. As such, the viability of the local Grey-headed Flying-fox population would not be adversely affected thereby resulting in the local extinction of this species.

(b) "…in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction…",

An 'endangered population' is defined as a "population specified in Part 2 of Schedule 1" of the TSC Act. Therefore the Grey-headed Flying-fox is not an endangered population.

(c) "…in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

> **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
>
> **(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction..."**

An Endangered Ecological Community means an ecological community specified in Part 3 of Schedule 1 of the TSC Act. The Grey-headed Flying-fox is not listed as an Endangered Ecological Community.

(d) "…in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed…", and

The vegetation likely to be removed or impacted may offer some foraging opportunities for the Grey-headed Flying-fox when the Myrtaceae species flower. Whilst this is the case other areas of foraging habitat may also be found in local parks and reserves, in private gardens and streetscapes, and ofcourse vast areas of bushland within the property that will remain unaffected by the proposed development.

The removal of foraging habitat is not considered to be significant in the context of the Locality and Region.

(ii) "… whether an area of habitat is likely to become fragmented or isolated from other areas o habitat as a result of the proposed action…", and

The Grey-headed Flying-fox is known to easily negotiate urban infrastructure, roads, open fields, water bodies and paddocks. When eucalyptus trees are flowering, the Flying-fox is known to traverse long distances in search of food.

The proposed development will not fragment or isolate habitat for this species.

The subject species potentially utilising the subject site for foraging, is highly mobile. Thus, the loss of what is considered a relatively small amount of native vegetation in relation to their territorial range is unlikely to increase the fragmentation or isolation of habitat for these species.

(iii) "…the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality…"

The importance of the habitat proposed for removal is not considered significant.

The areas of potential habitat for this species to be removed under the current proposal is not considered critical to the survival of the local population of these species, particularly in proportion to the area of similar and better quality habitats that will be retained on the property and locality and throughout the region.

(e) "…whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)…"

No critical habitat would be adversely affected by the Proposal. The Study Area and Locality are

not listed as critical habitat under Part 3, Division 1 of the TSC Act. Critical habitat for the Grey-headed Flying-fox is yet to be defined.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

A Draft National Recovery Plan has been prepared for the Grey-headed Flying-fox (DECCW 2009).

The following objective is relevant to this Proposal: to identify and protect foraging habitat

critical to the survival of Grey-headed Flying-foxes throughout their range. However, given the

very small amount of habitat likely to be disturbed by the proposal it is highly unlikely that this stand of vegetation would be identified as a priority foraging area.

(g) ..whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Currently 27 Key Threatening Processes for mainland NSW are listed under Schedule 3 of the

TSC Act. Of these, "clearing of native vegetation" would be applicable to the Proposal. Whilst it is acknowledged that the proposal would impact native bushland, it is not considered that this impact, would result in a significant loss of habitat for this species from the Locality or Region.

The effects of other key threatening processes such as the introduction and spread of weeds such as Lantana, exotic vines, perennial grasses, vines and scramblers should be kept to a minimum.

It is recommended that the largest possible area of bushland within the Study Area remains undisturbed to minimise the impact of key threatening processes.

Conclusion

The proposal is unlikely to constitute a significant impact on Grey-headed Flying Fox given that:

- the proposed works would only remove marginal foraging resources for these species
- other areas of potential foraging habitat are present within the subject site and surrounding landscape
- the proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by these highly mobile species

7.2.5 Microchiropteran Bats

The Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), and Eastern Freetail-bat (*Mormopterus norfolkensis*), Greater-broad-nosed Bat (*Scoteanx ruepelli*) and Large-eared Pied Bat (*Chalinolobus dwyeri*) have been grouped on the basis of their similar habitat requirements.

(a) "…in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction…"

A total of three (3) hollow-bearing trees of low potential breeding habitat for these species Significant areas of foraging habitat will remain available within the property. The hollows may be used as occasional roosting resources.

Given that this species is highly mobile/migratory and the insignificant amount of -potential foraging habitat proposed for removal (in relation to what will remain on the property), it is considered unlikely that the proposal would impact on this species such that it would place a local population at risk of extinction.

Microbats use 'flyways' created by openings or interface edges surrounding bushland. It is expected that post-construction, these species would to continue forage in and around the property, utilising much the same habitat types as previously. Given the area of vegetation to be impacted in proportion to the species' high mobility and foraging range, it is unlikely that the proposal would have a significant impact on a viable local population of these microchiropteran bats.

(b) "…in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a
viable local population of the species is likely to be placed at risk of extinction…",

An endangered population is defined under the *TSC Act* as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of microchiropteran bat species listed under the Act.

(c) "…in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
(i)... is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
(ii)... is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction..."

Not applicable to a threatened species.

(d) "…in relation to the habitat of a threatened species, population or ecological community:
(i) ...the extent to which habitat is likely to be removed or modified as a result of the action proposed…", and

A total of three (3) hollow-bearing trees of low potential breeding habitat for these species Significant areas of foraging habitat will remain available within the property. The hollows may be used as occasional roosting resources.

The vegetation likely to be removed or impacted may offer some foraging for insects. Whilst this is the case other areas of foraging habitat may also be found in local parks and reserves, in private gardens and streetscapes, and ofcourse vast areas of bushland within the property that will remain unaffected by the proposed development.

(ii) "… whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action…", and

Microchiropteran bats can easily negotiate open areas and given the limited size of the habitat to be cleared, this loss is not expected to result in the disturbance to the bats' foraging patterns. The possible roosting (i.e. hollows for the Eastern Freetail-bat) and foraging sites within the Study Area will still be connected to other foraging and roosting in the Locality and

Region.

(iii) "…the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality…"

The habitat proposed for removal is not considered important breeding habitat for the local population of these species. Although potential foraging habitat would be removed similar foraging habitat will be available in the locality. Given the extent of the resources to be retained in the Study Area and beyond, it is not considered that the Proposal would affect these species such that there would be an impact on their long term survival.

(e) "…whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)…"

No critical habitat would be adversely affected by the draft Proposal. The Study Area is not listed as critical habitat under Part 3 Division 1 of the *TSC Act*.

(f) "…whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan…"

No Recovery Plans or Threat Abatement Plans (either finalised or draft) have been prepared for these species.

The recommendation of this report to retain native vegetation and hollows on site is consistent with the objectives of the priority actions.

(g) "…whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process..."

Currently 27 Key threatening processes are defined under Schedule 3 of the *TSC Act*. The Proposal would include the clearing of an area of native vegetation; this being listed as a Key Threatening Process.

The effects of other key threatening processes such as the introduction and spread of weeds such as Lantana, exotic vines, perennial grasses, vines and scramblers should be kept to a minimum.

Conclusion

The proposal is unlikely to constitute a significant impact on threatened microchiropetran bats given that:

- the proposed works would only remove marginal foraging resources for these species
- other areas of potential foraging habitat are present within the subject site and surrounding landscape
- the proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by these highly mobile species

7.2.6 Koala

a) ***in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,***

The proposal is not likely to have an adverse effect on the life cycle of Koala such that a viable local population of the species is likely to be placed at risk of extinction given only a a minimal number of feed trees species are proposed for removal. Large tracts of similar trees species are present in the surrounding bushland.

Other areas of better quality potential habitat is present directly adjacent to the subject site and within the locality. Given that this species is highly mobile and the insignificant amount of low-potential foraging habitat proposed for removal (in relation to what will remain on the property), it is considered unlikely that the proposal would impact on this species such that it would place a local population at risk of extinction.

b) ***in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,***

This is not an Endangered Population.

c) ***in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:***
   i) ***is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***
   ii) ***is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction?***

This is not an Endangered Ecological Community.

d) ***in relation to the habitat of a threatened species, population or ecological community:***
   i) ***the extent to which habitat is likely to be removed or modified as a result of the action proposed?***

The extent of habitat removed relevant to the Koala are *Eucalyptus punctata* (Grey Gum) trees that are considered to be provide marginal and potential foraging habitat.

   ii) ***whether an area of habitat is likely to be come fragmented or isolated from other areas of habitat as a result of the proposed action?***

The proposed development will not fragment or isolate habitat for this species

The subject species potentially utilising the subject site for foraging, is highly mobile. Thus, the loss of what is considered a relatively small amount of native vegetation in relation to their territorial range is unlikely to increase the fragmentation or isolation of habitat for these species.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality?

Suitable habitat is present adjacent and within the locality. Thus, the habitat modification is not considered to be of key importance to the local long term survival of the species in the locality.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)?

No critical habitats have been declared for this species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan?

A Draft Recovery Plan has been prepared for this species (DECCW 2008). The proposal is consistent with these recovery actions.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process?

"Clearing of Native Vegetation" is a Key Threatening Process listed in Schedule 3 of the *Threatened Species Conservation Act, 1995*. However, given that important habitat for this species will be impacted it is considered that the proposal would not significantly exacerbate this KTP.

Conclusion

The proposal is unlikely to constitute a significant impact on the Koala given that:

- the proposed works would only remove marginal foraging resources for this species
- other areas of potential foraging habitat are present within the subject site and surrounding landscape
- the proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by this highly mobile/migratory species

7.2.7 Regent Honeyeater

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Numerous canopy trees occur throughout the locality; these trees are likely to be utilised by the Regent Honeyeater as food when these Myrtaceae species flower.

Given that this species is highly mobile/migratory, it is considered unlikely that the proposal would impact on this species such that it would place a local population at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

This is not an Endangered Population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
   i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
   ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction?

This is not an Endangered Ecological Community.

d) in relation to the habitat of a threatened species, population or ecological community:
   i) the extent to which habitat is likely to be removed or modified as a result of the action proposed?

The vegetation likely to be removed or impacted may offer some foraging opportunities for the Regent Honeyeater when the Myrtaceae species flower. Whilst this is the case other areas of foraging habitat may also be found in local parks and reserves, in private gardens and streetscapes, and ofcourse vast areas of bushland within the property that will remain unaffected by the proposed development.

The proposed development proposes the removal of native vegetation that comprises of potential foraging habitat.

   ii) whether an area of habitat is likely to be come fragmented or isolated from other areas of habitat as a result of the proposed action?

The proposal will not further fragment or isolate the habitat for this mobile species present within the locality given the removal of trees within a previously cleared area that is surrounded by extensive tracts of undisturbed bushland.

   iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality?

The importance of the habitat proposed for removal is not considered significant.

The areas of potential habitat for this species to be removed under the current proposal is not considered critical to the survival of the local population of these species, particularly in proportion to the area of similar and better quality habitats that will be retained on the property and locality and throughout the region.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)?

No critical habitats have been declared for this species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan?

A recovery plan has been prepared for Regent Honeyeater – *The Regent Honeyeater* (*Anthochaera Phrygia*) Recovery Plan 1999-2003' and a revised recovery plan is currently in preparation.

The proposed works do not conflict with any of these objectives.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process?

"Clearing of Native Vegetation" is a Key Threatening Process listed in Schedule 3 of the *Threatened Species Conservation Act, 1995*.

Conclusion

The proposal is unlikely to constitute a significant impact on the Regent Honeyeater given that:

- the proposed works would only remove marginal foraging resources for this species
- other areas of potential foraging habitat are present within the subject site and surrounding landscape
- the proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by this highly mobile/migratory species

7.2.9 Spotted Tailed Quoll

b) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Spotted-tailed Quolls den in hollow logs on the ground, in rocky outcrops, small caves, rock crevices, underground borrows (usually under logs, rocks or dense vegetation or those used by rabbits or Wombats) and/or in hollows in trees or tree roots. They often utilise a number of different dens (up to 20) within their home range area which may be of considerable size (100 – 200 ha for females and much larger for males). Quolls are highly mobile and may forage over large areas in one night, often travelling several kilometres. Critical habitat for Quolls includes large tracts of forest, particularly those with older trees containing hollows. As well, larger hollow logs on the ground, rocky outcrops or areas with caves and crevices are important habitat for Quolls. These areas provide both shelter and an abundant food supply (Strahan 1995).

Given that this species is highly mobile/migratory and the insignificant amount of -potential foraging habitat proposed for removal, it is considered unlikely that the proposal would impact on this species such that it would place a local population at risk of extinction.

c) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

This is not an Endangered Population.

d) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
  i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
  ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction?

This is not an Endangered Ecological Community.

e) in relation to the habitat of a threatened species, population or ecological community:
  i) the extent to which habitat is likely to be removed or modified as a result of the action proposed?

The proposed development proposes the removal of potential foraging habitat. However, this habitat is not considered critical to a breeding population. The areas containing fallen dead timber and logs will be retained.

  ii) whether an area of habitat is likely to be come fragmented or isolated from other areas of habitat as a result of the proposed action?

It is unlikely the proposal will increase the fragmentation or isolation of habitat for this species.

  iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality?

The habitat proposed for removal is not considered critically important to a known breeding population. Better quality habitats on the forest floor containing fallen dead timber and logs will be retained. Other potentially important habitats next to the creek will be retained via the implantation of a large buffer from the watercourses. These species have large territories and they are likely to occur outside the proposed area of clearing and this species not identified during targeted surveys.

Thus, the habitat modification is not considered to be of key importance to the local long term survival of the species in the locality.

f) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)?

No critical habitats have been declared for this species.

g) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan?

There is no Recovery Plan or Threat Abatement Plan for this species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process?

“Clearing of Native Vegetation” is a Key Threatening Process listed in Schedule 3 of the *Threatened Species Conservation Act, 1995*. However, given that important habitat for this species will be impacted it is considered that the proposal would not significantly exacerbate this KTP.

Conclusion

The proposal is unlikely to constitute a significant impact on Spotted Tailed Quoll given that the proposed work will:

- would not take place within the creek line
- would implement erosion and sedimentation controls
- would not isolate an area of known habitat from currently inter-connecting areas of potential habitat for this species

On the basis of the above considerations, it is not likely that the proposal will result in a significant effect on the Spotted-tail Quoll habitat.

7.2.10 Scarlet Robin and Flame Robin

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

A significant proportion of the similar habitat will be retained within the property in perpetuity. These retained areas contain better quality habitat for these species than those proposed for removal. I.e. areas of abundant logs and fallen timber for the Scarlet Robin will be retained.

Given that this species is highly mobile/migratory, and similar habitat will be retained on-site, it is considered unlikely that the proposal would impact on this species such that it would place a local population at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

This is not an Endangered Population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
   i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
   ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction?

This is not an Endangered Ecological Community.

d) in relation to the habitat of a threatened species, population or ecological community:
   i) the extent to which habitat is likely to be removed or modified as a result of the action proposed?

The proposed development proposes the removal of native vegetation that comprises of potential foraging habitat and breeding habitat.

   ii) whether an area of habitat is likely to be come fragmented or isolated from other areas of habitat as a result of the proposed action?

The proposal will not further fragment or isolate the habitat for this mobile species present within the locality given the removal of trees within a previously cleared area that is surrounded by extensive tracts of undisturbed bushland.

   iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality?

The Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer. This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub.

Flame Robin migrate to the lowland in winter. It nests is Spring are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks. It actually prefers clearings or areas with open understoreys (OEH 2015).

A significant proportion of the similar habitat will be retained within the property in perpetuity. These retained areas contain better quality habitat for these species than those proposed for removal. I.e. areas of abundant logs and fallen timber for the Scarlet Robin will be retained.

Given that this species is highly mobile/migratory, and similar habitat will be retained on-site, it is considered unlikely that the proposal would impact on this species such that it would place a local population at risk of extinction.

The importance of the habitat proposed for removal is not considered significant.

The areas of potential habitat for this species to be removed under the current proposal is not considered critical to the survival of the local population of these species, particularly in proportion to the area of similar and better quality habitats that will be retained on the property and locality and throughout the region.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)?

No critical habitats have been declared for this species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan?

There is no recovery plan or threat abatement plan for this species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process?

"Clearing of Native Vegetation" is a Key Threatening Process listed in Schedule 3 of the *Threatened Species Conservation Act, 1995*.

Conclusion

The proposal is unlikely to constitute a significant impact on the Scarlet Robin and Flame Robin given that:

- the proposed works would only remove marginal foraging resources for this species
- other areas of potential foraging habitat are present within the subject site and surrounding landscape
- the proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by this highly mobile/migratory species

7.2.11 Varied Sitella

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

A significant proportion of the similar habitat will be retained within the property in perpetuity. These retained areas contain better quality habitat for these species than those proposed for removal.

Given that this species is highly mobile/migratory, and similar habitat will be retained on-site, it is considered unlikely that the proposal would impact on this species such that it would place a local population at risk of extinction.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

This is not an Endangered Population.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
   i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
   ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction?

This is not an Endangered Ecological Community.

d) in relation to the habitat of a threatened species, population or ecological community:
   i) the extent to which habitat is likely to be removed or modified as a result of the action proposed?

The proposed development proposes the removal of native vegetation that comprises of potential foraging habitat.

   ii) whether an area of habitat is likely to be come fragmented or isolated from other areas of habitat as a result of the proposed action?

The proposal will not further fragment or isolate the habitat for this mobile species present within the locality given the removal of trees within a previously cleared area that is surrounded by extensive tracts of undisturbed bushland.

   iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality?

Varied Sitella Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years (OEH 2015).

The area proposed for removal vegetation provides potential foraging habitat for this species.

The importance of the habitat proposed for removal is not considered significant.

The areas of potential habitat for this species to be removed under the current proposal is not considered critical to the survival of the local population of these species, particularly in proportion to the area of similar and better quality habitats that will be retained on the property and locality and throughout the region.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)?

No critical habitats have been declared for this species.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan?

There is no recovery plan or threat abatement plan for this species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process?

"Clearing of Native Vegetation" is a Key Threatening Process listed in Schedule 3 of the *Threatened Species Conservation Act, 1995*.

Conclusion

The proposal is unlikely to constitute a significant impact on the Varied Sitella given that:

- the proposed works would only remove marginal foraging resources for this species
- other areas of potential foraging habitat are present within the subject site and surrounding landscape
- the proposal would not isolate or fragment any currently connecting areas of habitat in terms of use by this highly mobile/migratory species

APPENDIX 4: NSW OEH information on Shale Sandstone Transition Forest Endangered Ecological Community

Shale Sandstone Transition Forest

Conservation Status

Shale-Sandstone Transition Forest is listed as an endangered ecological community under the *Threatened Species Conservation Act* 1995 and the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999*.

NPWS/M. Cufer 2001

Description

Shale-Sandstone Transition Forest occurs at the edges of the Cumberland Plain where shale rock and clay soils gradually change to sandstone. The boundaries of this plant community are indistinct. The main tree species are forest red gum (*Eucalyptus tereticornis*), grey gum (*E. punctata*), stringybarks (*E. globoidea*, *E. eugenioides*) and ironbarks (*E. fibrosa* and *E. crebra*). There are two forms of Shale-Sandstone Transition Forest: low sandstone influence and high sandstone influence. The high sandstone influence form includes sandstone species, such as tick bush (*Kunzea ambigua*) and narrow leaved geebung (*Persoonia linearis*), and is most widespread in the southern section of the Cumberland Plain. The low sandstone influence form has an understorey layer that is closer to Cumberland Plain Woodland and includes shrub layer dominated by blackthorn (*Bursaria spinosa*) with grasses, such as kangaroo grass (*Themeda australis*), hedgehog grass (*Echinopogon ovatus*), and other herbs, such as *Dichondra repens*.

Distribution

Before European settlement, Shale-Sandstone Transition Forest was extensive at the edges of the Cumberland Plain and covered 43,990 hectares. Today, it is reduced to 22.6 percent of its original extent in an area bounded by Sackville (north), Mulgoa (west), Wilton (south) and Revesby (east) (NPWS 2002a, NPWS 2002b). Shale-Sandstone Transition Forest occurs in the Bankstown, Baulkham Hills, Blacktown, Campbelltown, Hawkesbury, Liverpool, Parramatta, Penrith, Sutherland and Wollondilly local government areas.

Examples to see

Good examples of Shale-Sandstone Transition Forest can be seen at Bents Basin Reserve, Scheyville National Park, Parramatta

NSW NATIONAL PARKS AND WILDLIFE SERVICE

Regional Park and Nattai National Park.

Ecology

Shale-Sandstone Transition Forest is well adapted to fire, being on the edges of the Cumberland Plain, often close to sandstone areas. Some species in shale areas regenerate from profuse annual seeding and underground tubers. High sandstone influence sites have poor rocky soils that support a diverse shrub layer, including wattle and pea flower species that rely on nitrogen fixing root nodules and soil/root fungi to obtain nutrients.

Threats

The greatest threat to Shale-Sandstone Transition Forest is clearing for agriculture and urban/rural residential development. Other threats include grazing, mowing, rubbish dumping, weed invasion and frequent fire.

Recovery and management

The recovery of this ecological community is being addressed as part of the Cumberland Plain Endangered Ecological Communities Recovery Plan, which is currently being drafted.

High conservation value remnants of Shale-Sandstone Transition Forest will identified in the recovery plan and recommended for protection through a range of mechanisms including reservation, environmental protection zoning and development control processes. Other protection measures can be through plans of management and voluntary conservation agreements. These measures will enable the remnants to be better managed for conservation and vegetation corridors to be formed. All vegetation layers should be maintained as the removal of the understorey followed by slashing/mowing encourages weeds. Once threatening processes, such as grazing and mowing are removed, Shale-Sandstone Transition Forest can regenerate strongly. Wattle and pea species have seeds that can persist in the soil seedbank and, following fire, will colonise disturbed margins. Woody weeds should be controlled to prevent them dominating the understorey.

For further information contact

Central Threatened Species Unit, NSW Department of Environment and Conservation, PO Box 1967, Hurstville NSW 2220 Phone 02 9585 6678. www.nationalparks.nsw.gov.au

References

Benson, D.H. and Howell, J. (1990) Taken for Granted: The Bushland of Sydney and Its Suburbs*, Kangaroo Press, Sydney.*

Benson, D.H. and Howell, J. (2000) Sydney's Bushland — More than Meets the Eye*, Royal Botanic Gardens, Sydney.*

James, T. McDougall, L. and Benson, D.H. (1999) Rare Bushland Plants of Western Sydney*, second edition, Royal Botanic Gardens, Sydney.*

NPWS (2002a) Native Vegetation of the Cumberland Plain - Final Edition, NPWS, Sydney.

NPWS (2002b) Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain, Final Edition, NPWS, Sydney.

APPENDIX 5: NSW OEH information on River Flat Eucalypt Forest Endangered Ecological Community

River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act

NSW Scientific Committee

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Determination to make a minor amendment to Part 3 of Schedule 1 (Endangered ecological communities) of the Act by inserting the River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (as described in the determination of the Scientific Committee under Division 5 Part 2) and as a consequence to omit reference to the River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (as described in the final determination to list the ecological community) which was published on pages 9420 to 9426 in the NSW Government Gazette No. 200 dated 17 December 2004. Minor amendments to the Schedules are provided for by Division 5 of Part 2 of the Act.

The Scientific Committee is of the opinion that the amendment is necessary or desirable to correct minor errors or omissions in the Determination in relation to the Thackway and Cresswell (1995) reference.

The Scientific Committee has found that:

1. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is the name given to the ecological community associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Floodplains are level landform patterns on which there may be active erosion and aggradation by channelled and overbank stream flow with an average recurrence interval of 100 years or less (adapted from Speight 1990). River-Flat Eucalypt Forest on Coastal Floodplains generally occurs below 50 m elevation, but may occur on localised river flats up to 250 m above sea level in the NSW North Coast, Sydney Basin and South East Corner bioregions. Bioregions are defined in Thackway and Cresswell (1995). The structure of the community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees. Typically these forests and woodlands form mosaics with other floodplain forest communities and treeless wetlands, and often they fringe treeless floodplain lagoons or wetlands with semi-permanent standing water (e.g. Goodrick 1970).

The composition of River-Flat Eucalypt Forest on Coastal Floodplains is primarily determined by the frequency and duration of waterlogging and the texture, nutrient and moisture content of the soil. Composition also varies with latitude. The community is characterised by the following assemblage of species:

Acacia floribunda	*Acacia parramattensis*
Acmena smithii	*Adiantum aethiopicum*
Angophora floribunda	*Angophora subvelutina*
Austrostipa ramosissima	*Backhousia myrtifolia*
Breynia oblongifolia	*Bursaria spinosa*
Casuarina cunninghamiana subsp. *cunninghamiana*	*Casuarina glauca*
Cayratia clematidea	*Centella asiatica*
Cheilanthes sieberi subsp. *sieberi*	*Clematis aristata*
Clematis glycinoides	*Commelina cyanea*
Cymbopogon refractus	*Desmodium varians*
Dichelachne micrantha	*Dichondra repens*
Digitaria parviflora	*Doodia aspera*
Echinopogon caespitosus var. *caespitosus*	*Echinopogon ovatus*
Einadia hastata	*Einadia trigonos*
Entolasia marginata	*Entolasia stricta*
Eragrostis leptostachya	*Eucalyptus amplifolia*
Eucalyptus baueriana	*Eucalyptus benthamii*
Eucalyptus botryoides	*Eucalyptus elata*
Eucalyptus grandis	*Eucalyptus longifolia*
Eucalyptus moluccana	*Eucalyptus ovata*
Eucalyptus saligna	*Eucalyptus tereticornis*
Eucalyptus viminalis	*Euchiton sphaericus*

Eustrephus latifolius	*Galium propinquum*
Geitonoplesium cymosum	*Geranium solanderi*
Glycine clandestina	*Glycine microphylla*
Glycine tabacina	*Hardenbergia violacea*
Hydrocotyle peduncularis	*Hymenanthera dentata*
Hypolepis muelleri	*Imperata cylindrica* var. *major*
Livistona australis	*Lomandra filiformis*
Lomandra longifolia	*Lomandra multiflora* subsp. *multiflora*
Melaleuca decora	*Melaleuca linariifolia*
Melaleuca styphelioides	*Melia azedarach*
Microlaena stipoides var. *stipoides*	*Opercularia diphylla*
Oplismenus aemulus	*Oxalis perennans*
Ozothamnus diosmifolius	*Pandorea pandorana*
Paspalidium distans	*Persicaria decipiens*
Phyllanthus gunnii	*Plectranthus parviflorus*
Poranthera microphylla	*Pratia purpurascens*
Pteridium esculentum	*Rubus parvifolius*
Sigesbeckia orientalis subsp. *orientalis*	*Solanum prinophyllum*
Stephania japonica var. *discolor*	*Themeda australis*
Trema aspera	*Tristaniopsis laurina*
Vernonia cinerea	*Veronica plebeia*
Viola hederacea	*Wahlenbergia gracilis*

2. The total species list of the community is considerably larger than that given above, with many species present at only one or two sites or in low abundance. The species composition of a site will be influenced by the size of the site, recent rainfall or drought conditions and by its disturbance (including fire, grazing, flooding and land clearing) history. The number and relative abundance of species will change with time since fire, flooding or significant rainfall, and may also change in response to changes in grazing regimes. At any one time, above-ground individuals of some species may be absent, but the species may be represented below ground in the soil seed banks or as dormant structures such as bulbs, corms, rhizomes, rootstocks or lignotubers. The list of species given above is of vascular plant species, the community also includes micro-organisms, fungi, cryptogamic plants and a diverse fauna, both vertebrate and invertebrate. These components of the community are poorly documented.

3. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is known from parts of the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Eastern Capital City Regional, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions. Bioregions are defined in Thackway and Cresswell (1995). Major examples once occurred on the floodplains of the Hunter, Hawkesbury, Moruya, Bega and Towamba Rivers, although many smaller floodplains and river flats also contain examples of the community.

4. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). *Eucalyptus baueriana* (blue box), *E. botryoides* (bangalay) and *E. elata* (river perppermint) may be common south from Sydney, *E. ovat*a (swamp gum) occurs on the far south coast, *E. saligna* (Sydney blue gum) and *E. grandis* (flooded gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain. Other eucalypts including *Eucalyptus longifolia* (woollybutt), *E. moluccana*(grey box) and *E. viminalis* (ribbon gum) may be present in low abundance or dominant in limited areas of the distribution. A layer of small trees may be present, including *Melaleuca decora, M. styphelioides* (prickly-leaved teatree), *Backhousia myrtifolia* (grey myrtle), *Melia azaderach* (white cedar), *Casuarina cunninghamiana* subsp. *cunninghamiana* (river oak) and *C. glauca* (swamp oak). Scattered shrubs include *Bursaria spinosa* subsp. *spinosa* (blackthorn), *Solanum prinophyllum*(forest nightshade), *Rubus parvifolius* (native raspberry), *Breynia oblongifolia* (coffee bush),*Ozothamnus diosmifolius, Hymenanthera dentata* (tree violet), *Acacia floribunda* (white sally) and*Phyllanthus gunnii*. The groundcover is composed of abundant forbs, scramblers and grasses including *Microlaena stipoides* (weeping grass), *Dichondra repens* (kidney weed), *Glycine clandestina, Oplismenus aemulus, Desmodium gunnii, Pratia purpurascens* (whiteroot), *Entolasia marginata* (bordered panic), *Oxalis perennans* and *Veronica plebeia* (trailing speedwell). The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic shrubs, grasses, vines and forbs.

5. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions provides habitat for a broad range of animals, including many that are dependent on trees for food, nesting or roosting (Law *et al*. 2000a, b). These include cormorants (*Phalacrocorax* spp.) and egrets (*Ardea* spp. and *Egrettia* spp.), the Osprey (*Pandion haliaetus*), Whistling Kite (*Haliastur sphenurus*), White-bellied Sea-eagle (*Haliaeetus leucogaster*), as well as the Brush-tailed Phascogale (*Phascogale tapoatafa*), Yellow-bellied Glider (*Petaurus australis*), Squirrel Glider (*Petaurus norfolcensis*) (Law *et al*. 2000a), Sugar Glider (*Petaurus breviceps*) and Grey-headed Flying Fox (*Pteropus poliocephalus*). The fauna of River-Flat Eucalypt Forest also includes a number of species of frogs in the families Myobatrachidae and Hylidae, particularly *Litoria*spp., and many species of forest birds including honeyeaters, kingfishers, cuckoos, owls, doves, whistlers and fantails.

6. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions forms part of a complex of forested wetland and treeless wetland communities found throughout the coastal floodplains of NSW. A recent analysis of available quadrat data from these habitats identified a distinct grouping of vegetation samples attributable to this community (Keith and Scott 2005). The combination of features that distinguish River-Flat Eucalypt Forest on Coastal Floodplains from other endangered communities on the coastal floodplains include: its dominance by either a mixed eucalypt canopy or by a single species of eucalypt belonging to either the genus *Angophora* or the sections *Exsertaria* or *Transversaria* of the genus*Eucalyptus* (Hill 2002); the relatively low abundance or sub-dominance of *Casuarina* and *Melaleuca*species; the relatively low abundance of *Eucalyptus robusta*; and the prominent groundcover of soft-leaved forbs and grasses. It generally occupies central parts of floodplains and raised levees; habitats where flooding is periodic and soils are rich in silt, without deep humic horizons and show little or no influence of saline ground water.

7. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions includes and replaces Sydney Coastal River-Flat Forest Endangered Ecological Community. River-Flat Eucalypt Forest on Coastal Floodplains may adjoin or intergrade with several other endangered ecological communities, which collectively cover all remaining native vegetation on the coastal floodplains of New South Wales. These include Lowland Rainforest on Floodplain in the NSW North Coast bioregion, Subtropical Floodplain Forest of the NSW North Coast bioregion, Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (including the formerly listed Sydney Coastal Estuary Swamp Forest in the Sydney Basin bioregion), Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions and Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. For example, northwards from the Hunter valley, River-Flat Eucalypt Forest on Coastal Floodplains may intergrade with, or be replaced by, Subtropical Floodplain Forest of the NSW North Coast bioregion. As soil salinity increases, River-Flat Eucalypt Forest may adjoin or intergrade with Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions. The boundaries between all of these communities are dynamic and may shift in response to changes in hydrological regimes, fire regimes or land management practices. The Determinations for these communities collectively encompass the full range of intermediate assemblages in transitional habitats.

8. A number of vegetation surveys and mapping studies have been conducted across the range of River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. In the Comprehensive Regional Assessment of the north-eastern NSW (NPWS 1999), areas that were mapped on coastal floodplains of the Manning River as 'Forest Ecosystem 47, Escarpment Red Gums' are included within this community. In the lower Hunter valley, 'Central Hunter Riparian Forest' (map unit 13), 'Wollombi Redgum-River Oak Woodland' (map unit 14) and 'Redgum Roughbarked Apple Swamp Forest' (map unit 38) of NPWS (2000) fall within this community. On the Cumberland Plain, 'Riparian Forest' (map unit 12) of Tozer (2003) and parts of 'Alluvial Woodland' (map unit 11) that are dominated by eucalypts (Tozer 2003) are included within this community. Benson's (1992) 'Camden White Gum Forest' (map unit 6d) and those parts of 'River Flat Forest' (map unit 9f) dominated by eucalypts also fall within this community, as do parts of the 'River-flat forests' of Benson and Howell (1990) and Benson *et al.* (1996) that are dominated by eucalypts. In the Warragamba catchment, small areas of 'Burragorang River Flat Forest' (map unit 88b) and 'Oakdale Alluvial Rough-barked Apple Forest' (map unit 88c) of NPWS (2002) are included within this community. On the south coast of NSW, this community includes those parts of 'Ecotonal Coastal Swamp Forest' (forest ecosystem 27) of Thomas *et al.* (2000) dominated by eucalypts, those parts of 'Coastal Lowlands Riparian Herb/Grass Forest' (forest ecosystem 48) and 'Southern Hinterland Shrub/Herb/Grass Riparian Forest' (forest ecosystem 49) of Thomas *et al*. (2000) mapped on alluvial soils, and those parts of 'Cumberland River Flat Forest' (map unit 33) and 'Floodplain Swamp Forest' (map unit 105) of Tindall et al. (2004) that are dominated by eucalypts. In the Eden region, this community includes forested parts of 'Floodplain Wetlands' (map unit 60) that are dominated by eucalypts and parts of 'Bega Wet Shrub Forest' (map unit 19) that are mapped on floodplains (Keith and Bedward 1999). River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is included within the 'Coastal Floodplain Wetlands' vegetation class of Keith (2002, 2004). There may be additional or unmapped occurrences of River-Flat Eucalypt Forest on Coastal Floodplains within and beyond these surveyed areas.

9. The extent of the River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions prior to European settlement has not been mapped across its entire range. However, one estimate based on a compilation of regional vegetation maps suggests that Coastal Floodplain Wetlands, which include Temperate Eucalypt Forest on Coastal Floodplains, currently cover 800-1400 km^2, representing less than 30% of the original extent of this broadly defined vegetation class (Keith 2004). Compared to this combined estimate, the remaining area of River-Flat Eucalypt Forest on Coastal Floodplains is likely to be considerably smaller and is likely to represent much less than 30% of its original range. Major occurrences include: about 2000 ha in the lower Hunter region in 1990s (NPWS 2000); less than 10 000 ha on the NSW south coast from Sydney to Moruya in the mid 1990s (Tindall et al.

2004), of which up to about three-quarters occurred on the Cumberland Plain in 1998 (Tozer 2003); and less than 1000 ha in the Eden region in 1990 (Keith and Bedward 1999).

10. River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions has been extensively cleared and modified. Large areas that formerly supported this community are occupied by exotic pastures grazed by cattle, market gardens and other cropping enterprises (e.g. turf). In the lower Hunter region, about one-quarter of the original extent was estimated to have remained during the 1990s (NPWS 2000), while less than one-quarter remained on the Cumberland Plain in 1998 (Tozer 2003). In the Sydney – South Coast region, less than one-fifth was estimated to remain in the late 1990s (Tindall et al. 2004), in the Eden region about 30% was estimated to remain during the 1990s (Keith and Bedward 1999).

11. Land clearing continues to threaten River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. A small minority of the remaining area occurs on public land (e.g. Benson and Howell 1990), with most occurring on productive agricultural land or in close proximity to rural centres. The remaining stands are severely fragmented by past clearing and are further threatened by continuing fragmentation and degradation, flood mitigation and drainage works, landfilling and earthworks associated with urban and industrial development, pollution from urban and agricultural runoff, weed invasion, overgrazing, trampling and other soil disturbance by domestic livestock and feral animals including pigs, activation of 'acid sulfate soils', removal of dead wood and rubbish dumping (e.g. Benson and Howell 1990, Boulton and Brock 1999, Johnston *et al*. 2003). Anthropogenic climate change may also threaten River-Flat Eucalypt Forest on Coastal Floodplains if this affects future flooding regimes (IPCC 2001, Hughes 2003). Localised areas, particularly those within urbanised regions, may also be exposed to frequent burning which reduces the diversity of woody plant species. Clearing of native vegetation; Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands; Invasion of native plant communities by exotic perennial grasses; Predation, habitat destruction, competition and disease transmission by feral pigs; Anthropogenic climate change; High frequency fire; and Removal of dead wood and dead trees are listed as Key Threatening Processes under the Threatened Species Conservation Act (1995).

12. Very few examples of River-Flat Eucalypt Forest on Coastal Floodplains remain unaffected by weeds. The causes of weed invasion include physical disturbance to the vegetation structure of the community, dumping of landfill rubbish and garden refuse, polluted runoff from urban and agricultural areas, construction of roads and other utilities, and grazing by domestic livestock. The principal weed species affecting River-Flat Eucalypt Forest on Coastal Floodplains include *Anredera cordifolia* (madeira vine), *Araujia sericiflora* (moth plant), *Asparagus asparagoides* (bridal creeper),*Axonopus fissifolius* (narrow-leaved carpet grass), *Bidens pilosa* (cobbler's peg), *Cardiospermum grandiflorum* (balloon vine), *Cirsium vulgare* (spear thistle), *Conyza bonariensis* (flaxleaf fleabane), *C. sumatrensis* (tall fleabane), *Gleditsea triacanthos* (honey locust), *Hypochaeris radicata* (catsear),*Ipomoea* spp. (morning glories), *Lantana camara* (lantana), *Ligustrum lucidum* (large-leaved privet),*L. sinense* (small-leaved privet), *Lonicera japonica* (Japanese honeysuckle), *Macfaydyena unguis-cati* (cat's claw creeper), *Olea europea* subsp*. cuspidata* (African olive), *Plantago lanceolata*(plantain), *Rubus* fruticosis agg. (blackberries), *Senecio madagascariensis* (fireweed), *Senna pendula* var. *glabrata, Setaria parviflora* (slender pigeon grass), *Sida rhombifolia* (paddy's lucerne), *Sonchus oleraceus* (common sowthistle), *Tradescantia fluminensis* (wandering jew), *Verbena bonariensis* (purpletop), *Paspalum dilatatum* (paspalum), *P. urvillei* and *Pennisetum clandestinum*(kikuyu) (Tozer 2003, Keith and Scott 2005, J. R. Hosking, pers. comm.).

13. Small areas of River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions are contained within existing conservation reserves, including Blue Mountains, Cattai, Dharug, Georges River, Marramarra, Morton, Deua and Wadbilliga National Parks, and Gulguer and Mulgoa Nature Reserves, and these are unevenly distributed throughout the range and unlikely to represent the full diversity of the community. The reserved examples are on localised, sheltered river flats between hills, rather than the large open floodplains that comprised the majority of the original habitat (Keith 2004).

14. In view of the above the Scientific Committee is of the opinion that River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Dr Richard Major
Chairperson
Scientific Committee

Proposed Gazettal date: 08/07/11
Exhibition period: 08/07/11 - 02/09/11

References

Benson DH (1992) The natural vegetation of the Penrith 1:100 000 map sheet. *Cunninghamia* 2, 541-596.

Benson DH, Howell, J (1990) 'Taken for granted: the bushland of Sydney and its suburbs.' (Kangaroo Press, Sydney.)

Benson DH, Howell J, McDougall L (1996) 'Mountain devil to mangrove.' (Royal Botanic Gardens, Sydney.)

Boulton AJ, Brock MA (1999). 'Australian freshwater wetlands: processes and management.' (Gleneagles Publishing, Glen Osmond.)

Goodrick GN (1970) A survey of wetlands of coastal New South Wales. Technical Memorandum No. 5. CSIRO, Canberra.

Hill KD (2002) *Eucalyptus*. In: 'Flora of New South Wales. Volume 2' Revised edition (Ed. GJ Harden), pp96-164. University of New South Wales Press, Kensington.

Hughes L (2003) Climate change and Australia: trends, projections and impacts. *Austral Ecology* **28**, 423-443.

IPCC (2001) Climate change 2001: Impacts, adaptation and vulnerability. Report from Working Group II. Intergovernmental Panel on Climate Change, Geneva.

Johnston SG, Slavich PG, Hirst P (2003) Alteration of groundwater and sediment geochemistry in a sulfidic backswamp due to Melaleuca quinquenervia encroachment. *Australian Journal of Soil Research* **41**, 1343-1367.

Keith DA (2002) *A compilation map of native vegetation for New South Wales. NSW Biodiversity Strategy. NSW National Parks and Wildlife Service, Sydney.*

Keith DA (2004) 'Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT.' (NSW Department of Environment and Conservation, Sydney.)

Keith DA, Bedward, M (1999) Vegetation of the South East Forests region, Eden, New South Wales.*Cunninghamia* 6, 1-218.

Keith DA, Scott, J (2005) Native vegetation of coastal floodplains– a broad framework for definition of communities in NSW. *Pacific Conservation Biology* **11**, in press.

Law BS, Chidel M, Turner G (2000a) The use by wildlife of paddock trees in farmland. Pacific*Conservation Biology* **6**, 130-143.

Law BS, Mackowski C, Schoer L, Tweedie T (2002b) The flowering phenology of myrtaceous trees and their relation to environmental and disturbance variables in Northern New South Wales. *Austral Ecology* **25**, 160-178.

NPWS (1999) *Forest ecosystem classification and mapping for the upper and lower north east Comprehensive Regional Assessment*. NSW National Parks and Wildlife Service, Coffs Harbour.

NPWS (2000). *Vegetation Survey, Classification and Mapping: Lower Hunter and Central Coast Region.* Version 1.2. NSW National Parks and Wildlife Service, Sydney.

NPWS (2002). *Native vegetation of the Warragamba Special Area.* NSW National Parks and Wildlife Service, Sydney.

Speight JG (1990) Landform. In: 'Australian soil and land survey. Field handbook' Second edition (Eds. RC McDonald, RF Isbell, JG Speight, J, Walker, MS Hopkins), pp9-57. Inkata Press, Melbourne.

Thackway R, Cresswell ID (1995) (eds) 'An interim biogeographic regionalisation of Australia: a framework for establishing the national system of reserves.' (Version 4.0 Australian Nature Conservation Agency: Canberra).

Tindall D, Pennay C, Tozer MG, Turner K, Keith, DA (2004) Native vegetation map report series. No. 4. Araluen, Batemans Bay, Braidwood, Burragorang, Goulburn, Jervis Bay, Katoomba, Kiama, Moss Vale, Penrith, Port Hacking, Sydney, Taralga, Ulladulla, Wollongong. NSW Department of Environment and Conservation and NSW Department of Infrastructure, Planning and Natural Resources, Sydney.

Thomas V, Gellie N, Harrison T (2000). Forest ecosystem classification and mapping for the southern Comprehensive Regional Assessment. NSW National Parks and Wildlife Service, Queanbeyan.

Tozer MG (2003). The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* **8**, 1-75.
Page last updated: 08 July 2011

APPENDIX 6: Results from EPBC Protected Matters Search Tool database

Australian Government
Department of 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.

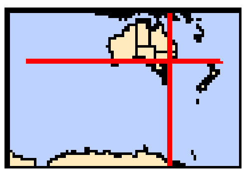
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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

Report created: 21/06/15 15:56:28

- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements

Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	64
Listed Migratory Species:	34

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/index.html

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:	8
Commonwealth Heritage Places:	2
Listed Marine Species:	34
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	49
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

World Heritage Properties
[Resource Information]

Name	State	Status
The Greater Blue Mountains Area	NSW	Declared property

National Heritage Properties
[Resource Information]

Name	State	Status
Natural		
The Greater Blue Mountains Area	NSW	Listed place

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
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered	Community likely to occur within area
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered	Community likely to occur within area

Listed Threatened Species
[Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora epomophora Southern Royal Albatross [25996]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora sanfordi Northern Royal Albatross [82331]	Endangered	Species or species habitat likely to occur within area
Diomedea exulans antipodensis Antipodean Albatross [82269]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans exulans Tristan Albatross [82337]	Endangered	Species or species habitat may occur within area
Diomedea exulans gibsoni Gibson's Albatross [82271]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus 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
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta salvini Salvin's Albatross [82343]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris impavida Campbell Albatross [82449]	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
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat known 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
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Other		
Pommerhelix duralensis Dural Land Snail [85268]	Endangered	Species or species habitat known to occur within area
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat likely to occur within area
Acacia pubescens Downy Wattle, Hairy Stemmed Wattle [18800]	Vulnerable	Species or species habitat likely to occur within area
Allocasuarina glareicola [21932]	Endangered	Migration route known to occur within area
Asterolasia elegans [56780]	Endangered	Species or species habitat known to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Genoplesium baueri Yellow Gnat-orchid [7528]	Endangered	Species or species habitat may occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat likely to occur within area
Micromyrtus minutiflora [11485]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Olearia cordata [6710]	Vulnerable	Species or species habitat likely to occur within area
Pelargonium sp. Striatellum (G.W.Carr 10345) Omeo Stork's-bill [84065]	Endangered	Species or species habitat likely to occur within area
Persoonia hirsuta Hairy Persoonia [19006]	Endangered	Species or species habitat likely to occur within area
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat known to occur within area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat known to occur within area
Pomaderris brunnea Rufous Pomaderris [16845]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Pterostylis pulchella Pretty Greenhood [6448]	Vulnerable	Species or species habitat may occur within area
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat known to occur within area
Pultenaea parviflora [19380]	Vulnerable	Species or species habitat likely to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Streblus pendulinus Siah's Backbone, Sia's Backbone, Isaac Wood [21618]	Endangered	Species or species habitat likely to occur within area
Tetratheca juncea Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Wollemia nobilis Wollemi Pine [64545]	Endangered	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 known to occur within area

Name	Status	Type of Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely 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
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered*	Species or species habitat likely to occur within area
Macronectes giganteus 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 area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area
Thalassarche impavida Campbell 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*	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat 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 known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to 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
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to 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 may 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		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Pandion cristatus Eastern Osprey [82411]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -
Commonwealth Land - Australian & Overseas Telecommunications Corporation
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Director of Defence Service Homes
Defence - RICHMOND - FUEL FARM, DENTAL, MEDICAL
Defence - RICHMOND - MIDDLE MARKER
Defence - RICHMOND RAAF BASE

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
North Base Trig Station	NSW	Listed place
RAAF Base Richmond	NSW	Listed place

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable*	Species or species habitat likely to occur

Name	Threatened	Type of Presence
		within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered*	Species or species habitat 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]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus 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 may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat likely to occur within area
Thalassarche impavida Campbell 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*	Species or species habitat likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	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 known 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

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Pitt Town	NSW
Wollemi	NSW

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
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 likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur

Name	Status	Type of Presence
		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
Sus scrofa Pig [6]		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
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 may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Pitt Town Lagoon	NSW

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

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

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

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

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-33.52103 150.79773

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:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA 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, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-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.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

APPENDIX 7: QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Alex Fraser (Fraser Ecological Consulting) has over 10 years experience in ecological assessment and on-ground bushland restoration management. Previous work roles include ecological consulting with Parsons Brinckerhoff (large infrastructure), NPWS (regional biodiversity surveys), NSW Department of Environment and Climate Change (SIS DGRs/ breach investigations) and Hornsby Shire Council (residential, rural and industrial DA assessment and bushland project management) have focussed primarily on ecological survey, project work and policy development for consent authorities. Alex also possesses practical experience in bushland restoration and landscape construction.

A full list of flora and fauna assessments previously undertaken can be provided upon request.

Professional Affiliations include the Australian Association of Bush Regenerators, Ecological Society of Australia, Royal Zoological Society of NSW, Birds Australia, Australasian Bat Society, Urban Feral Animal Action Control Group (Sydney North Councils), Surfrider Foundation & Fred Hollows Foundation.

Relevant qualifications and training:

- Bachelor of Applied Science – Coastal Resource Management (Honours)
- Certificate 3 - Bushland Restoration (Ryde Horticultural College)
- Land for Wildlife Assessor (NPWS and Central Coast Environment Network)
- Chemcert (Department of Natural Resources – Cert 3)
- Chainsaw Cross Cutting Techniques (Ryde Horticultural College)
- Certificate 3 Vertebrate Animal Pest Control (NSW DPI, Orange)
- OH&S General Induction for Construction Work (Work Cover NSW)
- Senior First Aid (St. Johns Ambulance Australia)
- Project Management 'the hard and soft skills' (NPWS- 2004)
- Frog, Bat and Reptile: species identification and survey skills (Forests NSW)
- Planning for Bushfire Protection (2006) UTS Sydney
- State Rail Contractor Safety Awareness (State Rail Authority)
- NPWS Scientific Licence - S10445 (Department of Environment Climate Change and Water)
- Animal Ethics Research Authority (NSW DPI&I)
- Recreational Boat Drivers Licence (NSW Maritime)