Eureka 1 Project 10 Pty Ltd

Ecological and Bushfire Assessment for Rezoning Application, Lots 93-96 Boundary Road, Medowie

February 2010

Umwelt
Environmental Consultants

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Prepared by

Umwelt (Australia) Pty Limited

on behalf of

Eureka 1 Project 10 Pty Ltd

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Executive Summary

Lots 93-96 Boundary Road Medowie (the study area) is currently subject to a proposed rezoning application to allow the development of a rural small holdings residential estate lying to the south-west of an endangered ecological community (EEC), indicatively comprising primarily of lots ranging in size from 1,000 m^2 to 1,500 m^2 (as per the Medowie Strategy). Lots fronting Boundary Road will be of a similar size and configuration (indicatively 4,000m^2) to lots that are existing on the southern side of Boundary Road. The study area has been subject to a number of ecological surveys, completed by both Orogen and Umwelt over a number of years.

Flora surveys completed have included vegetation community description and mapping, documentation of the flora assemblage of the study area and targeted searches for threatened flora species. Fauna surveys have involved the use of numerous standard survey methods (such as trapping, hair tubes, bird searches, herpetofauna searches, spotlighting and call playback) to document the fauna assemblage of the study area, as well as complete targeted threatened fauna species searches. Habitat assessments were completed to identify and describe key habitat features of the study area, particularly as they relate to the provision of specific habitat for threatened species.

From these surveys, a total of five vegetation communities have been described, and a total of 226 flora species have been identified from the study area. 14% of flora species identified are introduced species. No threatened flora species have been recorded within the study area. The EEC Swamp Sclerophyll Forest has been recorded running through the centre of the study area.

Fauna surveys have resulted in the identification of 101 vertebrate fauna species, comprising nine amphibian species, four reptiles, 65 bird species and 23 mammal species. A number of threatened fauna species were recorded and these have been listed below.

The following significant ecological features have been identified as occurring within the study area:

- Swamp Sclerophyll Forest on Coastal Floodplains EEC, forming a riparian corridor;
- a number of threatened fauna species, including:
    - glossy black-cockatoo (*Calyptorhynchus lathami*) (Vulnerable TSC Act);
    - masked owl (*Tyto novaehollandiae*) (Vulnerable TSC Act), including a probable roost/nest tree;
    - varied sittella (*Daphoenositta chrysoptera*) (Preliminary Determination as Vulnerable TSC Act);
    - koala (*Phascolarctos cinereus*) (Vulnerable TSC Act) scats;
    - squirrel glider (*Petaurus norfolcensis*) (Vulnerable TSC Act);
    - yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*) (Vulnerable TSC Act);
    - eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) (Vulnerable TSC Act);
    - little bentwing-bat (*Miniopterus australis*) (Vulnerable TSC Act);
    - greater broad-nosed bat (*Scoteanax rueppellii*) (Vulnerable TSC Act);
    - eastern freetail-bat (*Mormopterus norfolkensis*) (Vulnerable TSC Act);

  - large-eared pied bat (*Chalinolobus dwyeri*) (Vulnerable TSC Act, Vulnerable EPBC Act); and
  - grey-headed flying-fox (*Pteropus poliocephalus*) (Vulnerable TSC Act, Vulnerable EPBC Act);
- koala habitat (Port Stephens Council 2002, 2006) of varying categories;
- regionally significant habitat according to LHCCREMS, Regional Biodiversity Conservation Strategy (House 2003);
- high to medium fauna habitat conservation significance (Biolink 2006);
- key habitat according to the Key Habitat and Corridors Project (Scotts 2003);
- potential fauna movement corridor;
- old growth lowland coastal Dry Sclerophyll Forest;
- classification as remnant bushland (being >1 hectare area with relatively intact canopy and understorey); and
- contiguity with large areas of existing protected vegetation.

While such ecological issues provide a challenge to proposed development of the study area, each of these has been considered in the planning and design of the Concept Plan/Vision for the proposed development. Assessments of the potential impact of the proposed development on these features have been completed, as per the requirements of the *Environmental Planning and Assessment Act 1979* and the *Environment Protection and Biodiversity Conservation Act 1999.* These assessments have concluded that it is not likely that the proposed development will result in a significant impact on threatened species, endangered populations or EECs listed under the schedules of the *Threatened Species Conservation Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999*.

The adoption of a set of detailed ecological planning principles as part of the Concept Plan/Vision, has assisted in the avoidance and minimisation of potential impacts on identified (and potentially occurring) significant ecological features. While the assessment of potential impact on these features has proven to be non-significant, Eureka has proposed a formal offset area to be transferred to the Council reserve system to address residual impacts of the proposed development that can not be avoided, minimised or mitigated. This has ensured that the proposed development offers an economically acceptable development that contributes to the provision of housing to the Medowie area, while ensuring minimal impact on the ecological features of the study area, as well as the larger Medowie township area.

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1.0 Introduction

Umwelt (Australia) Pty Limited (Umwelt) has been commissioned by Eureka 1 Project 10 Pty Ltd (Eureka) to prepare an Ecological and Bushfire Assessment for a rezoning application for Lots 93-96 Boundary Road (the study area), Medowie (**Figure 1.1**). It is proposed to rezone the study area from the current Rural Small Holdings 1 (c1) to allow for residential development. The study area has been subject to ongoing investigations (including ecological survey) as a potential development site since at least 2006. The ecological features identified as part of such investigations (including current and previous field survey) have been used to guide the design of an appropriate Concept Plan/Vision for the proposed development, with the aim of providing a development approach which balances the economic potential of the study area with appropriate biodiversity conservation outcomes for the broader Medowie area.

1.1 Background to the Project

Initial investigations into the development potential of the study area focused on residential rezoning/development, with proposed lot sizes ranging between 450 and 600 m^2. A Conceptual Masterplan was prepared for this proposal, and formed the basis of a submission to the 2007 public exhibition of the (then) Draft Medowie Strategy (Port Stephens Council 2007) for the inclusion of the study area as an option for future urban development.

In response to the concerns raised by Council at that time, the proposed type and density of development of the study area was revised to provide for a rural residential estate. The Concept Plan/Vision developed for this planned estate has typical lot sizes ranging between 2,000 and 5,000 m^2, and reflected the general pattern of the existing rural residential suburbs adjoining the study area to the south of Boundary Road (**Figure 1.2**).

Allowance for such an increased lot size and the retention of significant ecological features within the Concept Plan/Vision substantially increased the potential for retention of native vegetation within the lots, thus reducing the potential ecological impact of the proposed development.

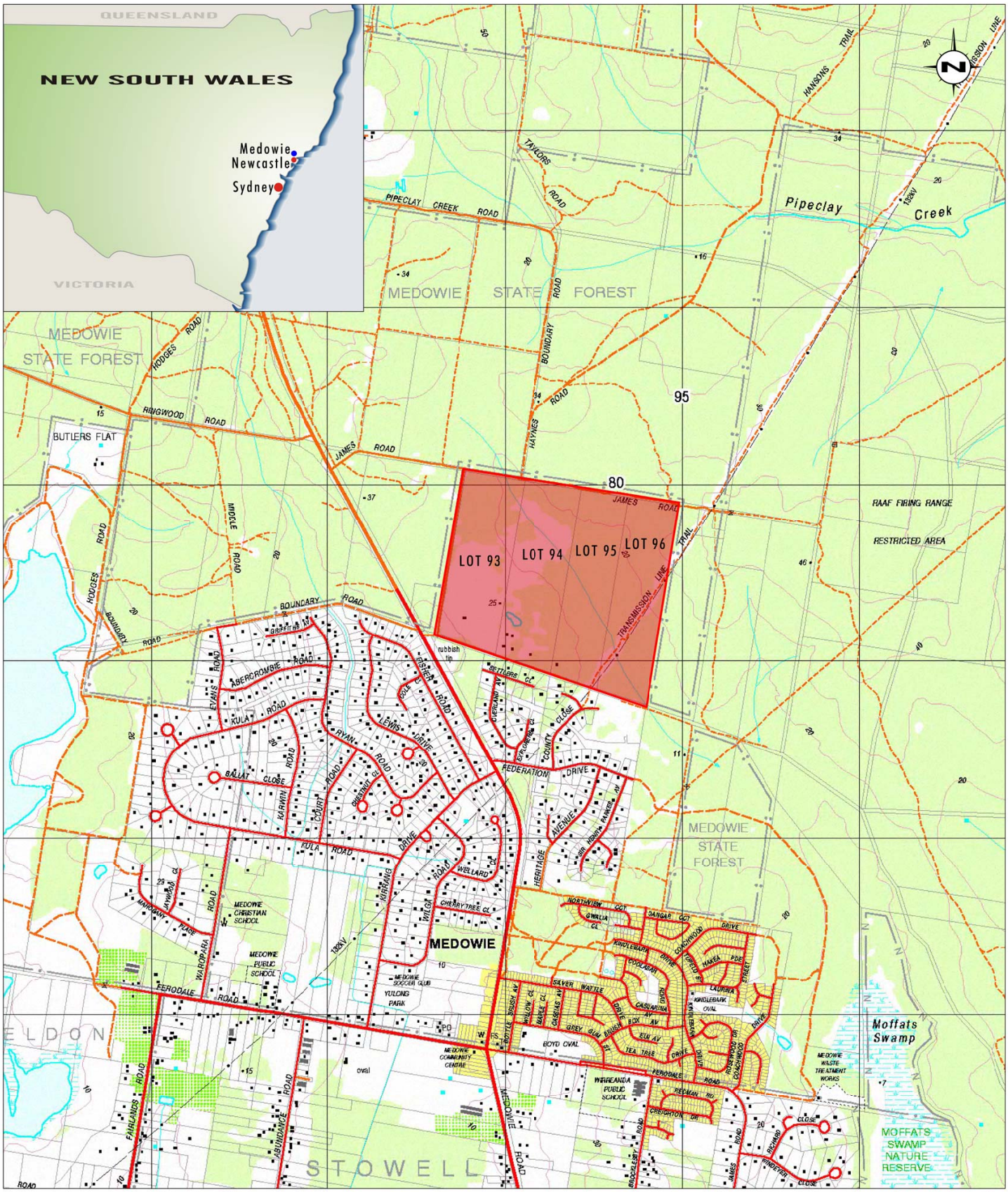
However, upon further discussion and negotiation with Council, it was decided to exclude development from the north-eastern portion of the study area, in order to protect significant ecological values and the existing connectivity to the surrounding vegetation. In response to the protection of this part of the study area, the Concept Plan/Vision was revised to provide an increased lot yield in the remainder of the study area (via reduced lot size), to ensure the economic viability of the project.

This revised Concept Plan/Vision (discussed further in **Section 1.5** and displayed in **Figure 1.3**) provides for the protection of the Swamp Sclerophyll Forest EEC within the study area, as well as substantial portions of other native vegetation of high ecological value.

1.2 Objectives

The objectives of this Ecological and Bushfire Assessment are to:

- identify and map significant ecological features (being threatened species, endangered populations and endangered ecological communities (EECs), or their habitats) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act), the NSW *Fisheries Management Act 1994* (FM Act) or the Commonwealth *Environment Protection*



Source: Department of Lands (2006)

Legend

Study Area

FIGURE 1.1

Locality Map

File Name (A4): R01_V1/2711_002.dgn

Source: Google Earth (2007), Port Stephens Council (2006)

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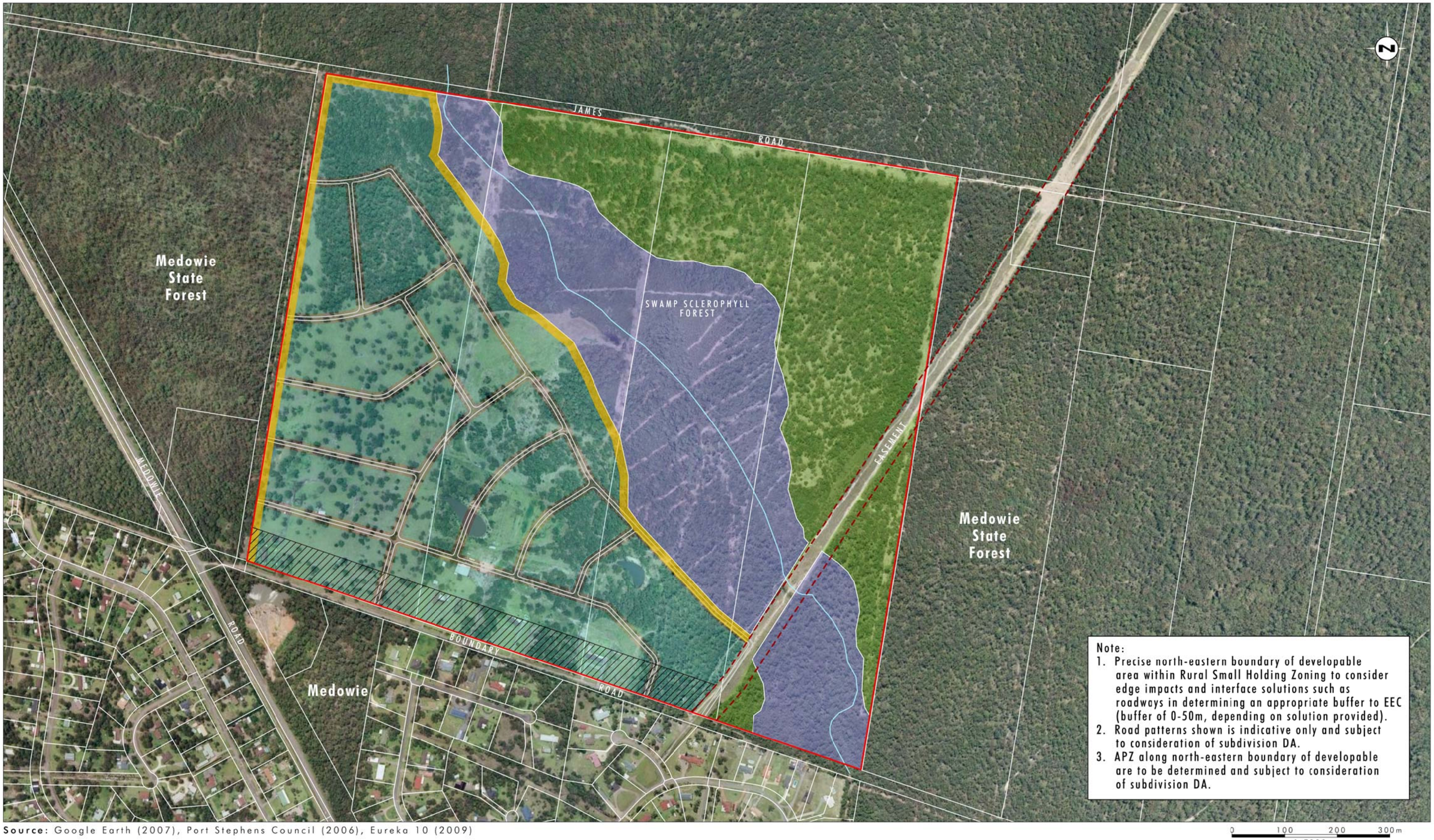
1:10 000

Legend
The Site

FIGURE 1.2

Aerial Photograph of Study Area

File Name (A4): R01_V1/2711_001.dgn



Source: Google Earth (2007), Port Stephens Council (2006), Eureka 10 (2009)

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Legend

- Study Area
- Swamp Sclerophyll Forest EEC
- Undeveloped Land
- Rural Small Holdings (1000-1500m²)
- APZ Area
- Drainage
- Proposed Road Layout
- Easement
- Larger lots to be provided reflecting a similar frontage width and presentation to Boundary Road as those fronting the southern side of Boundary Road

FIGURE 1.3

Concept Plan / Vision for Study Area

and Biodiversity Conservation Act 1999 (EPBC Act), that have been recorded within the study area from current, and previous ecological surveys;

- supplement previous surveys of the study area with targeted field survey, focusing on updating historical information and knowledge gaps that relate specifically to significant ecological features;

- provide ecological input into the development of a Concept Plan/Vision for the proposed development of the study area, based on identified ecological constraints and opportunities;

- provide generalised advice on bushfire issues relating to the proposed development, including recommended asset protection zones (APZs) to include into a Concept Plan/Vision;

- assess the potential impact of the Concept Plan/Vision for the proposed development in relation to identified and potential significant ecological features, according to the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act), EPBC Act, and any other relevant legislation; and

- develop impact mitigation measures (including consideration of offsetting opportunities) to avoid or reduce any potential significant impacts of the proposed development on the significant ecological values of the study area.

1.3 Previous Surveys of Study Area

Umwelt staff undertook ecological field survey within the study area on three occasions, commencing in 2006. The background and objectives of each of these surveys are defined below. The outcomes of these previous surveys have been discussed further in **Section 2.1** of this report and amalgamated into the results incorporated into **Section 3**. The information gained from these studies was ultimately used to provide ecological advice and input into the project planning and design for the proposed development.

1.3.1 Umwelt 2006 - Flora and Fauna Assessment for Medowie Structure Plan, Prepared for Port Stephens Council

The aim of this assessment was to identify the biodiversity values of the broader Medowie area, and, in turn, inform the preparation of the Medowie Structure Plan. Flora and fauna surveys were undertaken at a number of sites across the Medowie area (including in the study area). This was completed to assist in vegetation and fauna habitat mapping, as well as for the development of a conservation significance assessment. The objectives of the ecological investigations within the study area at this time were to:

- survey and describe the floristics and vegetation communities;

- survey and describe fauna habitats and fauna species diversity;

- determine and describe all features of ecological significance in both the study area and in the wider context of the locality and surrounds;

- identify inherent biological constraints and opportunities and the implications of such on the planning of future land use;

- identify existing and potential habitat linkages; and

- identify conservation strategies and the potential for offsets to provide long term protection to habitat areas and linkages.

1.3.2 Biolink 2006 – Medowie Structure Plan – Ecological Review and Advice, Prepared for Port Stephens Council

Biolink was engaged by Port Stephens Council to review the vegetation mapping of the Medowie township area (provided by Umwelt 2006, House 2003 (LHCCREMS) and Port Stephens Council 2002), with the view of providing a map of priority areas for protection and management for habitat connectivity values, as part of the Medowie Structure Plan. The report also aimed to identify suitable areas for protection and/or restoration, as conservation offsets for any future clearing of native vegetation in the Medowie township.

1.3.3 Orogen 2007 – Flora and Fauna Study Lots 93-96 Boundary Road, North Medowie

Orogen (2007) undertook ecological surveys of the study area in June and October 2006, as part of the initial investigations into residential development of the study area. The purpose of this survey was to complete field survey to identify potential constraints and opportunities to the (then) proposed development and to provide recommended management measures to minimise impacts on flora and fauna habitats from potential future subdivision.

1.3.4 Umwelt 2007 – Detailed Peer Review and Constraints and Opportunities Analysis, Lots 93-96 Boundary Road, North Medowie

Umwelt undertook a Peer Review and Constraints and Opportunities Analysis for Lots 93-96 Boundary Road, Medowie (the study area) for Buildev Development (CM) Pty Ltd (Buildev) and Eureka 1 Project 10 Pty Ltd (the 'Co-venture').

The objectives of the project were to provide:

- a detailed review of existing ecological documentation for the study area;
- identification of ecological constraints and opportunities for the future development of the study area;
- review of existing planning documents for the Medowie township, particularly in relation to outcomes for the study area; and
- comment on proposed Concept Masterplan (prepared by the Co-venture) for the study area.

This involved a site visit by two Umwelt Ecologists on 22 March 2007, in order to ground-truth constraints and opportunities for the provision of ecological advice to the project.

1.3.5 Umwelt 2008 – Submission on Ecological Matters to 2008 Public Exhibition of Draft Medowie Strategy, Lots 93-96 Boundary Road, North Medowie

Umwelt was commissioned by the Co-venture to provide an ecological submission to the 2008 public exhibition of the Draft Medowie Strategy relating to the potential residential development of the study area.

The purpose of this submission was to address reasons stated for the omission of the study area from the land use conclusions of the (then) Draft Medowie Strategy (Port Stephens

Council 2007), as well as to address the future potential development of the study area from an ecological perspective.

One of the key outcomes of this process was the development of a set of proposed Ecological Planning Principles to be followed as part of the design and planning for the proposed development of the study area. These Principles were developed in order to be adopted as part of the planning and design phase of the rural small holdings residential estate, and aim to minimise ecological impact within the planning and construction phases of the project, and to maximise ecological conservation outcomes in the post-development landscape. The performance of the current Concept Plan/Vision against these principles is provided in **Section 5.2** of this report.

1.4 Study Area and Summary of Significant Features Present

The study area comprises Lots 93-96, Boundary Road, North Medowie (**Figure 1.1**). It is located to the north of the Medowie township, and is bordered to the north, east and west by Medowie State Forest, and by rural-residential development (of varying densities) to the south. To the north of the study area, Medowie State Forest adjoins parts of Medowie State Conservation Area. **Figure 1.2** displays an aerial photograph of the study area. The study area is approximately 127 hectares in size.

The majority of the study area is vegetated, however the vegetation in the southern parts of Lots 93 and 94 has been heavily modified, and currently consists of grazed paddocks (until recently supporting horses), with a discontinuous canopy of mature eucalypts. There is little or no native shrub or ground layer in this area. Part of the south-western corner of Lot 95 has also been cleared. The remaining parts of the study area support native vegetation, in the form of swamp sclerophyll forest and dry sclerophyll open forest. These vegetation formations generally comprise an intact canopy, however, the shrub and ground layers in parts of these forests have been modified by under-scrubbing and/or track creation. The shrub and ground layers remain intact within the majority of the riparian forest.

From the previous studies completed within the study area by Umwelt and Orogen, a number of significant ecological features have been identified, including:

- Swamp Sclerophyll Forest on Coastal Floodplains endangered ecological community (EEC), forming a riparian corridor;
- potential presence of Hunter Lowland Red Gum Forest EEC (see discussion and rejection of this in **Section 3.1.2**, below);
- presence of a number of threatened fauna species (discussed in detail in **Section 3.3.4**):
- koala habitat (Port Stephens Council 2002) of varying categories (discussed in detail in **Section 3.3.8**):
- regionally significant habitat according to LHCCREMS, Regional Biodiversity Conservation Strategy (House 2003);
- high to medium fauna habitat conservation significance (Biolink 2006);
- key habitat according to the Key Habitat and Corridors Project (Scotts 2003);
- old growth lowland coastal Dry Sclerophyll Forest;

- classification as remnant bushland (being >1 hectare area with relatively intact canopy and understorey); and

- contiguity with large areas of existing protected vegetation.

Each of these issues has been considered in the development of the Concept Plan/Vision for the proposed development, as well as in the impact assessment in this report.

1.5 Proposed Concept Plan/Vision

A Concept Plan/Vision has been prepared by Eureka which identifies the conceptual layout of the proposed development, including provision of:

- apart from the lots that immediately front Boundary Road, the balance of the site (south west of the EEC) will be developed as rural small holding lots indicatively ranging in size from 1,000 m^2 to 1,500 m^2;

- lots fronting Boundary Road will be of similar size and configuration (indicatively 4,000 m^2) to lots that are existing on the southern side of Boundary Road;

- retention and protection of Swamp Sclerophyll Forest EEC across the centre of the study area;

- retention and protection of ecologically significant vegetation in the north-eastern portion of the study area;

- internal and external access roads; and

- asset protection zones (APZs) for bushfire protection purposes.

The Concept Plan/Vision for the proposed rural small holdings residential rezoning and development of the study area is provided in **Figure 1.3**.

2.0 Methods

The methods employed as part of the desktop and field components of the Ecological Assessment are discussed in the following sections, including those of the current and previous surveys within the study area. The bushfire component of the Assessment has been provided separately, in **Section 4.0** of this report.

The methods used for the Ecological Assessment include a detailed literature review of relevant reports and available vegetation mapping, as well as searches of relevant ecological databases. Information gathered from the literature reviews and database searches was used to identify knowledge gaps, or historical information requiring verification or updating. From this, a field survey program was designed to map and survey vegetation communities, and to target the identification of threatened species, endangered populations, EECs, and their habitats within the study area.

2.1 Literature Review

A review of all relevant and available literature was undertaken in order to gain a greater understanding of the ecological values of the study area and its locality. The objectives of the key documents reviewed are discussed in **Section 1.3** above, however key details relating to survey methods and effort are detailed below.

2.1.1 Umwelt 2006 (Medowie Structure Plan)

The study area was surveyed broadly as part of the flora and fauna assessment undertaken by Umwelt for the Medowie Structure Plan (Umwelt 2006), prepared for Port Stephens Council. The surveys completed within the study area at this time comprised two habitat assessments, two vegetation quadrats and two walking transects, predominantly in the eastern portion of the study area (Lots 95 and 96). The locations of this survey are provided in Umwelt (2006) on **Figures 2.1** and **2.2**.

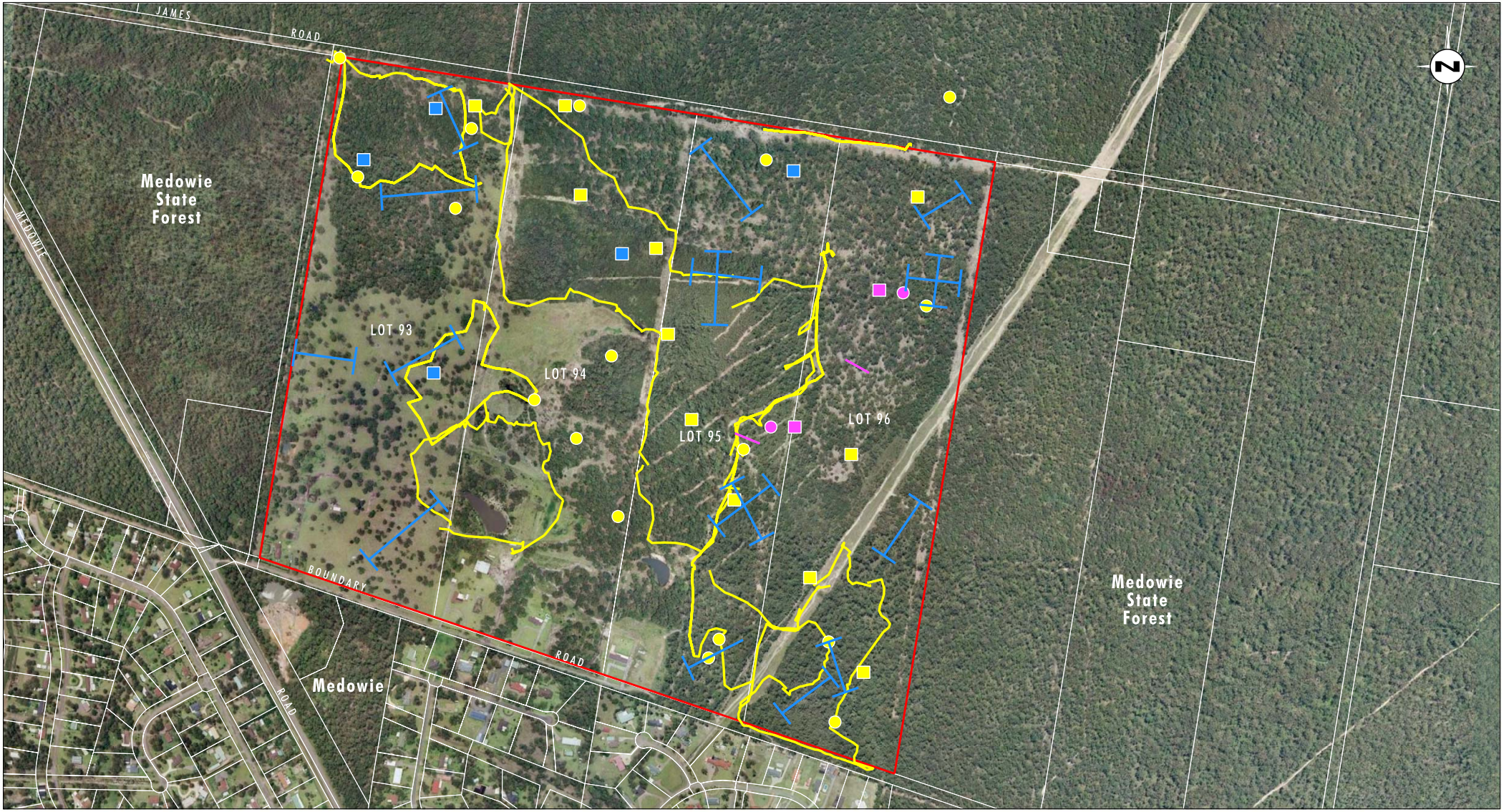
2.1.2 Biolink 2006 (Medowie Structure Plan)

The vegetation mapping provided within the Biolink (2006) report was based on mapping completed by the Australian Koala Foundation (AKF) in 2006 and by House (2003). It is noted that the AKF mapping was completed at a larger scale (local scale) than the mapping completed by Umwelt and Orogen, which was based on floristic surveys and ground-truthing of the study area. This mapping was completed to update the habitat mapping contained within the Port Stephens Council Comprehensive Koala Plan of Management (Port Stephens Council 2002).

The Biolink report identified the study area as being of high conservation status, for the following reasons:

- presence of two EECs, being the Swamp Sclerophyll Forest on Coastal Floodplains and Subtropical Coastal Floodplain Forest (Note: the presence of this latter EEC is not supported by the Orogen (2007) or Umwelt (2006, 2008 and current) reports, however, both EECs occupy a similar position in the landscape);

- classification as remnant bushland (being >1 hectare area with relatively intact canopy and understorey);



Source: Google Earth (2007), Port Stephens Council (2006), Umwelt (2006), Orogen (2006)

0 100 250 500m
1:10 000

Legend

Study Area

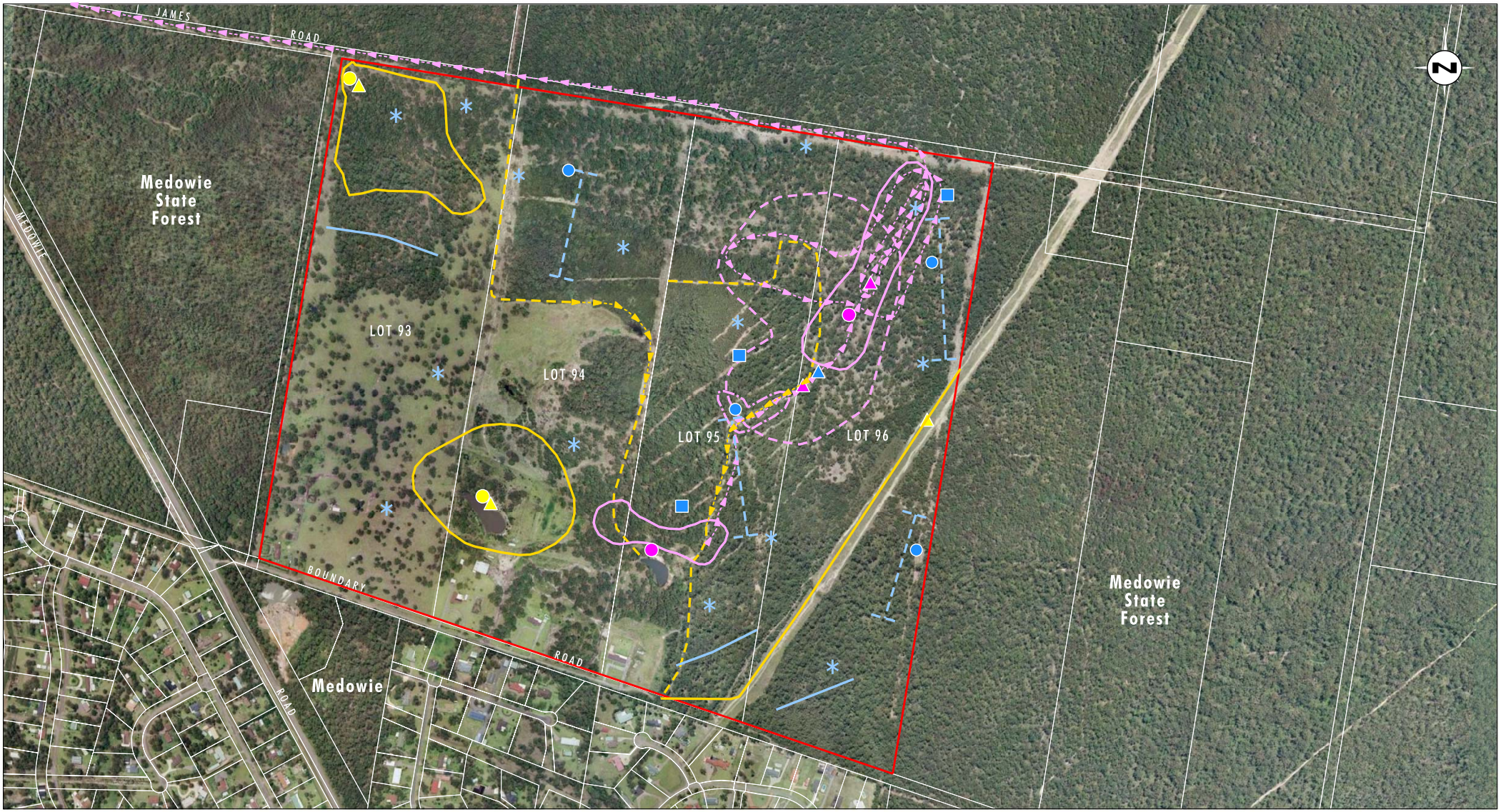
Umwelt Survey Effort (2009)
- Vegetation Transect
- Vegetation Quadrat
- Habitat Quadrat

Orogen Approximate Survey Location (2007)
- Vegetation Transect
- Vegetation Quadrat

Umwelt Survey Effort (2006)
- Vegetation Transect
- Habitat Quadrat
- Vegetation Quadrat

FIGURE 2.1

Flora Survey Effort



Source: Google Earth (2007), Port Stephens Council (2006), Umwelt (2006), Orogen (2006)

0 100 250 500m
1:10 000

Legend

Study Area

Umwelt Survey Effort (2009)
- Bird Survey
- Spotlight Survey
- Herpetofauna Survey
- Anabat
- Call Playback

Orogen Approximate Survey Location (2007)
- Trap line
- Hair tube line
- Harp Trap
- Anabat
- Call Playback
- Koala SAT Sites

Umwelt Survey Effort (2006)
- Bird Survey
- Herpetofauna Survey
- Spotlight Survey
- Anabat
- Call Playback

FIGURE 2.2

Fauna Survey Effort

File Name (A4): R01_V1/2711_003.dgn

- presence of areas of Preferred Koala Habitat (according to the AKF (Port Stephens Council 2002) vegetation mapping); and

- contiguity with large areas of existing vegetation.

It is noted that the mapping of EECs provided within this report was based on mapping provided by the AKF (Port Stephens Council 2002) and by LHCCREMS (NPWS 2000a and House 2003).

The following recommendations (relating specifically to the study area) were made:

- the vegetation in the north-east portion of the study area is high priority for management and protection for conservation purposes;

- 50 metre buffers are established around Preferred Koala Habitat (as per the Port Stephens Comprehensive Koala Plan of Management 2002);

- residential development in some parts could be in the form of Special Conservation Living Areas (as defined in report); and

- offsets would be required for any loss of EECs or Preferred Koala Habitat.

2.1.3 Orogen 2007 (Flora and Fauna Study)

A summary of the methods employed for the flora and fauna assessment of the study area undertaken by Orogen (2007) is provided below. The locations of the Orogen (2007) field surveys have been reproduced in the survey effort mapping, where possible (see **Figures 2.1** and **2.2**).

2.1.3.1 Flora Survey

Orogen (2007) undertook flora surveys of the study area between June and October 2006. The vegetation of the study area was mapped using aerial photograph interpretation combined with ground truthing vegetation surveys comprising five standard 400 m^2 vegetation plots and 17 vegetation transects (each a minimum of 100 metres in length).

2.1.3.2 Fauna Survey

Fauna surveys of the study area occurred over five days and four nights in October 2006, and comprised:

- four traplines, each of which included 25 Elliot A (terrestrial), 10 Elliot B (arboreal), 10 Elliot B (terrestrial) and six cage traps set for four consecutive nights;

- three hair tube lines, each comprising 10 large and 10 small hair tubes (terrestrial) and 10 large hair tubes (arboreal), set for 10 consecutive nights;

- koala scat searches following the Spot Assessment Technique (SAT) described by Phillips and Callaghan (1995);

- Anabat echolocation detection of micro-bat echolocation calls for two nights at four sites;

- harp trapping for micro-bats over two nights at each of three sites;

- call playback and spotlighting (nine person hours) over three consecutive nights;

- herpetological searches; and
- habitat assessment.

Significant ecological features identified in this report have been included in the mapping of threatened species in the results section of this report.

2.2 Ecological Database Searches

A search of the Department of Environment, Climate Change and Water (DECCW) Atlas of NSW Wildlife database was undertaken to identify threatened species, endangered populations and EECs that have been previously recorded within a 10 kilometre radius of the study area. Similarly, the Department of the Environment, Water, Heritage and the Arts (DEWHA) Protected Matters database was searched to identify Commonwealth listed flora and fauna species and ecological communities whose modelled range falls within the study area, and/or have been previously recorded within a 10 kilometre radius. The data obtained from these two database searches was used to compile a list of threatened species, populations and EECs with potential to occur within the study area. A comparison between habitat requirements for each of these species and the habitat types present within the study area was undertaken to determine the likelihood of listed flora and fauna species occurring.

2.3 Current Field Survey

The following sections document the methods employed by Umwelt for the flora components of the Ecological Assessment, which includes field survey and desktop vegetation mapping. The locations of the flora survey sites are identified in **Figure 2.1**. The current field surveys were conducted by two Umwelt ecologists on 1 and 2 March 2009. The weather during this period ranged from 10 to 18°C, with light to moderate winds. One period of two to three hours of light rain occurred during the field surveys.

The aims of the current flora and fauna surveys were to:

- describe the vegetation communities and fauna habitat types present within study area;
- describe the health and condition of the vegetation and habitats of the study area;
- obtain information on the general floristics and fauna species diversity of the study area;
- identify threatened flora and fauna species, populations or EECs or their habitats occurring within or having potential to occur within the study area; and
- gather sufficient information to enable an accurate assessment of the impacts of the proposed development on the significant ecological values of the study area.

2.3.1 Floristic Survey and Vegetation Mapping

A total of 11 systematic vegetation quadrats were sampled. The quadrats were positioned at sites that were selected by considering a range of attributes that influence or determine the type of vegetation communities present, in particular topographic position, slope, aspect and soil type. The selection of quadrat locations also aimed to achieve effective coverage of the study area, in particular areas in which the vegetation was thought to have potential to support EECs.

Each flora quadrat had dimensions of 20 metres by 20 metres (400 m^2), which is a standard size used widely for systematic flora surveys throughout NSW and is recognised by the DECCW and the Royal Botanic Gardens Sydney. Within each quadrat, two ecologists spent approximately 45 minutes to one hour searching for species, walking along parallel lines throughout the quadrat.

A modified Braun-Blanquet 6-point scale (Braun-Blanquet 1927, with selected modifications sourced from Poore 1955 and Austin et al. 2000) was used to estimate cover-abundances of all plant species within each quadrat. **Table 2.1** shows the cover-abundance categories used.

Table 2.1 - Modified Braun-Blanquet Crown Cover-Abundance Scale

Class	Cover-abundance*	Notes
1	Few individuals (less than 5% cover)	Herbs, sedges and grasses: <5 individuals Shrubs and small trees: <5 individuals
2	Many individuals (less than 5% cover)	Herbs, sedges and grasses: 5 or more individuals Shrubs and small trees: 5 or more individuals Medium-large overhanging tree
3	5 – less than 20% cover	-
4	20 – less than 50% cover	-
5	50 – less than 75% cover	-
6	75 – 100% cover	-

Note: * Modified Braun-Blanquet scale (Poore 1955; Austin et al. 2000)

Information on the structural characteristics of the vegetation in the quadrat was also recorded, including the height range and canopy cover of each stratum and the dominant species in each stratum. Information on the general health and condition of the vegetation within the quadrat was also recorded, including presence of introduced species, disturbances such as fire and feral animals, and evidence of dieback or insect attack.

2.3.1.1 Vegetation Transects

A number of vegetation transects were traversed across the study area, the locations of which are shown on **Figure 2.1**. The objectives of these transects were to:

- search for threatened flora species and their habitats;
- assist in the delineation of vegetation communities;
- enable greater coverage of the study area than would be achieved by plot-based sampling alone; and
- contribute to the overall floristic knowledge of the study area.

These transects were variable in length and location, and were tailored to suit the environment in which they occurred. Their locations were selected to achieve broad coverage of the full range of environments across the study area.

2.3.1.2 Plant Identification and Taxonomic Review

All vascular plants recorded or collected were identified using keys and nomenclature from Harden (1992, 1993, 2000 & 2002) and Wheeler et al. (2002). Recent changes to nomenclature and classification have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust 2009), the on-line plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 & 2002) where available, and draw on other sources such as local names where these references do not provide common names. Where the identity of a specimen was unknown or uncertain, it was lodged with the National Herbarium of New South Wales at the Royal Botanic Gardens Sydney.

2.3.1.3 Vegetation Mapping

The vegetation communities of the study area were mapped through a combination of aerial photograph interpretation, comparison with regional vegetation mapping and previous mapping (by Orogen 2007), and ground-truthing existing vegetation mapping through targeted field survey.

Preliminary mapping of the vegetation communities within the study area was prepared through aerial photograph and topographic map interpretation, review of regional vegetation mapping ((NPWS 2000a, House 2003, Orogen 2007 and Umwelt 2006) and expert knowledge of the local area. The field investigations enabled ground-truthing of the preliminary vegetation community mapping.

Particular attention was paid to potentially occurring EECs, specifically the Swamp Sclerophyll Forest, River-flat Eucalypt Forest on Coastal Floodplains and Hunter Lowland Red Gum Forest EECs.

2.3.2 Fauna Survey Methods

The following sections document the methods employed for the fauna survey completed by Umwelt within the study area in 2009. The locations of the fauna survey sites are identified in **Figure 2.2**, which includes detail on surveys completed by Orogen (2007) and Umwelt (2006).

2.3.2.1 Diurnal Bird Survey

Two diurnal bird surveys were conducted, each for approximately one person hour on two separate days. Bird surveys were undertaken in a range of different habitat types at various times of the day, primarily in early to mid morning and mid to late afternoon. Opportunistic observations were recorded during all other aspects of the field survey, particularly while completing flora surveys and while travelling throughout the study area. Bird species were identified from characteristic calls (where confident) and by observation using a 15 - 45 × 50 spotting scope or 10 × 60 binoculars.

Focal habitat areas such as large dams and patches of heavily-flowering eucalypts were targeted for opportunistic bird surveys, whenever encountered.

2.3.2.2 Herpetological Survey

Two diurnal herpetological (reptile and amphibian) surveys were completed (each of one person hour), on two separate days. Diurnal searches specifically targeting reptiles and opportunistically targeting amphibians were undertaken during the warmest parts of the day.

Nocturnal searches were completed opportunistically during spotlighting surveys. Nocturnal reptile and amphibian searches were undertaken using headlamps and/or 30 watt spotlights.

Habitat features investigated during herpetological surveys included water bodies, emergent vegetation, wet soak areas, logs, rocks, loose bark on tree trunks, exposed bedrock, leaf litter and open grassland areas. Amphibians not readily identifiable from their calls were captured for visual identification. All amphibians were handled according to the DECCW hygiene protocol for the control of disease in frogs (NPWS 2000b).

2.3.2.3 Spotlighting Survey

A total of five person hours of spotlighting was completed, across two separate nights. Spotlighting surveys were undertaken both on foot and from a moving vehicle. Walking spotlighting surveys were undertaken by two observers for a period of at least 30 minutes (total of one person hour) on each occasion. Vehicle spotlighting searches were undertaken by the passenger(s) from a slowly moving (first gear, low range) four wheel drive vehicle for a minimum of one kilometre. Vehicle spotlighting was undertaken whenever driving through the project area at night. Walking and vehicle spotlighting searches were undertaken using 30 watt spotlights.

Spotlight searches specifically targeted: flying mammals such as flying-foxes; arboreal mammals such as possums and gliders; terrestrial mammals such as kangaroos, wallabies, wombats, quolls, foxes and cats; and nocturnal birds such as owls and nightjars. Spotlighting also included opportunistic searches for nocturnal reptiles, amphibians and micro-bats.

2.3.2.4 Micro-bat Echolocation Recordings

Micro-bat echolocation recordings were made at two sites using an ‘Anabat II Bat Detector‘ and ‘Anabat CF Storage ZCAIM‘ (Anabat detectors). At each site the Anabat detector was placed upon a small platform on a tree trunk at a height of approximately 2 metres, and left operating for two nights, programmed to start recording at 6 pm and finish at 6 am each day. Anabat detectors were positioned within potential micro-bat flight paths or areas of high activity, such as dams.

Recorded bat calls were analysed by Glen Hoye of Fly By Night Bat Surveys Pty Ltd. The echolocation calls of species were identified to one of three levels of confidence:

- definite;
- probable; and
- possible.

All three levels of identification confidence were treated as positive identifications for the purposes of this Ecological Assessment.

2.3.2.5 Signs of Presence

Signs of fauna presence were searched for across the study area during all surveys. Signs of presence targeted included tracks, scats, scratches, burrows, bones, nests and drays. Scats were collected and sent for expert analysis, where required.

Specific habitat features, such as tree hollows and fallen logs, were also examined for evidence of fauna occupation, such as scratches on trees, chewed entrances to hollows, scratchings or diggings near logs and scats and regurgitation pellets at the base of trees or in or near logs.

2.3.2.6 Targeted Koala Surveys

An application for project approval which relates to a site occurring within a local government area (LGA) specified under State Environmental Planning Policy 44 (SEPP 44) – Koala Habitat Protection, affecting an area of one hectare or greater, must be assessed under SEPP 44. However, in a LGA which has prepared a shire-wide koala plan of management, the requirements under that plan override those of SEPP 44. Port Stephens Council has a Comprehensive Koala Plan of Management (CKPoM) (2002), and therefore a SEPP 44 assessment is not required.

Koala habitat assessments were undertaken at each of the 11 flora quadrats and 17 habitat assessment quadrats, the locations of which are shown on **Figure 2.1**. In each 20 metre by 20 metre quadrat/habitat assessment site, all known koala feed tree species were recorded, along with an estimate of the percentage of the total trees that they comprise within the quadrat. Searches for koala scats under known koala feed trees were also undertaken at each assessment site and opportunistically along vegetation transects.

Extensive koala faecal pellet searches, following the Spot Assessment Technique (SAT) prescribed in Phillips and Callaghan (1995), were undertaken by Orogen (2007) and therefore further detailed work was not deemed necessary. However, Umwelt undertook searches of koala scats and known feed trees during surveys of the study area for the current project during walking transects and at vegetation plots and condition assessment plots.

2.3.3 Habitat Assessment

A habitat assessment was undertaken at 17 sites throughout the study area, identified in **Figure 2.1**. Observations of the following habitat features were made:

- evidence of fire;
- nature of and extent of erosion;
- diversity, structure and floristics of vegetation;
- extent of introduced species;
- presence of feral animals;
- type of ground cover (e.g. litter, rock, soil);
- habitat resources for terrestrial fauna;
- wet soaks/drainage lines;
- degree of dieback;
- presence of mistletoe; and
- abundance and quality of habitat features.

In addition to these general habitat features, observations of the likely specific requirements of threatened fauna species considered to have potential to occur within the locality were also made, including matters such as the presence of winter-flowering eucalypt species, which are important foraging resources for migratory species such as the regent honeyeater (*Anthochaera phrygia*) and the swift parrot (*Lathamus discolor*).

All habitat features observed were considered when assessing the potential presence of threatened fauna species. Known habitat requirements of potential threatened fauna species were compared with the habitat features recorded within the study area.

3.0 Results

The following section presents the results of ecological surveys conducted for the current project, as well as the results of previous surveys of the study area as listed in **Section 1.3** above.

3.1 Flora Results

3.1.1 Floristics

A total of 128 flora species were recorded in the study area during current surveys completed by Umwelt. Including the results of Orogen (2007), there have been 226 flora species recorded in the study area to date, of which 194 (86%) are native and 32 (14%) are introduced species. A full list of the flora species recorded during surveys of the study area (by both Umwelt and Orogen) is presented in **Appendix 1**.

Of all species recorded in the study area to date, one species was from the Class Cycadopsida (cycads), seven species were from the Class Filicopsida (ferns), and 217 from Magnoliopsida (flowering plants) (of which 82 were from sub-class Liliidae (monocots) and 135 from sub-class Magnoliidae (dicots)). Flora species were recorded from 59 plant families, the most speciose being Poaceae (27 species), Fabaceae (27 species) and Myrtaceae (24 species). A total of 12 species from family Orchidaceae were recorded; a relatively high number for this typically poorly represented family. This can often be due to seasonal constraints to detection, and also due to specific habitat niches of individual orchid species and therefore a generally low diversity of species is found in any one location.

3.1.2 Vegetation Communities

Based on original mapping from Orogen (2007) and results of further field survey and ground-truthing undertaken by Umwelt, five vegetation communities were recorded in the study area. These are identified in **Table 3.1** below, including their mapped occurrence within the study area. Water bodies have been mapped due to the presence of two large dams within the study area, however these have not been described.

Table 3.1 - Extent of Vegetation Communities within the Study Area

Vegetation Community	Extent within Study Area (hectares)
Swamp Sclerophyll Forest	35
Coastal Plains Smooth-barked Apple Woodland	58
Forest Red Gum/Red Mahogany Open Forest	3
Derived Grassland with Scattered Canopy Trees	21
Derived Grassland	10
Water bodies	<1
Total	**127**

The location and extent of each of these communities is displayed in **Figure 3.1**. The characteristics of each community as it occurs in the study area are described in the following sections.

Source: Google Earth (2007), Port Stephens Council (2006), Umwelt (2006)

0 100 250 500m
1:10 000

Legend

- Study Area
- Swamp Sclerophyll Forest
- Coastal Plains Smooth-barked Apple Woodland
- Derived Grassland with Scattered Canopy Trees
- Forest Red Gum / Red Mahogany Open Forest
- Derived Grassland
- Waterbody

FIGURE 3.1

Vegetation Communities of the Study Area

File Name (A4): R01_V1/2711_005.dgn

3.1.2.1 Swamp Sclerophyll Forest

The Swamp Sclerophyll Forest dissects the study area from the north-west corner to the south-east corner, following a minor drainage line and its associated broad drainage flats, lying generally below the 20 metre contour level (**Figure 3.1**). In this area, the drainage is impeded and the surrounding areas are subject to waterlogging following rainfall. In the study area, the Swamp Sclerophyll Forest is characterised by an emergent to sparse canopy of *Eucalyptus* spp., a dense mid-stratum of prickly-leaved tea-tree (*Melaleuca nodosa*) and a moderately dense ground stratum of sedges, grasses and other forbs.

The canopy can occur as an emergent layer, however is more often present as a sparse to mid-dense stratum, up to 20% cover and 20 metres in height. The most frequent canopy species is red mahogany (*Eucalyptus resinifera* subsp. *resinifera*), while forest red gum (*Eucalyptus tereticornis*) and white stringybark (*Eucalyptus globoidea*) occur occasionally. Swamp mahogany (*Eucalyptus robusta*) is a very occasional canopy species, with isolated occurrences only. Smooth-barked apple (*Angophora costata*) also appears in this community, occurring in higher densities at the ecotone between the Swamp Sclerophyll Forest and the Coastal Plains Smooth-barked Apple Woodland and in locations where the drainage is less impeded.

The mid-stratum is characterised by a dense layer of prickly-leaved tea-tree (*Melaleuca nodosa*). There are two distinct layers in the mid-stratum, the taller generally being 6-10 metres in height with a cover of 40-50% and the lower being 1-2 metres in height and 20-30% cover. While *Melaleuca nodosa* is the dominant species in the mid-stratum, snow-in-summer (*Melaleuca linariifolia*) and Sieber's paperbark (*Melaleuca sieberi*) can occur as co-dominants or sub-dominants.

The ground stratum is moderately dense, with the cover ranging between 20 and 60%. Characteristic species include wiry panic (*Entolasia stricta*), pennywort (*Centella asiatica*), *Lepidosperma laterale*, white root (*Pratia purpurascens*), *Vernonia cinerea*, raspwort (*Gonocarpus teucrioides*), (*Goodenia heterophylla* subsp. *eglandulosa*) and branched goodenia (*Goodenia paniculata*). In areas that are more prone to prolonged inundation, sedges such as tall sedge (*Carex appressa*), jointed twig-rush (*Baumea articulata*) and *Baumea juncea* are more abundant.

The ecotonal influence in this and adjoining communities is strong, and therefore the boundary between the Swamp Sclerophyll Forest and the Coastal Plains Smooth-barked Apple Woodland is difficult to clearly define. The history of disturbance of the vegetation of the study area and the subsequent influences on floristic structure and composition create difficulties in clearly demarcating a boundary between the two communities. For the purposes of this assessment, a number of factors were taken into consideration for the delineation of the Swamp Sclerophyll Forest boundary, including drainage, topographical location and floristic and structural composition.

The Swamp Sclerophyll Forest of the study area is consistent with the Riparian Melaleuca Swamp Woodland, mapped and described for the LHCCREMS (House 2003 and NPWS 2000a). It is also consistent with the TSC Act listed EEC Swamp Sclerophyll Forest on Coastal Floodplains of the North Coast, Sydney Basin and South-east Corner bioregions. Further discussion of this EEC in relation to the study area is provided in **Section 3.3.1**.

In determining whether the Swamp Sclerophyll Forest of the study area is consistent with the EEC of the same name, a detailed assessment and comparison was undertaken, based on a range of characteristics, particularly condition, floristics, structural composition and geographical positioning. Consideration was given to other EECs that are known to occur on coastal floodplains, in particular the River-flat Eucalypt Forest on Coastal Floodplains of the North Coast, Sydney Basin and South-east Corner bioregions. Furthermore, the

LHCCREMS (House 2003 and NPWS 2000a) communities corresponding with both EECs were compared against the characteristics of the vegetation in the study area.

As stated on the final determination for the Swamp Sclerophyll Forest EEC, the corresponding LHCCREMS communities are map unit 42: Riparian Melaleuca Swamp Woodland, and map unit 37: Swamp Mahogany – Paperbark Forest. The LHCCREMS community corresponding to the River-flat Eucalypt Forest EEC is map unit 38: Red Gum – Rough-barked Apple Forest. On detailed assessment of each of these LHCCREMS communities and EECs, it was found that the Swamp Sclerophyll Forest of the study area showed some characteristics consistent with the River-flat Eucalypt Forest and map units 38 and 37, however was most similar to map unit 42 and the Swamp Sclerophyll Forest EEC.

3.1.2.2 Coastal Plains Smooth-barked Apple Woodland

The Coastal Plains Smooth-barked Apple Woodland is the dominant vegetation community within the study area, occurring at a slightly higher elevation than the Swamp Sclerophyll Forest and where the drainage is not impeded (**Figure 3.1**).

The canopy is mid-dense and moderately tall, with trees occurring up to 20 metres in height and with an overall cover of 20-30%. Smooth-barked apple (*Angophora costata*) is the dominant canopy tree, with co-dominant species occurring in various densities including white stringybark (*Eucalyptus globoidea*), Sydney peppermint (*Eucalyptus piperita*) and red bloodwood (*Corymbia gummifera*). Red mahogany (*Eucalyptus resinifera* subsp. *resinifera*) may also occur at the ecotone between this community and the Swamp Sclerophyll Forest.

The shrub stratum is sparse to moderately dense (10-30% cover) and typically has a height range of 2-4 metres. Commonly recorded species in this stratum include black sheoak (*Allocasuarina littoralis*), lemon-scented tea-tree (*Leptospermum polygalifolium* subsp. *cismontanum*), large-leaf hop-bush (*Dodonaea triquetra*), hairpin banksia (*Banksia spinulosa* subsp. *collina*), Sydney golden wattle (*Acacia longifolia* subsp. *longifolia*) and narrow-leaved geebung (*Persoonia linearis*).

The ground stratum occurs at densities of around 50% cover, and is generally less than 0.5 metre in height. The characteristic species of this stratum include wiry panic (*Entolasia stricta*), kangaroo grass (*Themeda australis*), blady grass (*Imperata cylindrica* var. *major*), spiny-headed mat-rush (*Lomandra longifolia*), rough Guinea flower (*Hibbertia vestita*), *Epacris pulchella, Lepidosperma laterale* and bracken fern (*Pteridium esculentum*).

The Coastal Plains Smooth-barked Apple Woodland of the study area is consistent with the community of the same name mapped and described for the LHCCREMS (House 2003 and NPWS 2000a). The derived grassland with scattered canopy trees (see **Section 3.1.2.4** below) is a disturbed variant of the Coastal Plains Smooth-barked Apple Woodland.

3.1.2.3 Forest Red Gum/Red Mahogany Open Forest

There is a small area within the study area which features a discrete occurrence of forest red gum (*Eucalyptus tereticornis*) in the canopy, primarily with red mahogany (*Eucalyptus resinifera* subsp. *resinifera*). This has been mapped as Forest Red Gum/Red Mahogany Open Forest. The potential for this remnant patch to comprise an EEC was considered, in particular in relation to the Swamp Sclerophyll Forest, the River-flat Eucalypt Forest and the Hunter Lowland Red Gum Forest EECs. Given the disturbed nature of the understorey floristic and structural characteristics, this assessment was limited to consideration of canopy composition and geomorphological occurrence. The outcome of the assessment concluded that the occurrence of *E. tereticornis* within the derived grassland with scattered canopy trees community is a variation on what once would have been Coastal Plains Smooth-barked Apple Woodland prior to disturbance. Forest red gum (*Eucalyptus tereticornis*) typically

occurs in wetter areas, so the location where this remnant is mapped may be situated in an area of shallow groundwater or slightly impeded drainage.

3.1.2.4 Derived Grassland with Scattered Canopy Trees

Derived Grassland with Scattered Canopy Trees is the name given to the modified vegetation which occurs in the south-western corner of the study area (**Figure 3.1**). These areas comprise a very open canopy of tall, mature trees, with a very sparse or absent shrub layer and modified ground stratum.

The canopy species are generally consistent with those found in the Coastal Plains Smooth-barked Apple Woodland, including smooth-barked apple (*Angophora costata*), white stringybark (*Eucalyptus globoidea*), Sydney peppermint (*Eucalyptus piperita*), red bloodwood (*Corymbia gummifera*), red mahogany (*Eucalyptus resinifera* subsp. *resinifera*) and forest red gum (*Eucalyptus tereticornis*). The canopy cover varies throughout this community, however is generally less than 10% cover. The height of the canopy ranges from 20 to 30 metres.

As described above, the mid-stratum is largely absent in this community generally as a result of a long period of grazing by horses. At the time of this survey, it appeared that this grazing had been excluded from this area for at least 6 to 12 months. Consequently there is some regeneration of colonising species such as wallaby tails (*Pultenaea villosa*), prickly-leaved tea-tree (*Melaleuca nodosa*) and Sydney golden wattle (*Acacia longifolia* var. *longifolia*).

The ground stratum is highly modified, having been subject to a history of grazing which has resulted in the suppression of native species diversity and the dominance of a number of introduced species. However, as mentioned above, the recent removal of grazing appears to be allowing the regeneration of native species. Native species that were recorded in the ground stratum in this community included couch (*Cynodon dactylon*), blady grass (*Imperata cylindrica* var. *major*), open summer grass (*Digitaria diffusa*), tall saw-sedge (*Gahnia clarkei*) and common fringe-sedge (*Fimbristylis dichotoma*). Introduced species recorded include whisky grass (*Andropogon virginicus*), dandelion (*Taraxacum officinale*), paspalum (*Paspalum dilatatum*), fireweed (*Senecio madagascariensis*) and slender pigeon grass (*Setaria gracilis*). The density of the ground stratum is approximately 80% and was less than 0.8 metres in height.

3.1.2.5 Derived Grassland

There are several patches of Derived Grassland in the central portion of the study area (**Figure 3.1**). The areas mapped as Derived Grassland includes existing infrastructure footprints, or those areas that are generally lacking in native vegetation communities. Due to past clearing and grazing, these areas now comprise a 'derived' or non-native grassland community which is predominantly characterised by introduced grass and herb species, with little native flora diversity.

3.2 Fauna Results

The following sections describe the fauna diversity and habitats identified within the study area, in addition to significant ecological values such as threatened fauna species, endangered fauna populations and regional habitat connectivity.

A full list of the fauna species recorded during surveys of the study area (by both Umwelt and Orogen) is presented in **Appendix 2**. For the purposes of this assessment, the fauna results from Umwelt (2006-9) and Orogen (2007) have been grouped.

3.2.1 Fauna Species Recorded

A total of 101 vertebrate fauna species were recorded within the study area, comprising nine amphibian species, four reptiles, 65 bird species and 23 mammal species. An outline and discussion of the species recorded is presented in the following sections.

3.2.1.1 Amphibians

Nine amphibian species have been recorded within the study area. These comprise two families, the most speciose of which is the Myobatrachidae, particularly the common eastern froglet (*Crinia signifera*) and brown froglet (*Crinia parasignifera*). The Hylidae family was represented by four species, most commonly the green reed frog (*Litoria fallax*). No threatened amphibian species have been recorded within the study area.

3.2.1.2 Reptiles

Four reptile species have been recorded during surveys of the study area. These comprise the lace monitor (*Varanus varius*), jacky lizard (*Amphibolurus muricatus*), grass skink (*Lampropholis delicata*) and small-eyed snake (*Cryptophis nigrescens*). No threatened reptile species were recorded within the study area during surveys.

3.2.1.3 Birds

A total of 65 bird species have been recorded from the study area. This comprises representatives from 32 families, the most speciose being the Meliphagidae (honeyeaters) with nine species recorded. Other well-represented families included the Psittacidae (lorikeets and rosellas) with four species recorded and Cuculidae (cuckoos) also with four species recorded. The most abundant species recorded throughout the study area were the yellow-faced honeyeater (*Lichenostomus chrysops*), white-throated treecreeper (*Corombates leucophaea*) and eastern yellow robin (*Eopsaltria australis*).

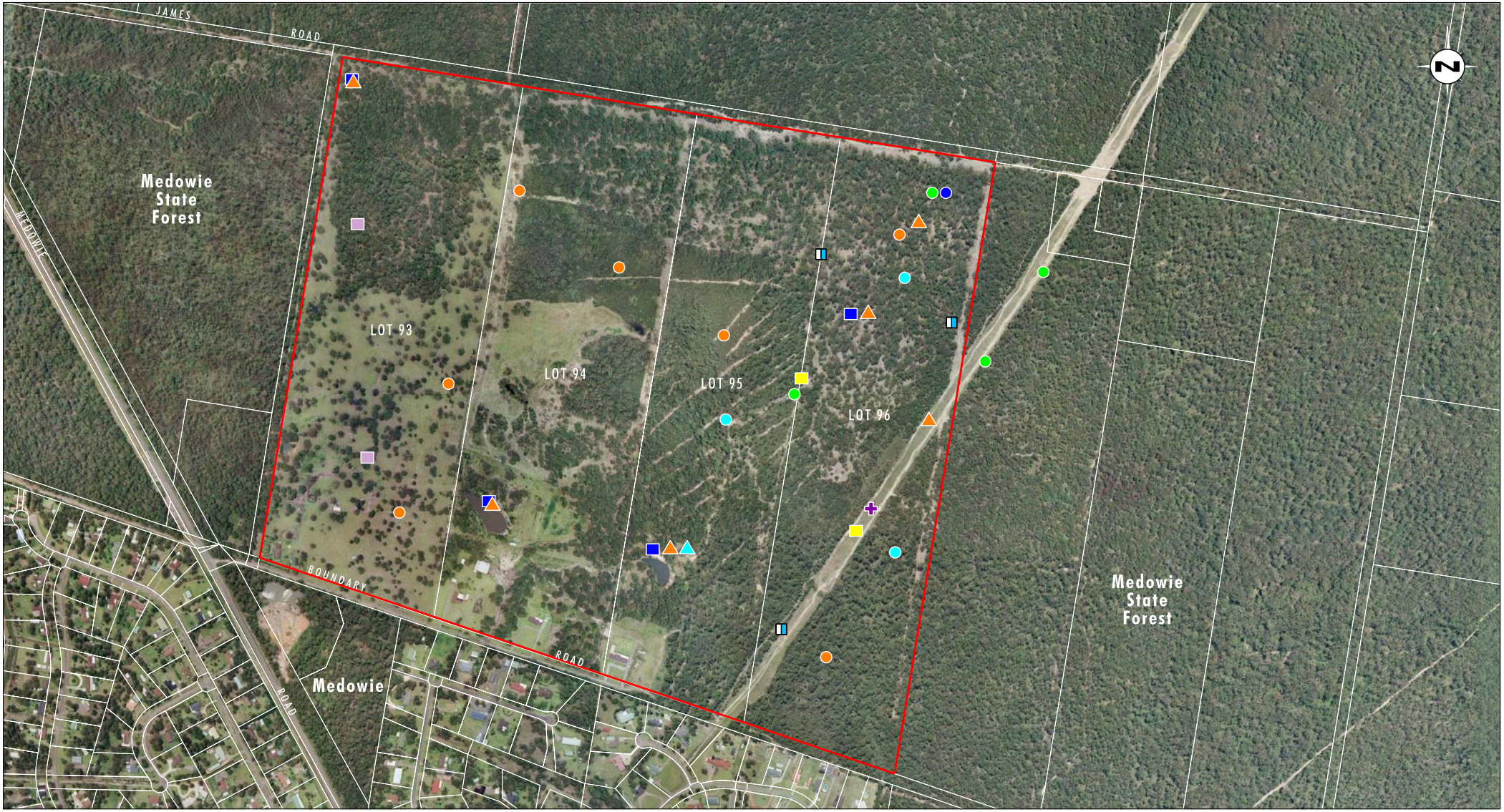
A total of three threatened bird species have been recorded within the study area, being:

- glossy black-cockatoo (*Calyptorhynchus lathami*) (chewed cones);
- masked owl (*Tyto novaehollandiae*), including a probable roost/nest tree; and
- varied sittella (*Daphoenositta chrysoptera*), a preliminarily determination as Vulnerable under the TSC Act.

The records of these threatened species are displayed on **Figure 3.2**, and the potential impact of the proposed development on these species is discussed further in **Section 5** of this report.

3.2.1.4 Mammals

A total of 23 mammal species from 11 families have been recorded within the study area. The most common mammal species recorded was the common brushtail possum (*Trichosurus vulpecula*), which was recorded at several locations throughout the study area. The most speciose family recorded was the Vespertilionidae (evening micro-bats) with nine species recorded, followed by the Macropodidae (kangaroos and wallabies), with three species recorded.



Source: Google Earth (2007), Port Stephens Council (2006), Umwelt (2006), Orogen (2006)

0 100 250 500m
1:10 000

Legend

- Study Area
- Squirrel Glider
- Grey-headed Flying-fox
- Varied Sittella
- Probable Masked Owl Roost / Nest Tree
- Masked Owl
- Koala-Scat Records
- Glossy Black-cockatoo Feed Tree
- Little Bentwing-bat
- Eastern Freetail-bat
- Eastern Bentwing-bat
- TSC listed micro-bats (unspecified)
  - Yellow-bellied Sheathtail-bat
  - Eastern Freetail-bat
  - Little Bentwing-bat
  - Greater Broadnosed Bat
  - Large-eared Pied Bat

FIGURE 3.2

Threatened Species Locations

File Name (A4): R01_V1/2711_004.dgn

Nine threatened mammal species have been recorded from the study area, comprising:

- koala (*Phascolarctos cinereus*) (scat records);
- squirrel glider (*Petaurus norfolcensis*);
- grey-headed flying-fox (*Pteropus poliocephalus*);
- little bentwing-bat (*Miniopterus australis*);
- eastern bentwing-bat (*Miniopterus schreibersii oceanensis*);
- eastern freetail-bat (*Mormopterus norfolkensis*);
- yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*);
- large-eared pied bat (*Chalinolobus dwyeri*); and
- greater broad-nosed bat (*Scoteanax rueppellii*).

The grey-headed flying-fox (*Pteropus poliocephalus*) and large-eared pied bat (*Chalinolobus dwyeri*) are listed as Vulnerable under both the TSC Act and EPBC Act.

The records of these threatened species are displayed on **Figure 3.2**, and the potential impact of the proposed development on these species is discussed further in **Section 5** of this report.

3.2.2 Fauna Habitats of the Study Area

Four broad fauna habitat types have been identified within the study area, comprising woodland, riparian, derived grassland with scattered canopy trees and derived grassland habitats. The broad characteristics of each of these are described below in relation to the provision of specific habitat features and value to fauna species.

3.2.2.1 Woodland Habitat

The woodland habitat dominates the study area, covering approximately 58 hectares across the Coastal Plains Smooth-barked Apple Woodland community. The general structure of this habitat type is similar across the study area, however some smaller areas of previously disturbed vegetation within this habitat type provide an open or reduced understorey cover.

The structure of the woodland habitat comprises a canopy cover ranging from 15 to 20 metres with less than 30% canopy cover, generally with an open understorey and dense ground cover. The canopy trees provide flowering resources for honeyeaters, lorikeets and arboreal mammals during most of the year. Mature hollow-bearing trees are common throughout this habitat type, providing potential nesting resources for a range of arboreal mammals (large and small), large forest owls and cockatoos, micro-bats, smaller birds and other hollow-dependent fauna species.

The open understorey provides potential foraging habitat for micro-bats, macropods, birds and some limited nesting potential in protected areas for small woodland birds. The ground cover is dense with large amounts of fallen timber, hollow logs and fallen trees providing terrestrial foraging and refuge niches for reptiles and small terrestrial mammals. Water resources are provided in several large dams throughout the study area.

3.2.2.2 Riparian Habitat

The riparian habitat covers approximately 35 hectares within the study area, comprising the Swamp Sclerophyll Forest vegetation community. As with the woodland habitat type, the general structure of the riparian habitat is similar across its extent, however some smaller areas of previously disturbed vegetation within this habitat type provide an open or reduced understorey cover.

The structure of the riparian habitat type comprises an open canopy cover, to 20 metres, with a dense sub-canopy stratum. The sub-canopy stratum commonly consists of a dense layer of melaleuca (*Melaleuca nodosa*) in the central and northern areas and black sheoak (*Allocasuarina littoralis*) in the north-west. This dense sub-canopy layer provides prolific flowering resources for nectarivorous and insectivorous species, and potential foraging recourses for cockatoos (Cacatuidae). The canopy and sub-canopy strata provide flowering resources for honeyeaters and lorikeets during most of the year. Hollow-bearing trees are not as common within this habitat type as in the woodland, however occasional large eucalypts do occur sporadically, and provide hollow resources for fauna species.

Of particular value in this habitat type is the presence of swamp mahogany (*Eucalyptus robusta*) in small numbers in this habitat type. This species is a prolific winter-flowering species, known to provide important foraging resources for winter migratory species. While it only occurs in small amounts within the study area (and is known to occur widely and prolifically within the broader Medowie area), it is likely to be utilised by nectarivorous species seasonally.

Fallen timber is common in this habitat type, providing foraging and refuge resources for small terrestrial species. An ephemeral creek runs through this habitat, providing periodic water resources in medium to high rainfall events.

3.2.2.3 Derived Grassland with Scattered Canopy Trees

The derived grassland with scattered trees habitat within the study area covers approximately 24 hectares of vegetation that is likely to have originally comprised the Coastal Plains Smooth-barked Apple Woodland community. This habitat appears to have been modified decades ago, whereby the vegetation was thinned (leaving scattered canopy species) and the remaining strata removed to allow for grazing. Subsequent grazing by horses (observed during surveys) has resulted in a very sparse (or absent) shrub layer and an altered ground stratum. Recent removal of grazing from this habitat (approximately 6 to 12 months exclusion) has resulted in obvious regeneration of parts of the shrub layer, generally by colonising species. Such regeneration is increasing the habitat value of this vegetation by increasing cover for small species, increasing the complexity and amount of terrestrial habitat and by providing some flowering shrubs as foraging resources. Such regeneration is likely to continue naturally (where allowed), and will eventually develop into a similar layer to that found in the Coastal Plains Smooth-barked Apple Woodland community.

The remnant mature trees in this habitat type are generally large, and contain moderate amounts of hollows of various sizes. The open grassy groundcover provides grazing habitat for macropods, and open areas for some foraging bird and reptile species. The general lack of protective cover in these areas reduces the quality of this habitat for many fauna species. Water resources in this habitat type are provided in the form of a large dam.

3.2.2.4 Derived Grassland Habitats

This habitat type covers approximately 10 hectares within the study area, and is likely to have previously comprised the Coastal Plains Smooth-barked Apple Woodland. These areas are generally devoid of habitat niches, being comprised of cleared, open areas with mainly introduced grass and weed species. Gardens surrounding the existing houses in the study area may provide some foraging habitat for fauna species, however this is likely to be of reduced value compared to the native vegetated habitats within the remainder of the study area.

3.3 Ecologically Significant Features of the Study Area

The following sections outline the significant ecological features identified within the study area, either as part of ecological field survey, or review of relevant literature and ecological databases. The potential impact of the proposed development each of these features will be discussed further in **Section 5** of this report.

3.3.1 Threatened Ecological Communities

The Swamp Sclerophyll Forest on Coastal Floodplains of the north coast, Sydney basin and south-east corner bioregions EEC (listed under TSC Act) has been identified within the study area. The extent of this EEC within the study area is shown in **Figure 3.1**, as part of the vegetation community mapping, as well as in **Figure 1.3**, as part of the Concept Plan/Vision for the proposed development. This latter figure shows that the EEC boundary has been 'smoothed' slightly, for the purposes of practicality and planning in lot layout and design.

The condition of the EEC within the study area is relatively uniform throughout. The community is generally in moderately good health with very few weed species and limited evidence of canopy dieback, insect attack or other signs of poor condition. There is a high abundance of the sub-canopy/mid-stratum species ball honeymyrtle (*Melaleuca nodosa*), which is often an early coloniser species, indicating that the community has been exposed to disturbances such as fire or historical clearing. The edges of this community are in slightly lower condition, being more influenced by weed species and other edge effect impacts, particularly where the boundary is adjoined by derived grassland with scattered canopy trees community.

The EEC is bisected in the far south-east corner of the study area by an existing electricity easement of approximately 30 metres wide. While some elements of the EEC are regenerating within the easement, the vegetation in the easement is regularly maintained and therefore is not given the opportunity to develop the natural structure and floristics of the adjacent community.

The potential impact of the proposed development on this EEC within the study area has been discussed in **Appendix 3**, and assessed in detail in **Appendix 4** to this report.

3.3.2 Threatened and Significant Flora Species

No threatened flora species have been recorded to date within the study area, however there are a number regarded to have potential to occur. **Appendix 3** lists these potential species, as well as providing information on habitat, distribution, reservation and the potential for impact from the proposed development. No threatened flora species are considered to have the potential to be significantly impacted by the proposed development.

Two regionally significant flora species were recorded by Orogen (2007) within the study area, being *Macrozamia flexuosa* and the *Eucalyptus tereticornis – E. robusta* hybrid. The former species is listed as a Rare or Threatened Australian Plan (ROTAP) (Briggs & Leigh 1996). The latter is a naturally occurring hybrid known to occur in the Port Stephens LGA and is thought to have regional significance, although this is not known to be formally declared in any documents.

3.3.3 Endangered Flora Populations

No endangered flora populations have been recorded within the study area during surveys undertaken to date, and there are none which are expected to occur.

3.3.4 Threatened Fauna Species

Twelve threatened fauna species have been recorded within the study area as a result of the survey effort for this report and previous surveys. **Table 3.2** identifies the threatened fauna species recorded including general locations (see **Figure 3.2**) of the records and method of recording.

Table 3.2 – Threatened Fauna Species Recorded Within the Study Area

Species	Status	Location	Method of Record
glossy black-cockatoo *Calyptorhynchus lathami*	V (TSC)	western study area	sighted and chewed cones (Orogen 2006, 2007)
masked owl *Tyto novaehollandiae*	V (TSC)	north-east study area (probable roost/nest tree) and along easement	sighted (Orogen 2006), including location of pellets and probable roost/nest tree
varied sittella *Daphoenositta chrysoptera*	*V (TSC)	eastern half of study area	sighted (Umwelt 2009)
koala *Phascolarctos cinereus*	V (TSC)	various sites across study area	faecal pellets (Orogen 2006, 2007)
squirrel glider *Petaurus norfolcensis*	V (TSC)	along easement in eastern part of the study area	sighted (Umwelt 2009)
grey-headed flying-fox *Pteropus poliocephalus*	V (TSC) V (EPBC)	eastern half of study area	sighted (Umwelt 2009 and Orogen 2006, 2007)
yellow-bellied sheathtail-bat *Saccolaimus flaviventris*	V (TSC)	eastern half of study area	Anabat echolocation analysis (Orogen 2007)
eastern freetail-bat *Mormopterus norfolkensis*	V (TSC)	eastern half of study area	Anabat echolocation analysis (Umwelt 2009 and Orogen 2006, 2007)
little bentwing-bat *Miniopterus australis*	V (TSC)	various sites across study area	Anabat echolocation analysis (Umwelt 2009 and Orogen 2007)
eastern bentwing-bat *Miniopterus schreibersii oceanensis*	V (TSC)	various sites across study area	Anabat echolocation analysis (Umwelt 2009 and Orogen 2006)
large-eared pied bat *Chalinolobus dwyeri*	V (TSC) V (EPBC)	eastern half of study area	Anabat echolocation analysis (Orogen 2007)
greater broad-nosed bat *Scoteanax rueppellii*	V (TSC)	eastern half of study area	Anabat echolocation analysis (Orogen 2007)

TSC = *Threatened Species Conservation Act 1995*
EPBC = *Environment Protection and Biodiversity Conservation Act 1999*
E = Endangered
V = Vulnerable
* = preliminary listing

Based on the habitat available, it is likely that other threatened fauna species could occur within the various habitats of the study area. **Appendix 3** lists these potential species, as well as providing information on habitat, distribution, reservation and the potential for impact from the proposed development. No threatened fauna species are considered to have the potential to be significantly impacted by the proposed development.

3.3.5 Endangered Fauna Populations

No endangered fauna populations were recorded within the study area, and there are none which have potential to occur. While the endangered emu (*Dromaius novaehollandiae*) population in the NSW North Coast Bioregion and Port Stephens LGA has been recorded from the nearby Medowie State Conservation Area (to the north of Medowie State Forest), it is likely that such a large, easily-recognised species would have been identified during surveys if it occurred within the study area.

3.3.6 Listed Migratory Species

A search of the DEWHA Protected Matters Database was undertaken in order to identify any EPBC Act listed threatened or migratory species which could potentially occur within a 10 kilometre radius of the centre of the study area. **Appendix 3** lists these potential species, as well as providing information on habitat, distribution, reservation and the potential for impact from the proposed development. Marine, estuarine and pelagic species were excluded, due to a lack of specific habitat within the study area.

Of these, three species have been recorded within the study area, being:

- grey-headed flying-fox (*Pteropus poliocephalus*) - Vulnerable;
- large-eared pied bat (*Chalinolobus dwyeri*) - Vulnerable; and
- cattle egret (*Ardea ibis*) - Migratory.

The potential impact of the proposed development on the grey-headed flying-fox (*Pteropus poliocephalus*) and large-eared pied bat (*Chalinolobus dwyeri*) has been assessed in **Appendix 5** to this report. While the cattle egret was recorded in the study area, it is not likely that the study area provides a significant area of breeding or foraging resources for an important population of this species. As such, it was not deemed necessary to complete an Assessment of Significance (according to the requirements of the EPBC Act).

3.3.7 Fauna Habitat

The fauna habitats identified within the study area comprise woodland, riparian, derived grassland with scattered canopy trees and derived grassland habitats. The riparian habitat is commensurate with the Swamp Sclerophyll Forest EEC, as such is of significance. The remainder of the fauna habitat types are common in the local area, and do not contain significant habitat features not found elsewhere in the Medowie area.

Of importance within the study area, is the large number of hollow-bearing trees that have been noted during field surveys. These have been observed broadly across the vegetated habits of the study area, with more observed in the areas containing higher densities of species such as smooth-barked apple (*Angophora costata*) and forest red gum (*Eucalyptus tereticornis*).

At least half of the threatened fauna species recorded within the study area are hollow-dependent. While hollow surveys were not completed by Umwelt, (some surveys were completed by Orogen in 2006), a large number of hollow-bearing trees were observed, with a

number of these comprising large (101- 300 millimetres) to very large hollows (>301 millimetres). These hollow size classes are particularly rare in the landscape, and provide a roosting and nesting resource for large fauna species, such as owls and large cockatoos. The very small (<25 millimetres), small (26-50 millimetres) and medium (51-100 millimetres) hollows observed within the study area also provide roosting, denning and breeding habitat for smaller species, such as possums, gliders and micro-bats.

While the majority of observed hollows were located within the Coastal Plains Smooth-barked Apple Woodland, they were also observed within all other vegetation communities containing mature canopy species. Although they occur in a modified environment, the mature trees within the derived grassland with scattered canopy trees are numerous, and are likely to provide valuable habitat for hollow-dependent fauna species also.

3.3.8 Koala Habitat

The vegetation of the study area has been included in the Koala Habitat Planning Map (Port Stephens Council 2006), and has been classified as comprising the following koala habitat categories:

- **preferred koala habitat** – primarily three areas within the Swamp Sclerophyll Forest EEC, as well as the south western corner of the study area;
- **preferred 100 metre buffer over marginal habitat** – surrounding these preferred koala habitat areas;
- **marginal koala habitat** – primarily in the north-eastern and western parts of the study area;
- **preferred link over marginal habitat** – filling in the 'gaps' between the other mapped categories within the southern half of the study area;
- **100 metre buffer over other vegetation** – small patch within the Swamp Sclerophyll Forest EEC;
- **100 metre buffer over cleared land** – small patches mapped within the south-western corner of the study area; and
- **link over cleared land** – small patches mapped within the south-western corner of the study area.

Of these mapped categories, the key areas of koala habitat fall within the Swamp Sclerophyll Forest EEC, as well as in the south-western corner of the study area. This particular patch of preferred koala habitat has been selectively cleared in the past, so that the vegetation currently consists of scattered canopy species over a cleared grazing pasture. Some degree of shrubby regeneration has occurred within this area since the exclusion of grazing over the past year. Despite this level of disturbance, the remnant canopy trees still provide likely habitat for the koala, and it is likely that this species could travel across the open ground to other areas of more substantial habitat.

The updated AKF mapping (Port Stephens Council 2006) identified large amounts of Preferred Koala Habitat within the Medowie township, including a number of large remnants in the southern parts surrounding Campvale Drain. In the north of the township, the mapping identified large areas of Preferred Koala Habitat adjoining the south-east and south-west of the study area.

3.3.9 Aquatic Habitats

The study area does not contain any significant aquatic habitats, other than the highly ephemeral creek that runs through the centre of the EEC. This habitat would provide periodic water resources in medium to high rainfall events, however such water is not likely to be retained within the area for sustained periods of time. As such, there is no potential for species or communities listed under the NSW FM Act to occur within the study area.

3.3.10 Corridors and Connectivity

The study area exhibits a high degree of unbroken vegetated connectivity to high quality habitat within Medowie State Forest on the northern, eastern and western sides. Such high levels of connectivity (and associated lack of isolation or fragmentation) are of particular value to terrestrial and arboreal species, as it provides them with protected movement opportunities between the study area and the adjoining Medowie State Forest. The high levels of connectivity of the study area also provide vegetation with a buffer to degradation from edge effects.

Within the Medowie local area, there are few other large remnants which display such a high degree of connectivity to high quality habitat. One exception to this is the large area of vegetation in the south of the Medowie township, surrounding the Campvale Drain.

As a result of the high degree of connectivity between the study area and Medowie State Forest, the study area is likely to contribute to the corridor function and integrity of the Medowie State Forest.

3.3.10.1 Watagan – Stockton Green Corridor

The study area has been identified as falling within the boundaries of the Watagan – Stockton Green Corridor within the Lower Hunter Regional Strategy (Department of Planning 2006) (Map 1 of the Regional Strategy), although such mapping provides conceptual boundaries, at a broad scale only. In this respect, it is unlikely that the boundaries of this corridor are expected to be 'hard and fast', or that every site within these boundaries has been ground-truthed to accurately assess suitability for functional inclusion within the corridor.

In a similar manner to the Lower Hunter Regional Strategy, the Lower Hunter Regional Conservation Plan (DECCW 2009b) addresses the importance of the protection and enhancement of regional vegetated linkages via the Watagan – Stockton Green Corridor. The mapping in this report is, again, conceptual and broad scale, however the study area falls within the proposed corridor (see Map 2 of the Conservation Plan). The issue of corridor function in relation to these two planning documents is addressed below.

As part of the Lower Hunter Regional Strategy, lands within this green corridor are defined as:

> 'Areas of high conservation values joining key corridors through the region. Lands within the corridor will be managed for conservation purposes'.

Key government actions to consolidate land ownership within this green corridor have been to initiate the transfer of existing government lands to conservation reserves, and to pursue the dedication of significant additional lands by major landholders. The study area has not been subject to either of these actions. As such, the future use of the study area is likely to be guided by the following statements (in relation to the green corridor):

1. 'The combination of environmental values, hazards and the distance to serviced centres means that the area is unsuitable for new large scale urban development, other than building on the existing community at Medowie and employment land at Tomago and Williamtown.'

The study area has been mapped within the Medowie Strategy (Port Stephens Council 2009) as being part of the Medowie township (Figure A1.6 of the Strategy). As it is part of the existing township, the future development of the study area for rural small holdings residential purposes will not be inconsistent with the above objective to focus future large scale urban developments to existing urban areas.

2. 'Additional protection of the biodiversity and conservation values of the green corridors will be achieved through appropriate planning controls on private lands, as well as the exclusion of one-off development proposals in these areas.'

As identified above, the future rural small holdings residential development of the study area should be considered as 'building on the existing community at Medowie', as the study area was mapped as occurring within the Medowie township in the Medowie Strategy. In the context in which 'one-off' development proposals are discussed in the Lower Hunter Regional Strategy, the development of the study area could not be considered as such given it is 'attached' to Medowie and represents natural growth to the town, rather than the development of an isolated area 'within' the green corridor.

In relation to corridor function, the position of the study area on the northern edge of the Medowie township places it (effectively) as part of the urban 'island' of Medowie that lies within the middle of the green corridor. Due to this positioning, future development on this existing urban fringe is not likely to be significantly damaging to the existing corridor function.

The aim of the current proposed development of the study area is for a rural small holdings residential estate, planned on the basis of a number of ecologically sensitive design principles. A primary focus of these design principles is to minimise loss of native vegetation to provide increased opportunity for improved ecological outcomes within the post-development rural small holdings residential estate. To this end, the proposed development (see **Figure 1.3**) would not impact the vast majority of the Swamp Sclerophyll Forest EEC, nor the ecological features in the north-eastern corner of the study area. This approach ensures the retention and protection of the most ecologically-significant vegetation within the study area, and provides for the protection of existing connectivity and corridor function throughout the study area, as well as in the broader area from Medowie to Medowie State Forest.

An approach such as this minimises the potential impact on the functioning of the formal green corridor, as well as informal local corridors, while accommodating ecologically-sensitive urban development.

4.0 Bushfire Hazard Assessment

A Bushfire Hazard Assessment has been prepared for the proposed development of the study area in order to provide input into the development of the Concept Plan/Vision by way of recommended asset protection zones (APZs), and other bushfire protection mechanisms. This bushfire hazard assessment has been prepared in accordance with Planning for Bushfire Protection (NSW RFS 2006).

The objectives of the Bushfire Hazard Assessment is to determine the required APZs and level of bushfire attack on the boundary of the study area to provide appropriate protection for future rural small holdings residential development of the study area.

Port Stephens Council has mapped the majority of the study area as Vegetation Category 1, with cleared areas mapped as Vegetation Buffer. Further assessment for individual lots will be required at the development application stage of the proposed development.

4.1 Site Assessment Methodology

Asset Protection Zones (APZ) and minimum construction standards have been determined using the Site Assessment Methodology provided on the Rural Fire Service (RFS) website (http://www.rfs.nsw.gov.au), and in consultation with the Development Assessment team at the RFS. The RFS recommend maximizing APZs to allow for a maximum defendable space in the event of a bushfire and therefore a conservative approach has been applied to this bushfire hazard assessment to minimise the potential threat to future residents of the study area.

4.1.1 Vegetation Assessment

Vegetation communities were assessed in each direction to determine the predominant vegetation class formation over a distance of 140 metres from the boundary of the study area. Regional mapping from House (2003) and NPWS (2000a) have identified the predominant vegetation community in Medowie State Forest (occurring to the north, east and west of the study area), as Coastal Plains Smooth-barked Apple Woodland. The landscape to the south comprises rural small holdings residential development with small patches of Coastal Plains Smooth-barked Apple Woodland. Coastal Plains Smooth-barked Apple Woodland corresponds to woodland vegetation formation, as described in Table A2.1 Classification of Vegetation Formations in Appendix 2 of *Planning for Bushfire Protection* (NSW RFS 2006).

Remnant vegetation in the central and north-eastern portions of the study area will be retained and protected as part of the rezoning and future development of the study area (**Figure 1.3**). The vegetation comprises Swamp Sclerophyll Forest on Coastal Floodplains EEC, which corresponds to Forested Wetlands, as described in Table A2.1 Classification of Vegetation Formations in Appendix 2 of *Planning for Bushfire Protection* (RFS 2006) and Coastal Plains Smooth-barked Apple Woodland corresponds to woodland vegetation formation.

4.1.2 Slope Assessment

The slope assessment was determined from assessment of the Karuah 1:25,000 topographic map over a distance of at least 100 metres across each boundary. In accordance with *Planning for Bushfire Protection*, the slope has been assessed based on the gradient that will

most affect bushfire behaviour. Slope is determined in terms of the following classes, relative to the location of the hazard:

- all upslope vegetation (considered 0°);
- >0 to 5° downslope vegetation;
- >5 to 10° downslope vegetation;
- >10 to 15° downslope vegetation; and
- >15 to 18° downslope vegetation.

The results of the slope assessment as presented in **Table 4.1** below.

4.2 Determination of Asset Protection Zones

The RFS has developed a Bushfire Attack Assessor and APZ calculator to assist in the consistent preparation and consideration of bushfire assessments in bushfire prone land. The online calculators determine the level of bushfire attack to which a site or development is exposed and the corresponding construction standards that are required to be included in the development. The APZ calculator incorporates the information contained within Appendix 2 of Planning for Bushfire Protection and calculates the required APZ.

The APZ requirements have been determined with the objective of the minimisation of vegetation clearing and therefore maximizing the contribution of construction standards to the protection of assets. Level 3 construction standards have been sought where bushfire threat is extreme (along the three vegetated boundaries of the site) which allows for a minimisation in clearing and the adequate protection of assets.

Table 4.1 summarises the results of the vegetation formation and slope assessment and identifies the APZs recommended along each boundary of the site.

Table 4.1 - Determination of Recommended Asset Protection Zones

Development Aspect	Vegetation Formation	Effective Slope	Recommended Asset Protection Zone (metres)
North	Woodland	4.4 ^{0} Upslope	15
South	Largely cleared with woodland patches	Flat	15 (for lots adjacent to woodland*)
East	Forested Wetland	Flat	16
West	Woodland	6.7^{o} Upslope	15

4.3 Bushfire Attack Assessment

The bushfire attack assessment determined an extreme category of attack to the boundary of the study area from the north, east and western boundaries. An extreme bushfire attack category equates to a Level 3 construction standard to prevent damage from ember and radiant heat attack.

As the study area has been mapped at Bushfire Prone by the Port Stephens Council bushfire prone mapping and significant vegetation retention is proposed within the study area to minimise the loss of significant ecological features, it is recommended that the minimum

construction standard applied to rural small holdings residential developments within the study area is Level 1. Level 2 (High Attack) and Level 3 (Extreme Attack) construction standards may be required in areas where individual lots are adjacent to retained vegetation or where they occur along the boundary of the study area.

The level of construction standard required for individual lots will be determined at the subdivision stage of the development.

4.4 Access/Egress

Access to the study area is currently from Boundary Road which forms the southern boundary of the study area. Additional access/egress will be constructed along the road reserve that forms the western boundary of the study area and the construction of a portion of James Road, which will bound the northern boundary of the study area.

Planning for Bushfire Protection (RFS 2006) states that:

> 'the public road system in a bush fire prone area should provide alternative access or egress for firefighters and residents during a bush fire emergency if part of the road system is cut by fire.'

4.5 Service Provision

Reticulated water and gas supplies will comply with *Planning for Bushfire Protection 2006* and the relevant Australian Standards. Electricity transmission lines will be installed underground.

5.0 Potential Impacts of Proposed Development on Ecologically Significant Features

5.1 Impacts of Proposed Development

The proposed development (as depicted in the Concept Plan/Vision in **Figure 1.3**) has been designed with the aim of providing a development approach which balances the economic potential of the study area with appropriate biodiversity conservation outcomes for the broader Medowie area. In order to achieve this outcome, focus has been paid to the retention of as much vegetation as possible (and practical), as well as the retention and protection of identified significant ecological features of the study area.

The Concept Plan/Vision provides for the following development outcomes:

- apart from the lots that immediately front Boundary Road the balance of the site (south-west of the EEC) will be developed as rural small holding lots indicatively ranging in size from 1,000 m^2 to 1,500 m^2;
- lots fronting Boundary Road will be of similar size and configuration (indicatively 4,000m^2) to lots that are existing on the Southern side of Boundary Road;
- retention and protection of Swamp Sclerophyll Forest EEC across the centre of the study area;
- retention and protection of ecologically significant vegetation in the north-eastern portion of the study area;
- internal and external access roads; and
- asset protection zones (APZs) for bushfire protection purposes.

The provision of the above development outcomes is likely to impact on a maximum of 59 hectares (approximately 46%) of vegetation within the study area. It is notable that this is a maximum potential impact, as this value does not take into account the existing disturbed nature of a substantial part of the vegetation in the area to be developed, nor vegetation that will be able to be retained within the larger lots. **Table 5.1** identifies the composition of the vegetation to be impacted as part of the proposed development.

Table 5.1 - Extent of Vegetation Communities within Area to be Developed

Vegetation Community	Amount (Hectares) within Area to be Developed	Extent within Study Area (hectares)	% Impact
Swamp Sclerophyll Forest	2	35	5.7
Coastal Plains Smooth-barked Apple Woodland	25	58	43
Forest Red Gum/Red Mahogany Open Forest	3	3	100
Derived Grassland with Scattered Canopy Trees	21	21	100
Derived Grassland	7	10	70
Water bodies	<1	<1	100
Total	**59**	**127**	**46**

The majority of the area to be disturbed comprises the previously disturbed Derived Grassland (7 hectares) and Derived Grassland with Scattered Canopy Trees (21 hectares). Approximately 25 hectares of Coastal Plains Smooth-barked Apple Woodland will be impacted, as will all of the Forest Red Gum/Red Mahogany Open Forest within the study area. A small proportion (5.7%) of the Swamp Sclerophyll Forest EEC will be impacted, due to smoothing of boundaries for planning purposes. This smoothing does, however, include the protection of an area of previously cleared EEC that will be allowed to regenerate to its former condition (and assisted if necessary), as part of the project.

The Plan/Vision also achieves the following ecological outcomes:

- retention and protection of at least 68 hectares of existing vegetation within the study area, via exclusion from proposed development areas. This vegetation comprises the majority of the Swamp Sclerophyll Forest EEC recorded within the study area (less approximately 5.7% due to smoothing), as well as all of the high-quality Coastal Plains Smooth-barked Apple Woodland that lies to the north of the EEC boundary (comprising 33 hectares) . Areas of EEC and other vegetation to the east of the existing easement will also be retained and protected as part of the proposed development. Current negotiations with Council are pursuing the likely potential for this land to be transferred to public ownership, to provide for long-term security, protection and management;

- retention and protection of high quality vegetation also enables the protection of preferred koala habitat (including identified buffer areas), as well as riparian vegetation and existing corridor function throughout the study area and broader local area; and

- provision of large lots to allow for the retention of as much existing vegetation as possible, with focus on hollow-bearing trees.

5.2 Performance against Ecological Planning Principles

One of the key outcomes of the previous investigations into the development potential of the study area was the adoption of a number of ecologically sensitive planning and design principles within the design of the Concept Plan/Vision for the rural small holdings residential estate. These principles were developed with input from Umwelt ecologists, and were adopted in the planning and design of the Concept Plan/Vision in order to minimise ecological impact as much as possible within the planning and construction phases of the project, and to maximise ecological conservation outcomes in the post-development landscape.

The principles that were adopted as part of the Concept Plan/Vision are:

- **To adopt an 'Eco-Living' approach to the planning and design of the estate** – (such as Special Conservation Living Areas recommended in the Biolink 2006 report). Measures to achieve this have included/will include:

    - maximum retention of native vegetation within lots, including minimisation of edge effects;
    - provision of resident education packages and promotion of ecological stewardship;
    - traffic control measures/speed limits within the estate to minimise fauna injury/road kills, as much as possible;
    - minimisation of loss of the Swamp Sclerophyll Forest EEC, by retention and protection of the vast majority of its occurrence in the study area;

- reduction of barriers to fauna movement through fence design (except for pool fencing), including avoiding use of barbed wire;
- community habitat restoration projects (particularly within the EEC), to maintain and enhance the existing riparian corridor, as well as the quality of the EEC and preferred koala habitat;
- appropriate long-term protection of retained vegetation (EEC, areas to the north of the EEC and vegetation to east of easement) by way of transferral to public ownership;
- pools to have fixed 50 millimetre ropes in them for koalas;
- native plants to be used in landscaping and gardening; and
- exclusion of cat and dog ownership from the post-development landscape.

- **Ecologically sensitive lot layout/yield** – focus on rural small holdings residential lots in pre-disturbed areas (on southern side of EEC), to allow for the retention and protection of ecologically significant areas (being the EEC and the north-eastern portion of the study area).

- **To adopt a 'no net loss' approach to biodiversity –** including the provision of offsetting (see **Section 6**, below). Consideration of replacement of specific fauna habitat such as hollows (where these cannot be retained) within the post-development landscape.

- **To provide defined building location zones for lots adjoining retained vegetation** – these will allow construction within a suitable proportion of the lot, while providing confidence in the retention of maximum amounts of vegetation adjoining the EEC. Such retained vegetation will allow for increased retention of fauna habitat, with the focus on retention of hollow-bearing trees as a priority. This retained vegetation within the lots adjoining the EEC will also provide a buffer, providing protection from urban-based edge effects and human impacts.

  Asset protection zones have also been included in the planning of the Concept Plan/Vision, to allow for informed planning and impact assessment, and to minimise the loss of habitat for this purpose.

- **Minimal ecological fragmentation from access/infrastructure** – access/egress has been excluded from the EEC and other retained vegetation, to ensure that existing fragmentation in this area (although not substantial) will not increase. It is likely that the retention and protection of the EEC will allow for the natural regeneration of the existing fragmented parts of this vegetation. Active regeneration of these areas may be considered, if deemed necessary to improve connectivity in this area.

- **To maximise retention of native vegetation** – via achieving required lot yield in areas that have been previously disturbed, so that higher quality vegetation can be excluded from development. Design has maximised connectivity of retained vegetation within the study area (via direct linkages to the north-east), as well as to existing vegetation outside of the study area.

- **Maximum retention of hollow-bearing trees** – to reduce potential impact on hollow-dependent species. Hollow-bearing trees will be prioritised when retaining vegetation in lots, as well as any other areas of retained vegetation. The use of monitored nest boxes to provide compensatory habitat and ameliorate overall loss of hollows will be considered as a management option in the post-development landscape.

- **Retention and protection of significant vegetation, including identified EEC** – the identified high quality vegetation of the north-eastern portion of the study area will be

maintained and protected as part of the proposal. The EEC will also be maintained and protected, however it has been necessary to 'smooth' the mapped margins of the EEC in order to allow for properly planned/located lots and to reduce irregular boundaries. This has equated to modification to 5.7% of the EEC within the study area. This smoothing process, however has also allowed for the inclusion of previously impacted parts of the EEC into the retained vegetation. Such vegetation is likely to naturally regenerate (currently occurring), and is likely to compensate for the modification of the small amount of this vegetation.

Formal walking tracks will be considered throughout the retained vegetation (including the margins of the EEC) to allow for recreation and appreciation with minimal impact. Other access to the retained vegetation will be discouraged to prevent human-created disturbances.

Community habitat restoration projects will be considered that focus on the restoration of disturbed parts of the retained vegetation, particularly restoring the damaged connectivity in the north-western portion.

Appropriate vegetated buffers to identified ecologically significant features – the provision of defined building envelopes in the lots adjoining the southern boundary of the EEC will ensure that retention of maximum amounts of vegetation adjacent to the EEC can be achieved, without limiting building potential within the lot. This retained vegetation will provide a buffer to the EEC, minimising edge effects such as weed invasion, damage due to human access and rubbish dumping. This buffer will also provide buffering to the identified preferred koala habitat mapped within the EEC.

- **Detailed ecological surveys** – these have been completed to address knowledge gaps and to update historical data for the purpose of informing this rezoning application and associated impact assessment.

- **Identification and accurate marking (via surveyors) of significant ecological features** – such as the accurate boundaries of the EEC and location of hollow-bearing trees within lots. This will allow for accurate planning and construction works, minimising accidental disturbance, and maximising conservation opportunities.

- **Development of a Construction Management Plan** – to identify the most appropriate methods and staging of construction in order to minimise vegetation loss and impact on identified threatened species.

  This will include detailed pre-clearing surveys to identify fauna (particularly breeding or threatened fauna) using the area to be cleared. Ameliorative measures will be implemented to minimise clearing impact on breeding or threatened fauna – this may include staging of clearing to allow breeding to finish, capture and relocation (possibly) of fauna to nearby secure habitats, or specialised tree felling methods that will minimise potential injury to fauna.

  A detailed tree-felling procedure will be adopted to minimise potential harm to hollow-dependent fauna while clearing.

- **To implement a post-development Ecological Management Plan** – to outline ecological management requirements to maintain and protect the retained ecological features of the post-development landscape.

  This will include details on ecological monitoring of retained ecological features, including the EEC and other retained vegetation, hollow-bearing trees, ongoing use of the study area by threatened species, and fauna habitat quality.

- **To employ appropriate mechanisms to ensure long-term protection of retained ecological features** – such as the EEC, retained hollow-bearing trees, fauna habitat and other retained vegetation. Upon discussion with Council, it is likely that long-term protection of the retained vegetation within the study area will be achieved via transferral to public ownership.

The existing commitment from Eureka to implement these principles will allow for increased conservation outcomes within the proposed rural small holdings residential estate, as well as in the construction phase and post-development landscape.

6.0 Impact Mitigation

The overarching principles employed in the planning of the proposed development of the study area have been to avoid, minimise, and mitigate/offset ecological impacts (as much as possible), while allowing an acceptable, economically viable development outcome.

Avoidance of ecological impact was adopted as much as possible within the planning and design of the Concept Plan/Vision, by way of:

- exclusion of at least 68 hectares of existing vegetation (including the majority of the mapped Swamp Sclerophyll Forest EEC within the study area, as well as Coastal Plains Smooth-barked Apple Woodland to the north of the EEC), from development. This also includes areas of non-EEC vegetation to the east of the exiting easement.

In avoiding development impacts within the identified significant vegetation communities of the study area, the Concept Plan/Vision has attempted to avoid impact on significant ecological features as much as possible, while providing rural small holdings residential options for the future population growth in the Medowie area.

Efforts to minimise ecological impacts have also been included within the Concept Plan/Vision, with these being:

- minimising potential loss of vegetation (including habitat for threatened species) by the provision of large lots to allow for the retention of as much vegetation as possible. This retention will focus on the prioritisation of the retention of hollow-bearing trees within the post-development landscape, as an important habitat resource for hollow-dependent threatened species;

- detailed pre-clearing surveys will be completed (during the construction phase for the subdivision, as well as when clearing is required for the provision of building envelopes/building location zones for the lots); and

- detailed tree felling procedures will be implemented (during the construction phase for the subdivision, as well as when clearing is required for the provision of building envelopes/building location zones for the lots), to minimise potential impact on fauna species.

Finally, where potential ecological impacts have not been able to be fully avoided or minimised, the following mitigation/offsetting measures will be implemented:

- provision of a formal biodiversity offset comprising 33 hectares of Swamp Sclerophyll Forest EEC and 33 hectares of Coastal Plains Smooth-barked Apple Woodland) to be transferred to public ownership as a formal biodiversity offset for the proposed development (see **Section 6.2.1**, below); and

- consideration of mitigative measures proposed in the Ecological Planning Principles (**Section 5.2**) for the post-development management of the study area, including consideration of measures such as (but not limited to):

    - resident education packages and promotion of ecological stewardship;
    - community habitat restoration projects (particularly within the offset area), to maintain and enhance the existing riparian corridor, as well as the quality of the EEC and preferred koala habitat;
    - pools to have fixed 50 millimetre ropes in them for koala safety;

- native plants to be used in landscaping and gardening;
- exclusion of cat and dog ownership from the post-development landscape; and
- consideration of replacement of specific fauna habitat such as hollows (where these cannot be retained) within the post-development landscape.

6.1 Recommended Impact Mitigation

A considerable amount of impact mitigation has been incorporated into the Concept Plan/Vision for the proposed development. This impact mitigation has been based on the ecologically sensitive planning principles that have been adopted in the planning and design of the proposed development. Details on such existing mitigation measures have been provided in **Section 5.2**, above.

One major commitment of these ecologically sensitive planning principles is the adoption of procedures to minimise the impact of the removal of vegetation (including hollow-bearing trees) as much as possible, particularly on threatened species. Where possible, clearing of hollow-bearing trees should be timed to avoid disturbance during breeding seasons of target threatened species. The recommended procedures to achieve this are discussed in the following sections.

6.1.1 Pre-Clearing Surveys

Pre-clearing surveys will be completed by a suitably qualified and experienced ecologist, as close to the proposed clearing time as possible. Surveys will be required during the construction phase for the subdivision, as well as when clearing is required for the provision of building envelopes/building location zones for the lots. The timing of pre-clearing surveys should be designed to maximise the potential to detect threatened species using hollow-bearing trees, while allowing flexibility in construction planning to allow mitigation measures to be adopted, if necessary. Such mitigation measures may involve allowing the completion of breeding periods, or allowing/encouraging fauna to vacate the area.

Hollow-bearing trees will be clearly marked during pre-clearing surveys, and will be inspected for signs of fauna presence, such as nests, pellets, scratches etc. If obvious signs of the presence of threatened species in a hollow-bearing tree are detected, the ecologist will discuss options to be adopted to minimise impacts.

Other components of the pre-clearing surveys will include detailed searches for threatened flora and fauna species, including micro-bats.

6.1.2 Hollow-Bearing Tree Felling Procedures

The felling of hollow-bearing tree has the potential to impact on numerous hollow-dependent threatened fauna species which have the potential to occur in the study area. Adoption of sensitive tree felling procedures has the potential to minimise this impact, and recommended methods include (but are not limited to):

- supervision of the felling of hollow-bearing trees by a suitably qualified and experienced ecologist. If an ecological issue is encountered, the ecologist is to advise on the most appropriate measures to ensure minimal impact on threatened fauna species;
- removal of non hollow-bearing trees/vegetation as close to the felling date as possible (in order to discourage fauna usage of the area);

- shaking of tree (with heavy machinery) for at least 30 seconds to encourage resident fauna to abandon tree, prior to felling;
- lowering of any hollow-bearing trees as gently as possible with heavy machinery;
- inspection of all felled hollows for fauna by ecologist;
- capture of any displaced/injured fauna by ecologist;
- release of unharmed fauna into nearby secure habitats;
- injured fauna to be assessed and taken to wildlife carer, if necessary, by a suitably experienced and licensed ecologist;
- felled tree to be rolled so that the number of hollows blocked against the ground are minimised; and
- all felled trees to remain in place overnight to allow any unidentified fauna to escape.

All personnel who will capture/handle/house and/or transport native fauna species (injured or uninjured) will be appropriately licensed under the requirements of the NSW Animal Ethics Committee.

6.2 Biodiversity Offsets

Section 6.0 of this report has identified the numerous measures employed as part of the planning and design of the Concept Plan/Vision to avoid, minimise and then mitigate/offset the potential impacts of the proposed development on the ecologically significant features of the study area. The implementation of these measures has resulted in a Concept Plan/Vision for the study area that is likely to result in minimal residual impact on significant ecological features.

While the impacts of this proposed rural small holdings residential development will be as minimal as possible, it is accepted by Eureka that it is both desirable and appropriate to provide an offsetting mechanism for those residual impacts that cannot be avoided, minimised or mitigated as part of the commitments of the Concept Plan/Vision. This will ensure the provision of an ecologically sound development, which will acceptable to the community and determining authorities.

A number of options for such biodiversity offsetting have been considered as part of the development of the Concept Plan/Vision, and these are discussed below. This offsetting has been designed in order to address residual ecological impacts that have not been able to be avoided, minimised or mitigated in the provision of the Concept Plan/Vision.

6.2.1 BioBanking

The NSW Government has developed the BioBanking scheme to enable a more consistent approach to biodiversity offsetting. It forms an alternative approach against which developments can be assessed and through which developers can achieve appropriate biodiversity offsetting without having ongoing management or legal responsibility for the offset areas. Participation in BioBanking is voluntary and the potential for utilising this recently developed and still evolving option is discussed below.

The BioBanking scheme works though applying a rule-based approach to determining the likely impact a development will have on biodiversity, and through then calculating the

number of *biodiversity credits* (comprising *ecosystem credits* and/or *threatened species credits*) that are required to be purchased to offset the development's impact. The credits are purchased from registered BioBanking Sites and the funds generated from the purchase are used by the BioBanking site manager(s) to achieve a set of previously-agreed management actions at that site(s). This process is known as credit retirement, and once the developer has purchased all of the necessary credits, their development has been offset and they have no further responsibility to any biodiversity offsetting requirements. BioBanking sites will be protected, managed and funded in-perpetuity.

It is acknowledged that BioBanking is a relatively new scheme that does not yet include a functioning credit market, and as such, is not yet able to be fully included/applied to the planning and assessment of this proposed development. Despite the immaturity of the credit market for this scheme, the concepts applied to its outcomes have been adopted by Eureka in order to be proactive in relation to this scheme.

While Eureka is not currently proposing to adopt this scheme as part of the proposed development, a 'Preliminary BioBanking Assessment' is has been prepared in order to:

- allow Eureka to pre-empt the outcomes of the application of this scheme as they relate to the proposed development;
- allow the informed planning and inclusion of appropriate mitigation/offsetting measures into the proposed development; and
- allow informed discussion of this scheme with determining authorities.

The early phases of this 'Preliminary BioBanking Assessment' have been completed, and its outcomes have been considered as part of the mitigation and offsetting proposed as part of this development.

6.2.2 Off-Site Biodiversity Offsetting Opportunities

There are also numerous opportunities for off-site offsetting of the potential impacts of the proposed development. The Medowie area contains considerable amounts of similar habitat types to those contained within the study area, and a portion of these may be available for consideration for offsetting for this proposed development. The Medowie Strategy (Port Stephens Council 2009) has identified a number of areas suitable for off-site offsetting for proposed urban development in the Medowie area. Many of these areas contain ecological features that would be targeted for offsetting for the proposed development of the study area. It is likely, however, that development opportunities provided for in the Medowie Strategy will increase demand for such offsetting opportunities, and they will be highly sought after by numerous potential projects.

In order to address this, it is deemed preferable to prioritise on-site offsetting opportunities, if/where they exist. In the case of the study area, a considerable offsetting opportunity exists (in the form of the Swamp Sclerophyll Forest EEC and the vegetation lying to the north) that, if adopted, will provide its own 'self-contained' on-site offsetting opportunity. This will benefit the development opportunities indicated in the Medowie Strategy by reducing demand for off-site offsetting options.

While it is known that the option for off-site offsetting is available, Eureka has not progressed further with investigating it, as it is considered that the study area itself provides suitable opportunity for on-site biodiversity offsetting for the potential impacts of the proposed development (see **Section 6.2.4**). If deemed necessary, this option will be considered in more detail.

6.2.3 Environmental Contributions

Another offsetting option considered as part of the proposed development is that of the provision of an environmental contribution payment. This option comes in the form of the payment of an agreed sum under the BioBanking Scheme that contributes to the management of formal BioBanking sites, formed under the scheme.

This option has not been considered in detail, due to the considerable effort that has gone into the avoidance, minimisation and mitigation/offsetting of ecological impacts as a result of the proposed development. The inclusion of BioBanking principles and outcomes in to the development of the impact mitigation for this proposed development have ensures that impacts are minimal and that appropriate offsetting has been provided for residual (unavoidable) impacts.

6.2.4 On-Site Biodiversity Offsetting

Due to the identified ecological constraints identified within the study area, considerable effort has gone into avoiding and minimising ecological impact as part of the Concept Plan/Vision. A mitigation/offsetting package has been developed to account for those residual impacts that could not be avoided or minimised. This package focuses primarily on the 68 hectares of retained Swamp Sclerophyll Forest EEC and Coastal Plains Smooth-barked Apple Woodland that is to be retained and protected.

In considering the preference for on-site offsetting, offering this retained area to be transferred to public ownership has been discussed with Council, as a formal Biodiversity Offset Area. This will allow the transferral of a substantial area of privately-owned vegetation to the State-owned reserve system, and allow for the formal protection and management of 68 hectares of vegetation that:

- constitutes a high quality example of a highly-cleared EEC in the Medowie area, as well as high quality mature Coastal Plains Smooth-barked Apple Woodland;
- contains areas of mapped preferred koala habitat, including buffers;
- provides well vegetated riparian protection to the ephemeral creek;
- contains important habitat features (such as target feed trees and hollow-bearing trees) for numerous threatened fauna species; and
- provides contiguous corridor function within the study area, as well as in the broad area, linking existing vegetation to the Medowie State Forest.

Ongoing discussions with Council have confirmed this as a viable option for this proposed development. It is proposed that this issue be discussed further with Council and DECCW, in order to ensure a mutually-beneficial outcome for the offsetting of this proposed development is reached.

7.0 Conclusion

This report provides an assessment of the potential ecological impacts of the proposed rural small holdings residential development of the study area, on threatened species, endangered populations, threatened ecological communities (or their habitats) recorded, or with potential to occur within the study area.

In completing this impact assessment, this report has considered the results of numerous field surveys completed within the study area (by both Orogen and Umwelt), as well as other relevant local surveys or reports. A detailed list of potential significant ecological features was devised from these sources, and the potential for the proposed development to impact on these features was assessed according to the requirements of the *Environmental Planning and Assessment Act 1979* and the *Environment Protection and Biodiversity Conservation Act 1999.*

This assessment identified that the efforts employed to avoid and minimise impact (adopted by Eureka as part of the Concept Plan/Vision) have ensured that the overall ecological impact of the proposed development will be minimal. In an effort to provide additional best-practice ecological outcomes for the project, residual impacts (those unable to be avoided or minimised) will be mitigated/offset by the proposed provision of a formal offset area to Council. This on-site offset area comprises a substantial amount of high quality vegetation, including an EEC which is highly-cleared in the Medowie area. Provision of this as a formal offset area will allow the inclusion of 68 hectares of ecologically significant vegetation into the reserve system. The proposed development provides an economically acceptable development that contributes to the provision of housing to the Medowie area, while ensuring minimal impact on the ecological features of the study area, as well as the larger Medowie township area.

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APPENDIX 1

Flora Species List

Appendix 1 – Flora Species List

This Appendix lists all flora species recorded within the study area during field surveys undertaken by Orogen in June and October 2006 and Umwelt in June 2009. Not all species are readily detected at any one time of the year, therefore the list will not necessarily include all plant species likely to occur in the study area. Many species flower only during restricted periods of the year, and some flower only once in several years. In the absence of flowering material, many of these species cannot be identified, or even detected.

Names of classes and families follow a modified Cronquist (1981) System.

The following abbreviations or symbols are used in the list:

sp. specimens that are identified to genus level only;

asterisk (*) denotes species not indigenous to the study area;

subsp. subspecies; and

var. variety.

All vascular plants recorded or collected were identified using keys and nomenclature in Harden (1992, 1993, 2000 & 2002) and Wheeler et al. (2008). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust 2009), the on-line plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 & 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

Family/Subfamily	Scientific Name	Common Name	Umwelt	Orogen
Cycadopsida (Cycads)				
Zamiaceae	*Macrozamia flexuosa*		x	x
Filicopsida (Ferns)				
Adiantaceae	*Adiantum aethiopicum*	common maidenhair	x	x
	Cheilanthes sieberi	poison rock fern		x
Dennstaedtiaceae	*Hypolepis muelleri*	harsh ground fern		x
	Pteridium esculentum	bracken	x	x
Dicksoniaceae	*Calochlaena dubia*	common ground fern		x
Lindsaeaceae	*Lindsaea linearis*	screw fern		x
	Lindsaea microphylla	lacy wedge fern	x	x
Magnoliopsida (Flowering Plants) – Liliidae (Monocots)				
Anthericaceae	*Arthropodium milleflorum*	vanilla lily		x
	Tricoryne elatior	yellow autumn-lily		x
Arecaceae	*Livistona australis*	cabbage palm	x	x
Colchicaceae	*Burchardia umbellata*	milkmaids	x	
	Wurmbea biglandulosa			x

Family/Subfamily	Scientific Name	Common Name	Umwelt	Orogen
Cyperaceae	*Baumea articulata*	jointed twig-rush		x
	Baumea juncea		x	x
	Carex appressa	tall sedge	x	
	**Cyperus eragrostis*	umbrella sedge	x	
	Cyperus sp.			x
	Fimbristylis dichotoma	common fringe-sedge	x	x
	Fimbristylis sp.			x
	Gahnia clarkei	tall saw-sedge	x	x
	Gahnia sieberiana		x	
	Gahnia sp.		x	
	Isolepis inundata			x
	Lepidosperma filiforme			x
	Lepidosperma laterale		x	x
	Ptilothrix deusta		x	x
Iridaceae	*Patersonia sericea*	silky purple-flag		x
Juncaceae	**Juncus cognatus*			x
	Juncus sp.		x	x
	Juncus usitatus			x
Juncaginaceae	*Triglochin procerum*	water ribbons	x	
	Triglochin sp.		x	
Lomandraceae	*Lomandra confertifolia* subsp. *rubiginosa*		x	
	Lomandra cylindrica			x
	Lomandra filiformis		x	
	Lomandra filiformis subsp. *filiformis*			x
	Lomandra glauca	pale mat-rush		x
	Lomandra longifolia	spiny-headed mat-rush	x	
	Lomandra longifolia var. *longifolia*			x
	Lomandra multiflora subsp. *multiflora*	many-flowered mat-rush	x	x
	Lomandra obliqua	fishbones	x	x
Luzuriagaceae	*Eustrephus latifolius*	wombat berry	x	
Orchidaceae	*Acianthus fornicatus*	pixie caps	x	x
	Arthrochilus prolixus		x	
	Calochilus robertsonii	purplish beard orchid		x
	Calochilus sp.			x
	Cryptostylis sp.		x	
	Cryptostylis subulata	large tongue orchid	x	
	Pterostylis acuminata	pointed greenhood	x	
	Pterostylis longifolia	tall greenhood	x	
	Pterostylis nutans	nodding greenhood		x
	Pterostylis reflexa			
	Pterostylis sp.		x	x
	Thelymitra pauciflora	slender sun orchid		x

Family/Subfamily	Scientific Name	Common Name	Umwelt	Orogen
Philydraceae	*Philydrum lanuginosum*	frogsmouth		x
Phormiaceae	*Dianella caerulea* var. *caerulea*	blue flax-lily	x	
	Dianella caerulea var. *producta*	blue flax-lily	x	x
	Dianella longifolia	blue flax-lily		x
	Dianella revoluta	blue flax-lily		x
	Thelionema caespitosum			x
Poaceae	**Andropogon virginicus*	whisky grass	x	x
	Anisopogon avenaceus	oat speargrass		x
	Aristida vagans	threeawn speargrass		x
	Austrodanthonia sp.		x	
	Austrodanthonia tenuior			x
	**Avena* spp.			x
	Bothriochloa macra	red grass	x	
	**Briza minor*	shivery grass		x
	Cortaderia sp.			x
	Cynodon dactylon	common couch	x	x
	Dichelachne sp.			x
	Digitaria diffusa	open summer grass	x	
	Digitaria sp.			x
	Echinopogon caespitosus	bushy hedgehog-grass		x
	Entolasia marginata	bordered panic		x
	Entolasia stricta	wiry panic	x	x
	Eragrostis brownii	Brown's lovegrass		x
	Eragrostis sp.		x	
	Imperata cylindrica var. *major*	blady grass	x	x
	Microlaena stipoides var. *stipoides*	weeping grass	x	x
	Oplismenus aemulus	basket grass	x	x
	Panicum simile	two-colour panic	x	x
	**Paspalum dilatatum*	paspalum	x	
	Phragmites australis	common reed		x
	**Setaria gracilis*	slender pigeon grass		x
	Setaria sp.			x
	Themeda australis	kangaroo grass	x	x
Xanthorrhoeaceae	*Xanthorrhoea latifolia* subsp. *latifolia*			x
	Xanthorrhoea sp.		x	
Magnoliopsida (flowering plants) – Magnoliidae (dicots)				
Acanthaceae	*Brunoniella australis*	blue trumpet	x	
	Brunoniella pumilio	dwarf blue trumpet		x
	Pseuderanthemum variabile	pastel flower	x	
Apiaceae	*Centella asiatica*	pennywort	x	x
	Hydrocotyle laxiflora	stinking pennywort	x	
	Hydrocotyle peduncularis			x
	Hydrocotyle tripartita	pennywort	x	

Family/Subfamily	Scientific Name	Common Name	Umwelt	Orogen
	Trachymene incisa		x	
	Xanthosia tridentata			x
Apocynaceae	*Parsonsia straminea*	common silkpod	x	x
Asteraceae	**Ageratina adenophora*	crofton weed		x
	Cassinia sp.			x
	**Conyza bonariensis*	flaxleaf fleabane		x
	**Conyza* sp.			x
	Cotula australis	common cotula	x	
	Epaltes australis	spreading nut-heads	x	
	Euchiton gymnocephalus	creeping cudweed		x
	**Hypochaeris radicata*	catsear		x
	Lagenifera stipitata	blue bottle-daisy	x	x
	**Onopordum* sp.			x
	Ozothamnus diosmifolius	white dogwood	x	x
	**Senecio madagascariensis*	fireweed	x	x
	Senecio sp.			x
	**Taraxacum officinale*	dandelion	x	
	Vernonia cinerea		x	x
Casuarinaceae	*Allocasuarina littoralis*	black sheoak	x	x
	Allocasuarina torulosa	forest oak	x	
Clusiaceae	*Hypericum gramineum*	small St John's wort	x	x
Convolvulaceae	*Dichondra repens*	kidney weed	x	x
	Polymeria calycina		x	x
Dilleniaceae	*Hibbertia aspera* subsp. *aspera*	rough Guinea flower	x	x
	Hibbertia vestita		x	x
Droseraceae	*Drosera peltata*	sundew	x	
Elaeocarpaceae	*Elaeocarpus reticulatus*	blueberry ash	x	x
Epacridaceae	*Epacris pulchella*		x	x
	Leucopogon juniperinus	prickly beard-heath	x	x
Euphorbiaceae	*Glochidion ferdinandi*	cheese tree	x	x
	Phyllanthus hirtellus		x	x
Fabaceae (Faboideae)	*Bossiaea obcordata*	spiny bossiaea		x
	Bossiaea rhombifolia subsp. *rhombifolia*			x
	Daviesia ulicifolia	gorse bitter pea	x	x
	Desmodium rhytidophyllum			x
	Dillwynia retorta			x
	Glycine clandestina		x	x
	Glycine microphylla		x	
	Glycine tabacina		x	x
	Glycine tomentella	woolly glycine	x	
	Gompholobium latifolium	golden glory pea		x
	Gompholobium pinnatum	pinnate wedge pea		x
	Hardenbergia violacea	false sarsaparilla	x	x
	Kennedia rubicunda	red kennedy pea	x	x
	Mirbelia rubiifolia			x

Family/Subfamily	Scientific Name	Common Name	Umwelt	Orogen
	Pultenaea daphnoides			x
	Pultenaea echinula			x
	Pultenaea euchila		x	
	Pultenaea flexilis			x
	Pultenaea myrtoides			x
	Pultenaea retusa		x	
	Pultenaea rosmarinifolia		x	
	Pultenaea villosa		x	x
Fabaceae (Mimosoideae)	*Acacia longifolia* subsp. *longifolia*	Sydney golden wattle	x	x
	Acacia myrtifolia	red-stemmed wattle	x	
	Acacia terminalis	sunshine wattle	x	
	Acacia ulicifolia	prickly Moses	x	x
Goodeniaceae	*Goodenia heterophylla* subsp. *eglandulosa*		x	x
	Goodenia paniculata	branched goodenia	x	
	Goodenia sp.		x	x
Haloragaceae	*Gonocarpus teucrioides*	raspwort	x	x
Lamiaceae	*Plectranthus parviflorus*			x
Lauraceae	*Cassytha glabella*	devils twine	x	
	Cassytha pubescens	devils twine	x	x
	**Cinnamomum camphora*	camphor laurel	x	x
Lobeliaceae	*Pratia purpurascens*	whiteroot	x	x
Loganiaceae	*Logania pusilla*			x
Loranthaceae	*Amyema* sp.			x
Malaceae	**Rhaphiolepis indica*	Indian hawthorn	x	
	**Malva* sp.		x	
Myrtaceae	*Angophora costata*	smooth-barked apple	x	x
	Angophora floribunda	rough-barked apple		x
	Callistemon linearis	narrow-leaved bottlebrush	x	x
	Callistemon paludosus			x
	Callistemon salignus	willow bottlebrush		x
	Corymbia gummifera	red bloodwood	x	x
	Eucalyptus capitellata	brown stringybark	x	x
	Eucalyptus globoidea	white stringybark	x	x
	Eucalyptus piperita	sydney peppermint	x	x
	Eucalyptus resinifera	red mahogany	x	x
	Eucalyptus robusta	swamp mahogany		x
	Eucalyptus robusta X *tereticornis*			x
	Eucalyptus sp.		x	
	Eucalyptus tereticornis	forest red gum	x	x
	Eucalyptus umbra			x
	Kunzea sp.		x	
	Leptospermum juniperinum	prickly tea-tree	x	
	Leptospermum polygalifolium subsp. *cismontanum*		x	x

Family/Subfamily	Scientific Name	Common Name	Umwelt	Orogen
	Melaleuca linariifolia	snow-in-summer	x	x
	Melaleuca nodosa	prickly-leaved tea-tree	x	x
	Melaleuca quinquenervia	broad-leaved paperbark		x
	Melaleuca sieberi	Sieber's paperbark	x	x
	Melaleuca thymifolia	thyme-leave paperbark		x
Nymphaeaceae	**Nymphaea caerulea* subsp. *zanzibarensis*	cape waterlily		x
Oxalidaceae	*Oxalis perennans*			x
	Oxalis sp.			x
Pittosporaceae	*Billardiera scandens*	appleberry	x	x
	Bursaria spinosa	native blackthorn	x	x
Polygonaceae	*Persicaria* sp.		x	
Primulaceae	**Anagallis arvensis*	scarlet/blue pimpernel		x
Proteaceae	*Banksia oblongifolia*		x	
	Banksia spinulosa var. *collina*	hairpin banksia	x	x
	Hakea dactyloides	broad-leaved hakea		x
	Lomatia silaifolia	crinkle bush	x	x
	Persoonia linearis	narrow-leaved geebung	x	
Rosaceae	**Rubus fruiticosus*	blackberry complex	x	
	Rubus parvifolius	native raspberry		x
Rubiaceae	*Opercularia varia*	variable stinkweed		x
	**Richardia stellaris*		x	
Rutaceae	*Boronia parviflora*	swamp boronia	x	
	Boronia sp.			x
	Zieria laxiflora			x
Santalaceae	*Exocarpos cupressiformis*	native cherry		x
Sapindaceae	*Dodonaea triquetra*	large-leaf hop-bush	x	x
Scrophulariaceae	*Veronica plebeia*	trailing speedwell		x
Solanaceae	**Solanum mauritianum*	wild tobacco bush	x	
Stylidiaceae	*Stylidium graminifolium*	grass triggerplant		x
Thymelaeaceae	*Pimelea linifolia*		x	x
Tremandraceae	*Tetratheca ericifolia*		x	
	Tetratheca thymifolia	black-eyed susan		x
Verbenaceae	**Lantana camara*	lantana		x
Violaceae	*Hybanthus monopetalus*	slender violet-bush	x	x
	Viola hederacea			x

APPENDIX 2

Fauna Species List

Appendix 2 – Fauna Species List

The following list was developed from surveys of the study area detailed in **Section 3.2** of the main report. It includes all species of vertebrate fauna recorded in the study area during fieldwork completed by Umwelt in 2009 and Orogen in 2006.

The following abbreviations or symbols are used to identify the method of detection in the appendix table:

sp. specimens that are identified to genus level only;

MAR Listed marine species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);

MIG Listed migratory species under the EPBC Act;

V Vulnerable under the *Threatened Species Conservation Act 1995* (TSC Act), or the EPBC Act;

E Endangered under the TSC Act or EPBC Act; and

PD Preliminary Determination to be listed as Vulnerable under the TSC Act.

Birds recorded were identified using descriptions in Slater et al. (2003) and the scientific and common name nomenclature broadly follows Christidis and Boles (2008). Reptiles recorded were identified using keys and descriptions in Cogger (2000), Swan et al. (2004), Weigel (1990) and Wilson & Swan (2008) and the scientific and common name nomenclature of Cogger (2000). Amphibians recorded were identified using keys and descriptions in Cogger (2000), Robinson (1998), Anstis (2002) and Barker et al. (1995) and the scientific and common name nomenclature of Cogger (2000). Mammals recorded were identified using keys and descriptions in Strahan (2002), Churchill (1998) and Menkhorst & Knight (2004) and the scientific and common name nomenclature of Strahan (2002) for non bat species. Bat species recorded were identified using keys and descriptions in Churchill (1998) and ecological information was obtained from Churchill (2008).

Scientific Name	Common Name	Conservation Status		Record Source	
		TSC Act	EPBC Act	Umwelt 2009	Orogen 2006
Amphibians					
Myobatrachidae					
Crinia parinsignifera	brown froglet			x	
Crinia signifera	common eastern froglet			x	x
Limnodynastes peronii	striped marsh frog				x
Pseudophryne coriacea	red-backed toadlet				x
Uperoleia laevigata	smooth toadlet			x	
Hylidae					
Litoria fallax	green reed frog, dwarf tree frog				x
Litoria latopalmata	broad-palmed frog			x	x

Scientific Name	Common Name	Conservation Status		Record Source	
		TSC Act	EPBC Act	Umwelt 2009	Orogen 2006
Litoria peronii	Peron's tree frog			x	x
Litoria verreauxii	Verreaux's tree frog			x	
Reptiles					
Varanidae					
Varanus varius	lace monitor				x
Agamidae					
Amphibolurus muricatus	jacky lizard				x
Scincidae					
Lampropholis delicata	grass skink				x
Elapidae					
Cryptophis nigrescens	small-eyed snake				x
Birds					
Anatidae					
Chenonetta jubata	Australian wood duck		MIG	x	x
Anas superciliosa	Pacific black duck		MIG		x
Podicipedidae					
Tachybaptus novaehollandiae	Australasian grebe				x
Columbidae					
Phaps chalcoptera	common bronzewing				x
Ocyphaps lophotes	crested pigeon			x	x
Geopelia humeralis	bar-shouldered dove				x
Aegothelidae					
Aegotheles cristatus	Australian owlet-nightjar				x
Pelecanidae					
Pelecanus conspicillatus	Australian pelican		MAR	x	x
Ardeidae					
Ardea ibis	cattle egret		MAR		x
Egretta novaehollandiae	white-faced heron			x	x
Threskiornithidae					
Threskiornis spinicollis	straw-necked ibis		MAR	x	
Accipitridae					
Haliastur sphenurus	whistling kite		MAR & MIG		x
Charadriidae					
Vanellus miles	masked lapwing		MIG	x	x
Cacatuidae					
Calyptorhynchus lathami	glossy black-cockatoo	V			x
Calyptorhynchus funereus	yellow-tailed black-cockatoo			x	x
Cacatua roseicapillus	galah			x	x

Scientific Name	Common Name	Conservation Status		Record Source	
		TSC Act	EPBC Act	Umwelt 2009	Orogen 2006
Psittacidae					
Trichoglossus haematodus	rainbow lorikeet			x	x
Trichoglossus chlorolepidotus	scaly-breasted lorikeet				x
Glossopsitta concinna	musk lorikeet			x	
Platycercus eximius	eastern rosella			x	x
Cuculidae					
Centropus phasianinus	pheasant coucal				x
Eudynamis orientalis	eastern koel				x
Scythrops novaehollandiae	channel-billed cuckoo		MAR		x
Cacomantis flabelliformis	fan-tailed cuckoo		MAR	x	x
Tytonidae					
Tyto novaehollandiae	masked owl	V			x
Halcyonidae					
Dacelo novaeguineae	laughing kookaburra			x	
Todiramphus sanctus	sacred kingfisher		MAR		x
Climacteridae					
Corombates leucophaea	white-throated treecreeper			x	x
Maluridae					
Malurus cyaneus	superb fairy-wren			x	x
Malurus lamberti	variegated fairy-wren				x
Acanthizidae					
Acanthiza nana	yellow thornbill			x	x
Acanthiza reguloides	buff-rumped thornbill			x	x
Acanthiza pusilla	brown thornbill			x	x
Pardalotidae					
Pardalotus striatus	striated pardalote			x	x
Meliphagidae					
Acanthorhynchus tenuirostris	eastern spinebill			x	x
Lichenostomus chrysops	yellow-faced honeyeater			x	x
Manorina melanocephala	noisy miner			x	x
Anthochaera carunculata	red wattlebird			x	x
Myzomela sanguinolenta	scarlet honeyeater			x	x
Lichmera indistincta	brown honeyeater				x
Melithreptus brevirostris	brown-headed honeyeater				x
Melithreptus lunatus	white-naped honeyeater			x	
Philemon corniculatus	noisy friarbird			x	x
Neosittidae					
Daphoenositta chrysoptera	varied sittella	V (PD)		x	x

Scientific Name	Common Name	Conservation Status		Record Source	
		TSC Act	EPBC Act	Umwelt 2009	Orogen 2006
Campephagidae					
Coracina novaehollandiae	black-faced cuckoo-shrike		MAR	x	x
Lalage sueurii	white-winged triller				x
Pachycephalidae					
Pachycephala pectoralis	golden whistler			x	x
Pachycephala rufiventris	rufous whistler				x
Colluricincla harmonica	grey shrike-thrush			x	x
Oriolidae					
Oriolus sagittatus	olive-backed oriole				x
Artamidae					
Cracticus torquatus	grey butcherbird			x	x
Gymnorhina tibicen	Australian magpie			x	x
Strepera graculina	pied currawong			x	x
Rhipiduridae					
Rhipidura albiscapa	grey fantail			x	x
Corvidae					
Corvus coronoides	Australian raven			x	x
Corvus orru	Torresian crow				x
Monarchidae					
Myiagra rubecula	leaden flycatcher				x
Grallina cyanoleuca	magpie-lark		MAR	x	x
Petroicidae					
Microeca leucophaea	jacky winter				x
Petroica rosea	rose robin			x	
Eopsaltria australis	eastern yellow robin			x	
Timaliidae					
Zosterops lateralis	silvereye		MAR	x	
Hirundinidae					
Hirundo neoxena	welcome swallow		MAR		x
Nectariniidae					
Dicaeum hirundinaceum	mistletoebird				x
Estrildidae					
Neochmia temporalis	red-browed finch			x	x
Mammals					
Dasyuridae					
Antechinus stuartii	brown antechinus				x
Phascolarctidae					
Phascolarctos cinereus	koala	V			x
Petauridae					
Petaurus norfolcensis	squirrel glider	V		x	

Scientific Name	Common Name	Conservation Status		Record Source	
		TSC Act	EPBC Act	Umwelt 2009	Orogen 2006
Pseudocheiridae					
Pseudocheirus peregrinus	common ringtail possum				x
Phalangeridae					
Trichosurus vulpecula	common brushtail possum			x	x
Macropodidae					
Macropus giganteus	eastern grey kangaroo			x	x
Macropus rufogriseus	red-necked wallaby				x
Pteropodidae					
Pteropus poliocephalus	grey-headed flying-fox	V	V	x	x
Emballonuridae					
Saccolaimus flaviventris	yellow-bellied sheathtail-bat	V			x
Molossidae					
Mormopterus norfolkensis	eastern freetail-bat	V			x
Nyctinomus australis	white-striped freetail-bat				x
Vespertilionidae					
Miniopterus australis	little bentwing-bat	V		x	x
Miniopterus schreibersii oceanensis	eastern bentwing-bat	V		x	
Nyctophilus sp.	unidentified long-eared bat			x	
Chalinolobus dwyeri	large-eared pied bat	V	V		x
Chalinolobus gouldii	Gould's wattled bat				x
Chalinolobus morio	chocolate wattled bat				x
Scoteanax rueppellii	greater broad-nosed bat	V			x
Scotorepens orion	eastern broad-nosed bat				x
Vespadelus vulturnus	little forest bat				x
Muridae					
Rattus fuscipes	bush rat				x
Rattus lutreolus	swamp rat				x

APPENDIX 3

Threatened Species Tables

Appendix 3 – Assessment of Significance under the EP&A Act for the Proposed Rezoning and Concept Plan

Threatened species, endangered populations and endangered ecological communities (EECs) identified, or with the potential to occur, within the study area are listed in **Tables 1** and **2** below. These tables include the results of the searches of the DECCW Atlas of NSW Wildlife Database and DEWHA Protected Matters Database for a 10 kilometre radius of the study area. Marine, estuarine and pelagic species have been excluded from these tables, due to a lack of specific habitat within the study area.

Tables 1 and **2** contain the relevant ecological details of each listing (including their habitat requirements, known range and reservation within conservation reserves within the region), as well as an assessment as to whether there may be an impact on any recorded or potentially occurring threatened species, population or EECs as a result of the project. The potential impacts of the project are described in **Section 4** of the main report. For the purposes of these tables, the 'region' is broadly defined as 30 kilometres surrounding the study area.

An Assessment of Significance is provided in **Appendix 4** for those identified threatened species, endangered populations or EECs considered (within **Tables 1** and **2**) to have the potential to be impacted by the project.

An Assessment of Significance for species listed under the Commonwealth EPBC Act which have potential to be impacted by the proposed project is provided in **Appendix 5**.

Information on threatened species was sourced from the DECCW website (http://www.threatenedspecies.environment.nsw.gov.au) containing Threatened Species Profiles (DECCW 2009). Additional references are cited where required.

Table 1 - Threatened Flora Assessment

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
THREATENED SPECIES						
netted bottle brush *Callistemon linearifolius*	V (TSC)	The species typically grows in dry sclerophyll forest on the coast and adjacent ranges.	The distribution of this species is primarily known from the areas of the Georges River and the Hawkesbury River near Sydney, extending to Nelson Bay in the north (although individuals have been recorded in the past from as far north as Woolgoolga), and to the west at Cessnock in the Hunter Valley. The study area occurs within the known range of this species.	Tomaree NP Worimi NR Medowie SF	The species has not been recorded in the study area; however, it could occur there. The species is not likely to be sensitive to the proposed development.	No
leafless tongue orchid *Cryptostylis hunteriana*	V (TSC)	This species appears to favour moist soils on the flat coastal plains. Occupies swamp heath, but also in sclerophyll forest and woodland, often on sandy soils. Typically found in communities containing *Eucalyptus haemastoma, E. capitellata* and *Corymbia gummifera*.	This species is known to occur in the Karuah Manning and Wyong CMA sub-regions in the Hunter-Central Rivers CMA region. The study area occurs within the known range of this species.	Tomaree NP	The species has not been recorded in the study area; however, it could occur there. The species is not likely to be sensitive to the proposed development.	No
sand doubletail *Diuris arenaria*	E (TSC)	This species occurs in coastal heath and dry grassy eucalypt forest on sandy flats. Grows in gently undulating country in eucalypt forest with a grassy understorey on clay soil.	This species is known to occur in the Karuah Manning sub-region of the Hunter-Central Rivers CMA region. The study area occurs within the known range of this species.	Tomaree NP	The species has not been recorded in the study area; however, it could occur there. The species is not likely to be sensitive to the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
THREATENED SPECIES						
Charmhaven apple *Angophora inopina*	V (EPBC) V (TSC)	This species typically occurs on the shallow sandy soils of the Narrabeen Group, on exposed ridges and slopes with westerly or northerly aspect. It has also been recorded on shallow alluvial soils of this geological type, in upper catchments and in embedded clay soil lenses with sandstone. This species is known to naturally hybridise with rough-barked apple (*A. floribunda*), particularly around major drainage lines.	Distribution confined to the Wyong, Lake Macquarie and Port Stephens LGAs of NSW. Pure forms of this species have been recorded from the Wallarah catchment in the south and north to the Toronto area. Disjunct populations have been identified at Karuah. The study area occurs within the known range of this species.	Medowie SCA Wallaroo NP	The species has not been recorded in the study area; however, it could occur there. The species is not likely to be sensitive to the proposed development.	No
Parramatta red gum *Eucalyptus parramattensis* subsp. *decadens*	V (TSC)	Generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant.	There are two separate meta-populations of *E. parramattensis* subsp. *decadens*. The Kurri Kurri meta-population is bordered by Cessnock - Kurri Kurri in the north and Mulbring - Abedare in the south. Large aggregations of the sub-species are located in the Tomalpin area. The Tomago Sandbeds meta-population is bounded by Salt Ash and Tanilba Bay in the north and Williamtown and Tomago in the south.	Tilligery SCA Medowie SF Scnapper Island NR Joe Redman Reserve	The species has not been recorded in the study area; however, it could occur there. The species is not likely to be sensitive to the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
THREATENED SPECIES						
small-flower grevillea *Grevillea parviflora* subsp. *parviflora*	V (TSC)	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest and a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Often occurs in open, slightly disturbed sites such as along tracks.	Sporadically distributed throughout the Sydney Basin with the main occurrence centred around Picton, Appin and Bargo (and possibly further south to the Moss Vale area). Separate populations are also known further north from Putty to Wyong and Lake Macquarie on the Central Coast, and Cessnock and Kurri Kurri in the Lower Hunter. The study area occurs within the known range of this species.	Wallaroo SF	The species has not been recorded in the study area; however, it could occur there. The species is not likely to be sensitive to the proposed development.	No
biconvex paperbark *Melaleuca biconvexa*	V (TSC)	Biconvex paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Scattered and dispersed populations of this species are known to occur in the Karuah Manning and Wyong sub-regions of the Hunter-Central Rivers CMA region. The study area occurs within the known range of this species.	Tilligery SCA	The species has not been recorded in the study area; however, it could occur there. The species is not likely to be sensitive to the proposed development.	No
dwarf kerrawang *Rulingia prostrata*	E (TSC)	Occurs on sandy, sometimes peaty soils in a wide variety of habitats.	This species is known to occur in the Karuah Manning sub-region of the Hunter-Central Rivers CMA region. The study area occurs within the known range of this species.	Tilligery SCA Medowie SF	The species has not been recorded in the study area; however, it could occur there. The species is not likely to be sensitive to the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
THREATENED SPECIES						
black-eyed Susan *Tetratheca juncea*	V (TSC) V (EPBC)	Usually found in low open forest or woodland with a shrub understorey and grass groundcover on low nutrient soils, however it and has also been found in heathland and moist forest. This species generally prefers well-drained sites and ridges, although it also found on upper and mid-slopes and occasionally in gullies. There appears to be a preference for southerly aspects, although the species will occur on slopes with a variety of aspects.	This species is confined to the Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock LGAs. The study area occurs within the known range of this species.	Glenrock SCA Wallaroo NP Wallaroo SF Schnapper Island NR	The species has not been recorded in the study area; however, it could occur there. The species is not likely to be sensitive to the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED ECOLOGICAL COMMUNITIES						
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	This community occurs in the intertidal zone on the shores of estuaries and lagoons. Key dominant species of this community are sea rush (*Juncus kraussii*), *Suaeda australis, Sarcocornia quinqueflora,* sand couch (*Sporobolus virginicus*), prickly couch (*Zoysia macrantha*), saltwater couch (*Paspalum vaginatum*), *Sesuvium portulacestrum.* Species restricted to coastal saltmarshes include *Distichlis distichophylla* (endangered), *Halosarcia pergranulata* subsp. *pergranulata*, *Wilsonia backhousei* (vulnerable) and *Wilsonia rotundifolia* (endangered).	This community occurs in the NSW North Coast, Sydney Basin and South East Corner Bioregions along the NSW coast in intertidal zones. The study area does not occur within the known range of this community.	Hunter Estuary NP	The study area does not provide suitable habitat for this ecological community, and it has not been recorded there. There is no potential for a significant impact on this ecological community.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED ECOLOGICAL COMMUNITIES						
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	Associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes but may also occur in backbarrier landforms where floodplains adjoin coastal sandplains. Generally occur below 20 metres elevation on level areas.	Known from along the majority of the NSW coast. There is less than 150 hectares remaining on the Tweed lowlands (estimate in 1985); about 10,600 hectares on the lower Clarence floodplain (in 1982); about 11,200 hectares on the lower Macleay floodplain (in 1983); about 3,500 hectares in the lower Hunter – Central Hunter region (in 1990s); less than 2,700 hectares on the NSW south coast from Sydney to Moruya (in the mid 1990s), including about 660 hectares on the Cumberland Plain (in 1998) and about 100 hectares on the Illawarra Plain (in 2001); and less than 1000 hectares in the Eden region (in 1990). The study area occurs within the known range of this community.	Hunter Estuary NP	The study area does not contain any examples of this ecological community. There is no potential for a significant impact on this ecological community.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED ECOLOGICAL COMMUNITIES						
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	EEC (TSC)	This EEC occurs on the Permian sediments of the Hunter Valley floor. Much of the remaining community is disturbed and fragmented. The floristic composition and structure of the community is influenced by both the size and disturbance history of the remaining fragments. Consequently at heavily disturbed sites only some of the species which characterise the community may be present.	This EEC occurs from Muswellbrook to the Lower Hunter in the Sydney Basin and North Coast bioregions. It has been recorded from the Maitland, Cessnock, Port Stephens, Muswellbrook and Singleton LGAs, but may occur elsewhere in these bioregions. The study area occurs within the known range of this community.	Werakata NP	A small portion of vegetation within the study displays some characteristics similar to those of this community. Further investigation into this has confirmed that the study area does not contain any examples of this ecological community. **Section 3.1.2** of the Ecological Assessment provides further discussion on this matter. There is no potential for a significant impact on this ecological community.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED ECOLOGICAL COMMUNITIES						
Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	Occurs on sand dunes and on soil derived from underlying rocks. Stands on headlands exposed to strong wind-action may take the form of dense, wind-pruned thickets. Stands are generally taller in sheltered sites such as hind dunes, although wind-pruning may still occur on their windward sides. Most stands occur within two kilometres of the sea, though are occasionally found further inland within reach of the maritime influence.	Littoral Rainforest occurs only on the coast and is found at locations in the NSW North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion. The study area does not occur within the known range of this community.	This EEC is not known to occur in reserves in the region.	The study area does not contain any examples of this ecological community. There is no potential for a significant impact on this ecological community.	No
Lowland Rainforest in NSW North Coast and Sydney Basin Bioregion	EEC (TSC)	May be associated with a range of high-nutrient geological substrates, notably basalts and fine-grained sedimentary rocks, on coastal plains and plateaux, footslopes and foothills. In the north of its range, this EEC is found up to 600 metres above sea level, but in the Sydney Basin bioregion it is limited to elevations below 350 metres. Lowland Rainforest, when optimally developed, has the structural and floristic form of subtropical rainforest, but may be interspersed with stands of dry rainforest as moisture status declines or topographic exposure increases.	The Hawkesbury River notionally marks the southern limit of Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions. The study area occurs within the known range of this community.	This EEC is not known to occur in reserves in the region.	The study area does not contain any examples of this ecological community. There is no potential for a significant impact on this ecological community.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED ECOLOGICAL COMMUNITIES						
Lowland Rainforest on Floodplain in the NSW North Coast Bioregion	EEC (TSC)	This community occurs on fertile soils in lowland river valleys. It is a closed canopy forest with a high species richness.	This community is only known to occur in the NSW North Coast Bioregion. The study area occurs within the known range of this community.	This EEC is not known to occur in reserves in the region.	The study area does not contain any examples of this ecological community. There is no potential for a significant impact on this ecological community.	No
River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Generally occurs below 50 metres elevation, but may occur on localised river flats up to 250 metres above sea level. Given its habitat, the community has an important role in maintaining river ecosystems and riverbank stability.	Known from parts of the LGAs 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, Palerang, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions. The study area occurs within the known range of this community.	This EEC is not known to occur in reserves in the region.	The study area provides suitable habitat for this ecological community, however the floristics of the vegetation are more aligned with those of the swamp sclerophyll forest EEC, and have been mapped accordingly (see **Section 3.1.2** of the Ecological Assessment for further discussion on this issue). The River-flat Eucalypt Forest EEC has not been recorded in the study area. There is no potential for a significant impact on this ecological community.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED ECOLOGICAL COMMUNITIES						
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally occurs below 20 metres (rarely above 10 metres) elevation	Known from parts of the LGAs of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes, Port Stephens, Maitland, Newcastle, Cessnock, Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Hawkesbury, Baulkham Hills, Hornsby, Lane Cove, Blacktown, Auburn, Parramatta, Canada Bay, Rockdale, Kogarah, Sutherland, Penrith, Fairfield, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions. Major examples once occurred on the floodplains of the Clarence, Macleay, Hastings, Manning, Hunter, Hawkesbury, Shoalhaven and Moruya Rivers. The study area occurs within the known range of this community.	Pambalong NR	The study area does not contain any examples of this ecological community. There is no potential for a significant impact on this ecological community.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED ECOLOGICAL COMMUNITIES						
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.	EEC (TSC)	Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Generally occurs below 20 metres (though sometimes up to 50 metres) elevation. The composition of the community is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil, and latitude. 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 grasses, vines and forbs.	This community is known from parts of the LGAs of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, Lake Macquarie, Wyong, Gosford, Hornsby, Pittwater, Warringah, Manly, Liverpool, Rockdale, Botany Bay, Randwick, Sutherland, Wollongong, Shellharbour, Kiama and Shoalhaven but may occur elsewhere in these bioregions. The study area occurs within the known range of this community.	This EEC is not known to occur in reserves in the region.	This ecological community has been recorded within the study area. The project will impact on a very small portion of this community mapped within the study area (being 5.7%) due to 'smoothing' of development boundaries. Comparative amounts of previously-cleared EEC will be allowed to continue to regenerate naturally (see **Figure 1.3**) to compensate for this smoothing. The remainder of the EEC is excluded from development, and will be retained and protected (outside of the proposed residential lots), likely as transferral to public ownership.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED ECOLOGICAL COMMUNITIES						
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	EEC (TSC)	This EEC is associated with clay-loams and sandy-loams on periodically inundated areas of alluvial flats, drainage lines, and river terraces that are associated with coastal floodplains. This EEC generally occurs below 50 metres elevation, but is known to occur up to 250 metres elevation. The structure of these EECs vary between tall open forests and woodlands. Typical canopy species are inclusive of *Angophora paludosa*, *A. woodsiana*, broad-leaved apple (*A. subvelutina*), white mahogany (*Eucalyptus acmenioides*), cabbage gum (*E. amplifolia*), grey box (*E. moluccana*), small-fruited grey-gum (*E. propinqua*), *E. resinifera subsp. hemilampra*, swamp mahogany (*E. robusta*), narrow-leaved red-gum (*E. seeana*), grey ironbark (*E. siderophloia*) and forest red gum (*E. tereticornis*).	This EEC is known from the NSW North Coast Bioregion and has been recorded in the LGAs of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens; but is believed to occur elsewhere in the bioregion.	This EEC is not known to occur in reserves in the region.	The study area does not contain any examples of this ecological community. There is no potential for a significant impact on this ecological community.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
ENDANGERED ECOLOGICAL COMMUNITIES						
Themeda Grassland on Seacliffs and Coastal Headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	The community is found on a range of substrates, although stands on sandstone are infrequent and small. Larger stands are found on old sand dunes above cliffs and basalt headlands.	The community is found in the NSW North Coast, Sydney Basin and South East Corner Bioregions, on seacliffs and coastal headlands. The study area does not occur within the known range of this community.	This EEC is not known to occur in reserves in the region.	The study area does not provide suitable habitat for this ecological community, and it has not been recorded there. There is no potential for a significant impact on this ecological community.	No

Notes

E:	endangered
EEC:	endangered ecological community
EPBC:	*Environment Protection and Biodiversity Conservation Act* 1999
LGA:	local government area
NP:	national park
NR:	nature reserve
SCA:	state conservation area
SF:	state forest
TSC:	*Threatened Species Conservation Act* 1995
V:	vulnerable

Table 2 - Threatened Fauna Assessment

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
AMPHIBIANS						
wallum froglet *Crinia tinnula*	V (TSC)	Wallum froglets are found only in acid paperbark swamps and sedge swamps of the coastal 'wallum' country.	This species is known to occur in the Hunter, Karuah Manning, Wyong and Macleay Hastings sub-regions of the Hunter/Central Rivers Catchment. The study area occurs within the known range of this species.	Tomaree NP Tilligery NR Tilligery SCA Joe Redman Reserve Moffats Swamp NR	The study area does not provide suitable habitat for this species and it has not been recorded there. There is no potential for a significant impact on this species.	No
green and golden bell frog *Litoria aurea*	E (TSC) V (EPBC)	Occurs amongst emergent aquatic or riparian vegetation and amongst vegetation, fallen timber, including grassland, cropland and modified pastures. Breeds in still or slow flowing waterbodies with some vegetation such as *Typha* spp. and *Eleocharis* spp.	NSW North Coast near Brunswick Heads, southwards along the NSW Coast to Victoria where it extends into east Gippsland. The study area occurs within the known range of this species.	Hunter Estuary NP	The study area does provide habitat for this species, however it has not been recorded there. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
BIRDS						
blue-billed duck *Oxyura australis*	V (TSC)	This species prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover.	Widespread in NSW, but most common in the southern Murray-Darling Basin area. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	The species has not been recorded in the study area; however, it could occur there. The aquatic habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
freckled duck *Stictonetta naevosa*	V (TSC)	This species prefers 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. This species generally rests in dense cover during the day, usually in deep water. Nesting usually occurs between October and December but can take place at other times when conditions are favourable. The nests are usually located in dense vegetation at or near water level.	The freckled duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. This species may also occur as far as coastal NSW and Victoria during such times. The study area occurs within the known range of this species.	Hunter Estuary NR	The species has not been recorded in the study area; however, it could occur there. The aquatic habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
Australasian bittern *Botaurus poiciloptilus*	V (TSC)	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleoacharis* spp.).	This species may be found over most of the state except for the far north-west. The study area occurs within the known range of this species.	Hunter Estuary NP	The species has not been recorded in the study area; however, it could occur there. The aquatic habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
black bittern *Ixobrychus flavicollis*	V (TSC)	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	Records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. The study area occurs within the known range of this species.	Hunter Estuary NP Moffats Swamp NR	The species has not been recorded in the study area; however, it could occur there. The aquatic habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
black-necked stork *Ephippiorhynchus asiaticus*	E (TSC)	Inhabits permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries.	This species is widespread across coastal northern and eastern Australia, becoming uncommon further south into NSW, and rarely found south of Sydney. The study area occurs within the known range of this species.	Hunter Estuary NP Pambalong NR Worimi NR Tilligery SCA	The species has not been recorded in the study area; however, it could occur there. The aquatic habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
eastern osprey *Pandion cristatus*	V (TSC)	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes.	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. The study area occurs within the known range of this species.	Tomaree NP Hunter Estuary NP Worimi NR	The species has not been recorded in the study area; however, it could occur there. The habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
spotted harrier *Circus assimilis*	PD V (TSC)	Their habitat of choice is open grassy woodland, grassland, inland riparian woodland and shrub steppe. Although mostly associated with native grasslands it has also been identified in agricultural farmland. Their nest is made in a tree and composed of sticks. Individuals of this species are sparsely distributed throughout Australia and occur as a single population.	The spotted harrier can be found throughout mainland Australia except for areas of dense forest on the coast, escarpments and ranges and rarely ever in Tasmania. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	The species has not been recorded in the study area; however, it could occur there. The habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
little eagle *Hieraaetus morphnoides*	PD V (TSC)	This species is typically identified in open eucalypt forests, woodlands and open woodlands, and other areas where prey are plentiful. The nest in tall living trees within remnant patches. This species occurs as a single population within Australia.	The little eagle is distributed throughout mainland Australia except for the most densely forested parts of the Great Dividing Range escarpment. The study area occurs within the known range of this species.	Hunter Estuary NP	The species has not been recorded in the study area; however, it could occur there. The habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
bush stone-curlew *Burhinus grallarius*	E (TSC)	This species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. The bush stone curlew is largely nocturnal, being especially active on moonlit nights. It nests on the ground in a scrape or small bare patch laying two eggs in spring and early summer.	The bush stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however, and in the south-east it is either rare or extinct throughout its former range. The study area occurs within the known range of this species.	Hunter Estuary NP Wallaroo NP Tilligery NR	The species has not been recorded in the study area; however, it could occur there. The habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
glossy black-cockatoo *Calyptorhynchus lathami*	V (TSC)	Habitat for this species includes forests on low-nutrient soils, specifically those containing key *Allocasuarina* feed species. They will also eat seeds from eucalypts, angophoras, acacias, cypress pine and hakeas, as well as eating insect larvae. Breeding occurs in autumn and winter, with large hollows required.	The glossy black-cockatoo has a sparse distribution along the east coast and adjacent inland areas from western Victoria to Rockhampton in Queensland. In NSW, it has been recorded as far inland as Cobar and Griffith. The study area occurs within the known range of this species.	Medowie SCA Tomaree NP Moffats Swamp NR Worimi NR Wallaroo NP	This species has been recorded from the study area. It is likely that the study area contains foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.
little lorikeet *Glossopsitta pusilla*	V (TSC)	This species can be found in dry-open eucalypt forests and woodlands, and have been identified in remnant vegetation, old growth vegetation, logged forests, and roadside vegetation. The little lorikeet usually forages in small flocks, not always with birds of their own species. They nest in hollows, mostly in living smooth-barked apples.	This species is distributed from just north of Cairns, around the east coast of Australia down to Adelaide. In NSW this species is found from the coast to the western slopes of the Great Dividing Range, extending as far west as Albury, Dubbo, Parkes and Narrabri. The study area occurs within the known range of this species.	Glenrock SCA Joe Redman Reserve Wallaroo NP Worimi NR Wallaroo SF	This species has not been recorded in the study area; however, it could occur there. The habitats of the study area would provide foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
swift parrot *Lathamus discolor*	E (TSC) E (EPBC) MAR (EPBC)	This species often visits box-ironbark forests, feeding on nectar and lerps. In NSW, typical tree species in which it forages include mugga ironbark, grey box, swamp mahogany, spotted gum, red bloodwood, narrow-leaved red ironbark, forest red gum and yellow box. This bird is a migratory species that breeds in Tasmania during the spring and summer, and migrates to the mainland during the cooler months of the year.	In NSW this species has been recorded from the western slopes region along the inland slopes of the Great Dividing Range, as well as forests along the coastal plains from southern to northern NSW. The study area occurs within the known range of this species.	Tomaree NP Worimi NR	This species has not been recorded in the study area; however, it could utilise its foraging resources as part of winter migrations. The project will impact on a very small portion of specific habitat for this species (being 5.7% of the EEC) The remainder of the EEC is excluded from development, and will be retained and protected in a manner to be confirmed. Despite being only a small amount, the proposed development has the potential to impact on foraging habitat for this species. The degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4 and 5**.
turquoise parrot *Neophema pulchella*	V (TSC)	This species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. It nests in tree hollows, logs or posts, from August to December.	The turquoise parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. The study area occurs within the known range of this species.	Glenrock SRA Wallaroo NP	This species has not been recorded in the study area however, it could occur there. The habitats of the study area (albeit not typical for this species) would provide foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
grass owl *Tyto capensis*	V (TSC)	Found in areas of tall grass, including grass tussocks in swampy areas, grassy plains, swampy heath, and cane grass, or sedges on flood plains.	The grass owl has been recorded in all mainland states of Australia, although it is most common in north and north east Australia. In NSW this species is most likely to be found in the north-east of the state in coastal areas from the Queensland-NSW border through to Sydney; and with several outlying records from inland areas, some as far west as Broken Hill. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	This species has not been recorded from the study area, although it could occur within the open, grassy habitats of the study area. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
masked owl *Tyto novaehollandiae*	V (TSC)	This species is generally recorded from open forest habitat with sparse mid-storey but patches of dense, low ground cover. It is also recorded from ecotones between wet and dry eucalypt forest, along minor drainage lines and near boundaries between forest and cleared land.	The masked owl occurs sparsely throughout the continent and nearby islands, including Tasmania and New Guinea. The study area occurs within the known range of this species.	Medowie SCA Tomaree NP Tilligery NR Medowie SF Worimi RP	This species has been recorded from the study area. The study area provides foraging and breeding habitat for this species, and it is probable that the species has bred in an identified nest tree in recent years. It is likely that this tree provides ongoing nesting habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.
powerful owl *Ninox strenua*	V (TSC)	The powerful owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. It generally 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.	The powerful owl occurs in eastern Australia, mostly on the coastal side of the Great Dividing Range, from south western Victoria to Bowen in Queensland. The study area occurs within the known range of this species.	Medowie SCA Moffats Swamp NR Tomaree NP Tilligery NR Worimi NP Worimi RP	This species has not been recorded from the study area, however it has the potential to occur there. The study area provides potential foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
brown treecreeper (eastern subsp.) *Climacteris picumnus victoriae*	V (TSC)	Typical habitat for this species includes drier forests, woodlands and scrubs with fallen branches; river red gums on watercourses and around lake-shores; paddocks with standing dead timber; and margins of denser wooded areas. This species prefers areas without a dense understorey.	This species occurs over central NSW, west of the Great Dividing Range and sparsely scattered to the east of the divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	This species has not been recorded from the study area, however it has the potential to occur there. The study area provides potential foraging and breeding habitat for this species. Despite this, the likelihood of occurrence of this species is reduced for this typically more western species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
regent honeyeater *Anthochaera phrygia*	E (TSC) E (EPBC) MIG (EPBC)	This species generally occurs in temperate eucalypt woodlands and open forests of south eastern Australia. It is commonly recorded from box-ironbark eucalypt associations, wet lowland coastal forests dominated by swamp mahogany, spotted gum and riverine casuarina woodlands. An apparent preference exists for the wettest, most fertile sites within these associations, such as creek flats, river valleys and foothills.	Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. The study area occurs within the known range of this species.	Glenrock SCA	This species has not been recorded in the study area; however, it could utilise its foraging resources as part of winter migrations. The project will impact on a very small portion of specific habitat for this species (being 5.7% of the EEC) The remainder of the EEC is excluded from development, and will be retained and protected in a manner to be confirmed. Despite being only a small amount, the proposed development has the potential to impact on foraging habitat for this species. The degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4 and 5**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
scarlet robin *Petroica boodang*	PD V (TSC)	This robin can be found in woodlands and open forests from the coast through to inland slopes. The birds can sometimes be found on the eastern fringe of the inland plains in the colder months of the year. Woody debris and logs are both important structural elements of its habitat. It forages from low perches on invertebrates either on the ground or in woody debris or tree trunks.	The scarlet robin can be found in south-eastern Australia, from Tasmania to the southern end of Queensland, to western Victoria and south SA. The study area occurs within the known range of this species.	Worimi NP	This species has not been recorded in the study area however, it could occur there. The habitats of the study area would provide foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.
flame robin *Petroica phoenicea*	PD V (TSC)	This species is known to breed in moist eucalypt forests and woodlands. It can usually be seen on ridges and slopes in areas where there is an open understorey layer. This species migrates during the winter to more lowland areas such as grasslands where there are scattered trees, as well as open woodland of the inland slopes and plains.	This robin is located in south-eastern Australia from the Queensland border to Tasmania and into Victoria as well as south-east SA. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	This species has not been recorded in the study area however, it could occur there. The habitats of the study area would provide foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
grey-crowned babbler (eastern subspecies) *Pomatostomus temporalis temporalis*	V (TSC)	Open box-gum woodlands on the slopes. Box-cypress-pine and open box woodlands on alluvial plains. Also found in acacia shrubland and adjoining areas.	Occurs throughout northern and south-eastern Australia. In NSW, this species occurs on the western slopes of the Great Dividing Range and on the western plains reaching as far west as Louth and Hay. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. The study area occurs within the known range of this species.	Wallaroo SF Wallaroo NP Worimi NP	This species has not been recorded from the study area, however it has the potential to occur there. The study area provides potential foraging and breeding habitat for this species. Despite this, the likelihood of occurrence of this species is reduced for this typically more western species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
varied sittella *Daphoenositta chrysoptera*	PD V (TSC)	The varied sittella can typically be found in eucalypt forests and woodlands, especially of rough-barked species and mature smooth-barked gums with dead branches, it can also be identified in mallee and acacia woodlands. This species builds a cup shaped nest made of plant fibres and spiders webs which is placed at the canopy level in the fork of a living tree.	The varied sittella is a sedentary species that inhabits the majority of mainland Australia with the exception of the treeless deserts and open grasslands. Its NSW distribution is basically continuous from the coast to the far west. The study area occurs within the known range of this species.	Medowie SF Worimi SF	This species has been recorded from the study area. It is likely that the study area provides both foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
MAMMALS						
spotted-tailed quoll *Dasyurus maculatus*	V (TSC) E (EPBC)	Habitat for this species is highly varied, ranging from sclerophyll forest, woodlands, coastal heathlands and rainforests. Records exist from open country, grazing lands and rocky outcrops. Suitable den sites including hollow logs, tree hollows, rocky outcrops or caves.	In NSW the spotted-tailed quoll occurs on both sides of the Great Dividing Range, with the highest densities occurring in the north east of the state. It occurs from the coast to the snowline and inland to the Murray River. The study area occurs within the known range of this species.	Tomaree NP Tilligery NP Tilligery NP Tilligery SCA Wallaroo SF Wallaroo NP Uffington SF	The species has not been recorded in the study area; however, it could occur there. The habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
brush-tailed phascogale (eastern subspecies) *Phascogale tapoatafa tapoatafa*	V (TSC)	Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest.	This species has a patchy distribution around the coast of Australia. In NSW it is more frequently found in forest on the Great Dividing Range in the north-east and south-east of the state. There are also a few records from central NSW. The study area occurs within the known range of this species.	Uffington SF Tilligery NR Tilligery SCA Tomaree NP Wallaroo NP Wallaroo SF Joe Redman Reserve Worimi NP	This species has not been recorded in the study area however, it could occur there. The habitats of the study area would provide foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
koala *Phascolarctos cinereus*	V (TSC)	This species inhabits eucalypt forest and woodland, with suitability influenced by tree species and age, soil fertility, climate, rainfall and fragmentation patterns. The species is known to feed on a large number of eucalypt and non-eucalypt species, however it tends to specialise on a small number in different areas. *Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis, E. microcorys, E. robusta, E. albens, E. camaldulensis* and *E. populnea* are some preferred species.	The koala has a fragmented distribution throughout eastern Australia, with the majority of records from NSW occurring on the central and north coasts, as well as some areas further west. It is known to occur along inland rivers on the western side of the Great Dividing Range. The study area occurs within the known range of this species.	Medowie SCA Moffats Swamp NR Tomaree NP Tilligery NP Tilligery NR Tilligery SCA Worimi RP Worimi NP	Scats of this species have been recorded from the study area. The study area is known potential habitat for the species, and it is likely to form both foraging and potential breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.
eastern pygmy possum *Cercartetus nanus*	V (TSC)	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.	This species is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extents from the coast inland as far as the Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	This species has not been recorded in the study area however, it could occur there. The habitats of the study area would provide foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
yellow-bellied glider *Petaurus australis*	V (TSC)	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient-rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	The yellow-bellied glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	This species has not been recorded from the study area, however it has the potential to occur there. The study area provides potential foraging and breeding habitat for this species. Despite this, the likelihood of occurrence of this species is not high. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
squirrel glider *Petaurus norfolcensis*	V (TSC)	Inhabits a variety of mature or old growth habitats, including box, box-ironbark woodlands, river red gum forest, and blackbutt-bloodwood forest with heath understorey. It prefers mixed species stands with a shrub or acacia mid-storey, and requires abundant tree hollows for refuge and nest sites.	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. The study area occurs within the known range of this species.	Medowie SCA Tomaree NP Tilligery NR Worimi NP Worimi RP Worimi SCA	This species has been recorded from the study area. The study area provides potential foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
grey-headed flying-fox *Pteropus poliocephalus*	V (TSC) V (EPBC)	This species occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 kilometres of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Grey-headed flying-foxes are found within 200 kilometres of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria. The study area occurs within the known range of this species.	Glenrock SCA Snapper Island NR Hunter Estuary NP Wallaroo NP Wallaroo NR Tilligery NR Worimi NP Worimi RP Worimi SCA	This species has been recorded from the study area. The study area is likely to provide foraging habitat only for this species, as no camps were recorded. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4 and 5**.
yellow-bellied sheathtail bat *Saccolaimus flaviventris*	V (TSC)	This species forages for insects, flies high and fast over the forest canopy, but lower in more open country. It forages in most habitats across its very wide range, with and without trees; and appears to defend an aerial territory. It roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to use mammal burrows.	The yellow-bellied sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range – most of Victoria, south-western NSW and adjacent South Australia – it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North-west Slopes. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	This species has been recorded from the study area. The study area is likely to provide foraging and roosting/breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
eastern freetail-bat *Mormopterus norfolkensis*	V (TSC)	This species occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures.	The eastern freetail-bat is found along the east coast from south Queensland to southern NSW. The study area occurs within the known range of this species.	Tomaree NP Medowie SF	This species has been recorded from the study area. The study area is likely to provide foraging and roosting/breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.
little bentwing-bat *Miniopterus australis*	V (TSC)	Prefers moist eucalypt forest, rainforest or dense coastal banksia scrub. This species roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Occurs in coastal north-eastern NSW and eastern Queensland. The study area occurs within the known range of this species.	Medowie SCA Wallaroo NP Wallaroo SF Tomaree NP Worimi NP Worimi SCA	This species has been recorded from the study area. The study area is likely to provide foraging habitat for this species, however it is not likely to be roosting or breeding in the study area. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
eastern bentwing-bat *Miniopterus schreibersii oceanensis*	V (TSC)	This species hunts in forested areas and uses caves as the primary roosting habitat, but also uses derelict mines, storm-water tunnels, buildings and other man-made structures. It forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Eastern bentwing-bats occur along the east and north-west coasts of Australia. The study area occurs within the known range of this species.	Hunter Estuary NP Wallaroo NP Wallaroo SF Uffington SF Worimi SCA	This species has been recorded from the study area. The study area is likely to provide foraging habitat for this species, however it is not likely to be roosting or breeding in the study area. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.
eastern false pipistrelle *Falsistrellus tasmaniensis*	V (TSC)	Habitat for this species includes sclerophyll forest. It prefers wet habitats, with trees over 20 metres high, and generally roosts in tree hollows or trunks.	This species has a range from south eastern Queensland, through NSW, Victoria and into Tasmania, and occurs from the Great Dividing Range to the coast. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	This species has not been recorded from the study area, however it has the potential to occur there. The study area provides potential foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
large-footed myotis *Myotis adversus*	V (TSC)	This species generally roosts in groups of 10-15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage. It forages over streams and pools catching insects and small fish by raking its feet across the water surface.	The large-footed myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 kilometres inland, except along major rivers. The study area occurs within the known range of this species.	Wallaroo SF Worimi NR Worimi RP Uffington SF	This species has not been recorded from the study area, however it has the potential to occur there. The study area provides potential foraging and breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.
greater broad-nosed bat *Scoteanax rueppellii*	V (TSC)	The greater broad-nosed bat appears to prefer moist environments such as moist gullies in coastal forests, or rainforest. They have also been found in gullies associated with wet and dry sclerophyll forests and open woodland. It roosts in hollows in tree trunks and branches and has also been found to roost in the roofs of old buildings.	The greater broad-nosed bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however it does not occur at altitudes above 500 metres. The study area occurs within the known range of this species.	Moffats Swamp NR Wallaroo NP Wallaroo SF Worimi RP Worimi NP	This species has been recorded from the study area. The study area is likely to provide foraging and roosting/breeding habitat for this species. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4**.

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
large-eared pied bat *Chalinolobus dwyeri*	V (TSC) V (EPBC)	The large-eared pied bat is generally found in a variety of drier habitats, including dry sclerophyll forests and woodlands, however, it probably tolerates a wide range of habitats. It tends to roost in the twilight zones of mines and caves, generally in colonies or common groups.	This species has a distribution from south western Queensland to NSW from the coast to the western slopes of the Great Dividing Range.	This species is not known to occur in any reserves in the region.	This species was recorded in the study area. While the study area provides potential foraging habitats, there are no potential roost habitats. The proposed development has the potential to impact on this species, and the degree of this potential impact will be investigated in an Assessment of Significance.	Yes See **Appendix 4 and 5**.
ENDANGERED FAUNA POPULATIONS						
emu population in the NSW North Coast Bioregion and Port Stephens LGA (*Dromaius novaehollandiae*)	EP (TSC)	Occur in open forest, woodland, coastal heath, coastal dunes, wetland areas, tea tree plantations and open farmland, and occasionally in littoral rainforest.	Previously widespread on the NSW north coast, but now largely restricted to coastal and near coastal areas between Evans Head and Red Rock and west to the Bungawalbin area. There have also been some recent records from the Port Stephens area. The study area occurs within the known range of this species.	Medowie SCA Tilligery SCA	The population has not been recorded in the study area; however, it could occur there. The proposed development is likely to remove potential habitat for this population, however this is not likely to comprise a significant impact.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
MARINE AND MIGRATORY SPECIES (EPBC Act Only)						
white-bellied sea-eagle *Haliaeetus leucogaster*	MAR (EPBC) MIG (EPBC)	These birds are typically sighted perched in tall trees and soaring above bodies of water and land. They are territorial and form permanent breeding pairs (Australian Museum 2005).	This species is distributed across Australia, China, India, Indonesia, New Guinea, and South-east Asia. Within Australia it is distributed along and near the coast. The study area occurs within the known range of this species.	Hunter Estuary NP Wallaroo SF Worimi NR Moffats Swamp NR Tomaree NP Tilligerry NP Joe Redman Reserve	The species has not been recorded in the study area; however, it could occur there. The aquatic habitats of the study area would only be low quality for this species, and would not be likely to contain significant breeding or foraging resources. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
white-throated needletail *Hirundapus caudacutus*	MAR (EPBC) MIG (EPBC)	This species is only in Australia approximately between the months of October and May. They forage upon flying insects and drink whilst in flight. Feeding is typically associated with rising thermal currents typical with storm fronts and bushfires. (Australian Museum Online 2003).	This species is distributed over eastern and northern Australia. The study area occurs within the known range of this species.	Glenrock SCA Wallaroo NP Medowie SF Joe Redman Reserve	The species has not been recorded in the study area; however, it could occur there. The study area is not likely to provide significant areas of breeding or foraging resources for this species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
rainbow bee-eater *Merops ornatus*	MAR (EPBC) MIG (EPBC)	The preferred habitat of the rainbow bee-eater is open forests and woodlands, shrublands, and cleared or semi-cleared areas (commonly farmland). These areas are usually in close proximity to permanent water, however, during migration this bird may fly over areas of non-preferential habitat.	This species is distributed throughout most of mainland Australia as well as several near-shore islands. It is not found in Tasmania and has only been identified in a thin strip in the most arid regions of central WA. The study area occurs within the known range of this species.	Worimi NR	The species has not been recorded in the study area; however, it could occur there. The study area is not likely to provide significant areas of breeding or foraging resources for this species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
black-faced monarch *Monarcha melanopsis*	MAR (EPBC) MIG (EPBC)	This bird can be identified in coastal scrub, damp gullies, eucalypt woodlands and rainforests. This bird can be seen foraging for insects amongst foliage, and builds a deep, cup-shaped nest in a tree fork (3 to 6 metres above the ground) which is made up of cobwebs, casuarinas needles, bark, moss and roots (Australian Museum 2005).	The black-faced monarch is distributed along the eastern coast of Australia, gradually becoming less common towards the south. The study area occurs within the known range of this species.	Wallaroo NP Medowie SF Moffats Swamp NR	The species has not been recorded in the study area; however, it could occur there. The study area is not likely to provide significant areas of breeding or foraging resources for this species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
spectacled monarch *Monarcha trivirgatus*	MAR (EPBC) MIG (EPBC)	This bird is migratory and can typically be identified in dense understories of rainforests, as well as mangroves, riparian vegetation and wet gullies (Birds in Backyards 2009).	The spectacled monarch is distributed from Cape York in Queensland to Port Stephens in NSW. As well as some islands of northern Queensland, the Moluccas, Papua New Guinea and Timor (Birds in Backyards 2009). The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	The species has not been recorded in the study area; however, it could occur there. The study area is not likely to provide significant areas of breeding or foraging resources for this species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
satin flycatcher *Myiagra cyanoleuca*	MAR (EPBC) MIG (EPBC)	This species typically inhabits wet areas of tall forests, particularly in gullies. The satin flycatcher moves north in the winter and is seldom seen in NSW, Tasmania, Victoria or SA during these times. This bird nests in loose colonies in broad-based cup-shaped nests on a bare horizontal branch. These nests are constructed from bark, grass, lichen and cobwebs (Australian Museum 2005).	The satin flycatcher can be found in both Australia and New Guinea. In Australia it is distributed along the east coast from Cape York through to Tasmania, also covering parts of south-eastern SA. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	The species has not been recorded in the study area; however, it could occur there. The study area is not likely to provide significant areas of breeding or foraging resources for this species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
rufous fantail *Rhipidura rufifrons*	MAR (EPBC) MIG (EPBC)	The rufous fantail typically inhabits areas of dense wet forest, mangrove, rainforest or swamp woodlands. It prefers areas where there is intense shade available and is often seen close to ground. In winter it is seldom found in NSW or Victoria. Nests are about 5 m from the ground in a small cup shape and constructed from thin grasses held together by cobwebs (Australian Museum 2005).	This species is distributed across the north and eastern coast of Australia, but is also found in Guam, New Guinea, the Solomon Islands and Sulawesi. The study area occurs within the known range of this species.	Glenrock SCA Hunter Estuary NP Tilligery NP Moffats Swamp NR Wallaroo NP Uffington SF Wallaroo SF	The species has not been recorded in the study area; however, it could occur there. The study area is not likely to provide significant areas of breeding or foraging resources for this species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No
great egret *Ardea alba*	MAR (EPBC) MIG (EPBC)	The great egret typically inhabits areas of shallow, flowing waters, but also uses damp grasslands and other watered areas. They can be observed both in flocks and on their own, and roost during the night in groups (Australian Museum 2005).	The great egret is distributed throughout the world, and is common throughout most areas of Australia, with exception to extremely arid areas. The study area occurs within the known range of this species.	Hunter Estuary NP	The species has not been recorded in the study area; however, it could occur there. The study area is not likely to provide significant areas of breeding or foraging resources for this species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Study Area	Reservation in the Region (NSW Government 2009)	Occurrence in Study Area and Potential for Significant Impact	Detailed Assessment of Significance Required?
cattle egret *Ardea ibis*	MAR (EPBC) MIG (EPBC)	The cattle egret can be found in grasslands, wetlands and woodlands and has never been identified in arid areas. These birds are commonly sighted at garbage dumps, pastures and croplands (especially where poor drainage is present) are common (Australian Museum 2005).	The cattle egret is distributed throughout Asia, Africa, Europe and Australia. It is most commonly found in north-eastern WA, the NT and in south-eastern Australia from Bundaberg, Queensland, through to Port Augusta SA. It has also been identified in Tasmania. The study area occurs within the known range of this species.	This species is not known to occur in any reserves in the region.	This species has been recorded in the study area. The study area is likely to provide potential foraging habitat for this species only. It is not likely that this species will be impacted by the proposed development to a significant degree.	No
fork-tailed swift *Apus pacificus*	MAR (EPBC) MIG (EPBC)	The fork-tailed swift is mostly found in Australia through the months of October through to April. This swift spends most of its time when in flight ahead of storm fonts and updraughts (Slater et al. 2003).	The fork-tailed swift can be found throughout Australia during migrating. In Australia it is most common west of the Great Dividing Range. This species is uncommon in Tasmania. The study area occurs within the known range of this species.	Hunter Estuary NP Tomaree NP	The species has not been recorded in the study area; however, it could occur there. The study area is not likely to provide significant areas of breeding or foraging resources for this species. Due to the low likelihood for the presence of this species within the study area, it is not likely that it will be impacted by the proposed development.	No

Notes:

E: endangered
EP: endangered population
EPBC: *Environment Protection and Biodiversity Conservation Act 1999*
LGA: local government area
MAR: marine
MIG: migratory
NP: national park
NR: nature reserve
PD: preliminary determination
RP: recreational park
SF: state forest
SCA: state conservation area
TSC: *Threatened Species Conservation Act 1995*
V: vulnerable

APPENDIX 4

Threatened Species Assessment (NSW EP&A Act 1979)

Appendix 4 - Assessment of Significance - *Environmental Planning and Assessment Act 1979* (EP&A Act)

Threatened species, endangered populations, or endangered ecological communities (EECs) recorded or with potential to occur within the study area are presented in the tables shown in **Appendix 3**. These tables provide information on each threatened species (including specific habitat, distribution and reservation) and provide a broad assessment of the potential for impact from the proposed development.

Those species considered to have reasonable potential to occur (or are known to occur) within the study area (based on known distribution and habitat requirements) and with reasonable potential to be impacted by the proposed development are addressed in more detail in the 'Assessment of Significance' included in this Appendix. This assessment of significance takes the form of seven part tests in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act), for all species listed under the *Threatened Species Conservation Act 1995* (TSC Act) found to have reasonable potential to be impacted by the proposed development.

All species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requiring further assessment are considered in a separate assessment provided in **Appendix 5**.

The following species are assessed in the seven part tests of significance below.

Threatened Ecological Communities

- Swamp Sclerophyll Forest on Coastal Floodplains of the north coast, Sydney basin and south-east corner bioregions endangered ecological community (EEC);

Threatened Fauna Species

- glossy black-cockatoo (*Calyptorhynchus lathami*);
- little lorikeet (*Glossopsitta pusila*);
- swift parrot (*Lathamus discolor*);
- turquoise parrot (*Neophema pulchella*);
- eastern grass owl (*Tyto longimembris*);
- masked owl (*Tyto novaehollandiae*);
- powerful owl (*Ninox strenua*);
- scarlet robin (*Petroica boodang*);
- flame robin (*Petroica phoenicea*);
- varied sittella (*Daphoenositta chrysoptera*);
- brush-tailed phascogale eastern subspecies (*Phascogale tapoatafa tapoatafa*);
- koala (*Phascolarctos cinereus*);

- eastern pygmy possum (*Cercartetus nanus*);
- squirrel glider (*Petaurus norfolcensis*);
- grey-headed flying-fox (*Pteropus poliocephalus*);
- yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*);
- eastern freetail-bat (*Mormopterus norfolkensis*);
- little bentwing-bat (*Miniopterus australis*);
- eastern bentwing-bat (*Miniopterus schreibersii oceanensis*);
- eastern false pipistrelle (*Falsistrellus tasmaniensis*);
- large-footed myotis (*Myotis adversus*); and
- greater broad-nosed bat (*Scoteanax rueppellii*); and
- large-eared pied-bat (*Chalinolobus dwyeri*).

1. Swamp Sclerophyll Forest EEC

A total of 35 hectares of the Swamp Sclerophyll Forest EEC were recorded in the study area. The majority of the Swamp Sclerophyll Forest occurring within the study area will be retained and formally protected outside of the proposed development area. The proposed development will impact on only 5.7% of this mapped community due to 'smoothing' of development boundaries. Comparative amounts of previously cleared EEC will be allowed to continue to regenerate naturally (see **Figure 1.3**) to compensate for this smoothing.

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,

Not applicable.

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

Not applicable.

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

Less than 5.7% of the Swamp Sclerophyll Forest identified within the study area will be disturbed as a result of the proposed development. The remainder of this EEC is proposed to

be retained and formally protected outside of the proposed residential lots. This small amount of this EEC that will be modified by the proposed development will not place the local occurrence of the community at risk of extinction.

(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.

Less than 5.7% of the Swamp Sclerophyll Forest identified within the study area will be disturbed for the proposed development. The remainder of this EEC is proposed to be retained and formally protected outside of the proposed residential lots. Furthermore, areas of previously cleared EEC will be allowed to regenerate, making up a near equivalent area to the 5.7% proposed to be disturbed. As such, the proposed development will not substantially or adversely modify the composition of the Swamp Sclerophyll Forest EEC such that its local occurrence would be placed at risk of extinction.

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 35 hectares of the Swamp Sclerophyll Forest EEC was recorded in the study area. The majority of this will be retained and formally protected outside of the proposed residential lots. The proposed development will impact on only 5.7% of this community occurring within the study area due to 'smoothing' of development boundaries. Comparative amounts of previously cleared EEC will be allowed to continue to regenerate naturally (see **Figure 1.3**) to compensate for this smoothing.

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

The proposed development will not lead to the fragmentation of the Swamp Sclerophyll Forest community occurring in the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, as will the existing vegetated linkages to the east and north of the study area.

(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 area of the Swamp Sclerophyll Forest EEC proposed to be disturbed (approximately 5.7% hectares) occurs along the edges of a 35 hectares occurrence of this community. Due to the strong ecotonal influence at these edges, the condition of the EEC in the area to be modified is not regarded to be of high conservation significance. The removal of 5.7% of predominantly ecotonal Swamp Sclerophyll Forest EEC is not regarded to be important to the long-term survival of this community in the locality.

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

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the disturbance to less than 5.7% of Swamp Sclerophyll Forest EEC.

While the proposed development will involve the operation of KTPs, the impacts of these are not regarded to be significant in relation to the loss of Swamp Sclerophyll Forest EEC.

Conclusion

The proposed development will not result in a significant impact on the Swamp Sclerophyll Forest EEC.

2. Glossy black-cockatoo (*Calyptorhynchus lathami*)

The glossy black-cockatoo (*Calyptorhynchus lathami*) has been recorded from the study area. It is likely that the study area contains foraging and breeding habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species, while 68 hectares of habitat containing the highest proportions of preferred feed trees for this species within the study area will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the glossy black-cockatoo (*Calyptorhynchus lathami*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or

indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the glossy black-cockatoo (*Calyptorhynchus lathami*).

3. Little lorikeet (*Glossopsitta pusilla*)

The little lorikeet (*Glossopsitta pusilla*) was not recorded from the study area, however the study area provides potential foraging and breeding habitats for this species. Approximately 59 hectares of habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the little lorikeet (*Glossopsitta pusilla*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the little lorikeet (*Glossopsitta pusilla*).

4. Swift parrot (*Lathamus discolor*)

The swift parrot (*Lathamus discolor*) was not recorded from the study area, however it could utilise its foraging resources as part of winter migrations. These foraging resources (i.e. winter-flowering tree species) are limited to the Swamp Sclerophyll Forest community recorded within the study area, of which only 5.7% are to be modified as a result of the proposed development. Approximately 59 hectares of potential general habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision. There is no potential for breeding habitat for the swift parrot (*Lathamus discolor*) within the study area.

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,

Specific foraging habitats for this species in the study area are restricted to a small number of the winter-flowering tree species swamp mahogany (*Eucalyptus robusta*) which occur in the Swamp Sclerophyll Forest community. While approximately 5.7% of this community will be modified for the proposed development, the majority of the winter flowering tree species will be conserved and protected as part of the Concept Plan/Vision. Outside of the study area, the Medowie area is known to support reasonably large amounts of swamp mahogany (*Eucalyptus robusta*) that are likely provide important foraging resources for the swift parrot (*Lathamus discolor*).

Given the small extent of foraging resources for this winter migrant, and the presence of more significant resources elsewhere in the locality, the proposed development will not have an adverse effect on the lifecycle of the swift parrot (*Lathamus discolor*) such that a viable local population would be placed at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the swift parrot (*Lathamus discolor*).

5. Turquoise parrot (*Neophema pulchella*)

The turquoise parrot (*Neophema pulchella*) has not been recorded in the study area, however it has potential to occur. The habitats of the study area (albeit not typical for this species) would provide foraging and breeding habitat (tree hollows) for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the turquoise parrot (*Neophema pulchella*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential

habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the turquoise parrot (*Neophema pulchella*).

6. Eastern grass owl (*Tyto longimembris*)

The eastern grass owl (*Tyto longimembris*) has not been recorded from the study area, although there is some potential (albeit very low) for this species to occupy the open, grassy habitats of the study area and to forage over the woodland habitats. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the eastern grass owl (*Tyto longimembris*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat

for this species. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the eastern grass owl (*Tyto longimembris*).

7. Masked owl (*Tyto novaehollandiae*)

The masked owl (*Tyto novaehollandiae)* has been recorded from the study area. The study area provides foraging and breeding habitat for this species, and it is probable that the species has roosted or bred in an identified tree (see **Figure 3.2**) in recent years. It is likely that this tree provides ongoing roosting/nesting habitat for this species, and this tree has been excluded from any development and protected as part of the Concept Plan/Vision. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 masked owl (*Tyto novaehollandiae*) was recorded in the study area. Suitable foraging and nesting habitat for this species occurs in the study area, in particular within the coastal plains smooth-barked apple woodland community. The identified nest tree has been protected as part of the Concept Plan/Vision. The proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the masked owl (*Tyto novaehollandiae*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species, while 68 hectares will be retained and protected within the study area. The known nest tree for this species will not be impacted by the proposed development, as it has been retained within a formal offset 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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the masked owl (*Tyto novaehollandiae*).

8. Powerful owl (*Ninox strenua*)

The powerful owl (*Ninox strenua*) has not been recorded from the study area, however it has the potential to occur. The study area provides potential foraging and breeding habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the powerful owl (*Ninox strenua*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the powerful owl (*Ninox strenua*).

9. Scarlet robin (*Petroica boodang*)

The scarlet robin (*Petroica boodang*) has not been recorded from the study area, however it has the potential to occur. The study area provides potential foraging and breeding habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the scarlet robin (*Petroica boodang*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the scarlet robin (*Petroica boodang*).

10. Flame robin (*Petroica phoenicea*)

The flame robin (*Petroica phoenicea*) has not been recorded from the study area, however it has the potential to occur. The study area provides potential foraging and breeding habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this

species, the modification of 59 hectares of vegetation will not place a viable local population of the flame robin (*Petroica phoenicea*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of

the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the flame robin (*Petroica phoenicea*).

11. Varied sittella (*Daphoenositta chrysoptera*)

The varied sittella (*Daphoenositta chrysoptera*) has not been recorded from the study area, however it has the potential to occur. The study area provides potential foraging and breeding habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also

occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the varied sittella (*Daphoenositta chrysoptera*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the varied sittella (*Daphoenositta chrysoptera*).

12. Brush-tailed phascogale (eastern subspecies) (*Phascogale tapoatafa tapoatafa*)

The brush-tailed phascogale (*Phascogale tapoatafa tapoatafa*) has not been recorded from the study area, however it has the potential to occur. The study area provides potential foraging and breeding habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the brush-tailed phascogale (*Phascogale tapoatafa tapoatafa*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the brush-tailed phascogale (*Phascogale tapoatafa tapoatafa*).

13. Koala (*Phascolarctos cinereus*)

Scats of the koala (*Phascolarctos cinereus*) have been recorded from the study area. The study area supports known foraging tree species, in particular forest red gum (*Eucalyptus tereticornis*) and provides potential breeding habitat for this species. Koalas are known to occur widely in Medowie and broader Port Stephens local government area (LGA). The

majority of the potential feed trees of this species that occur within the study area will be conserved in the Swamp Sclerophyll Forest EEC which will largely remain undisturbed as a result of the proposed development. However, some known koala feed tree species will be modified as a result of the proposed development. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the koala (*Phascolarctos cinereus*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the koala (*Phascolarctos cinereus*).

14. Eastern pygmy possum (*Cercartetus nanus*)

The eastern pygmy possum (*Cercartetus nanus*) has not been recorded from the study area, however it has the potential to occur. The study area provides potential foraging and breeding habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the eastern pygmy possum (*Cercartetus nanus*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the eastern pygmy possum (*Cercartetus nanus*).

15. Squirrel glider

The squirrel glider (*Petaurus norfolcensis*) has been recorded from the study area. It is likely that the study area contains foraging and breeding habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the squirrel glider (*Petaurus norfolcensis*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this

species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the squirrel glider (*Petaurus norfolcensis*).

16. Grey-headed flying-fox (*Pteropus poliocephalus*)

The grey-headed flying-fox (*Pteropus poliocephalus*) has been recorded from the study area. It is likely that the study area contains foraging habitat for this species, however there have been no camp/roost sites identified. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the grey-headed flying-fox (*Pteropus poliocephalus*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat

for this species. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the grey-headed flying-fox (*Pteropus poliocephalus*).

17. Yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*)

The yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*) has been recorded from the study area. It is likely that the study area contains foraging habitat for this species, and the tree hollows present provide potential roost habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat

for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*).

18. Eastern freetail-bat (*Mormopterus norfolkensis*)

The eastern freetail-bat (*Mormopterus norfolkensis*) has been recorded from the study area. The study area contains foraging habitat and the tree hollows present provide potential roost habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the eastern freetail-bat (*Mormopterus norfolkensis*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the eastern freetail-bat (*Mormopterus norfolkensis*).

19. Little bentwing-bat (*Miniopterus australis*)

The little bentwing-bat (*Miniopterus australis*) has been recorded from the study area. This species is likely to be foraging within the study area, however is not likely to be roosting/breeding in the study area. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the population of the little bentwing-bat (*Miniopterus australis*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for the little bentwing-bat (*Miniopterus australis*) occurring in the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of the little bentwing-bat (*Miniopterus australis*) between the habitats conserved in the study area and other local foraging habitats, particularly given the highly mobile nature of this species and its typically wide foraging range.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the little bentwing-bat (*Miniopterus australis*).

20. Eastern bentwing-bat (*Miniopterus schreibersii oceanensis*)

The eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) has been recorded from the study area. This species is likely to be foraging within the study area, however is not likely to be roosting/breeding in the study area. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the eastern bentwing-bat (*Miniopterus schreibersii oceanensis*).

21. Eastern false pipistrelle (*Falsistrellus tasmaniensis*)

The eastern false pipistrelle (*Falsistrellus tasmaniensis*) has not been recorded from the study area, however the study area contains potential foraging habitat and the tree hollows present provide potential roost habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this

species, the modification of 59 hectares of vegetation will not place a viable local population of the eastern false pipistrelle (*Falsistrellus tasmaniensis*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of

the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the eastern false pipistrelle (*Falsistrellus tasmaniensis*).

22. Large-footed myotis (*Myotis adversus*)

The large-footed myotis (*Myotis adversus*) has not been recorded from the study area, however the study area contains potential foraging habitat and the tree hollows present provide potential roost habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the large-footed myotis (*Myotis adversus*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the large-footed myotis (*Myotis adversus*).

23. Greater broad-nosed bat (*Scoteanax rueppellii*)

The greater broad-nosed bat (*Scoteanax rueppellii*) has been recorded from the study area. It is likely that the study area contains foraging habitat for this species, and the tree hollows present provide potential roost habitat for this species. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is

expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the greater broad-nosed bat (*Scoteanax rueppellii*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State

Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species, including potential hollows. The tree-clearing procedure outlined in **Section 5** of the main report will be adopted, minimising the potential risk to hollow-dependant species during clearing activities.

While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the greater broad-nosed bat (*Scoteanax rueppellii*).

24. Large-eared pied-bat (*Chalinolobus dwyeri*)

The large-eared pied-bat (*Chalinolobus dwyeri*) has been recorded from the study area. This species is likely to be foraging within the study area, however is not likely to be roosting/breeding in the study area. Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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 proposed development will result in the modification of up to 59 hectares of potential habitat for this species as part of the Concept Plan/Vision, while 68 hectares of habitat will be retained and formally protected. A significant area of suitable habitat for this species also occurs in the Medowie State Conservation Area which lies adjacent to the study area. Given the conservation of suitable habitat for this species both within the study area and in the adjacent Medowie State Conservation Area, and given the highly mobile nature of this species, the modification of 59 hectares of vegetation will not place a viable local population of the large-eared pied-bat (*Chalinolobus dwyeri*) at risk of extinction.

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

Not applicable.

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

Not applicable.

(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.

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

Approximately 59 hectares of potential habitat will be modified as a result of the proposed development, however it is expected that a substantial portion of this will be able to be retained within the large lots of the Concept Plan/Vision. A further 68 hectares of potential habitat for this species will be retained and formally protected within the study area as part of the Concept Plan/Vision.

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

The proposed development will not lead to the fragmentation of habitats for this species within the study area. Connectivity to the adjacent vegetation and habitats of Medowie State Conservation Area will be retained, with reasonably strong linkages retained to the east and north of the study area. The proposed development is not expected to form a barrier to the movement of this species between the habitats conserved in the study area and other local foraging habitats.

(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,

While the study area provides habitat suitable for use by this species, there are large areas of similar habitats in the locality, particularly those protected within the Medowie State Conservation Area. As such, the 59 hectares of potential habitat to be modified as a result of the proposed development are not critical to the 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),

The study area does not contain any areas of known critical habitat for any species, and there are no known areas of critical habitat within the local area which could be directly or indirectly affected by the proposed development. Therefore the proposed development will not have an adverse impact, either directly or indirectly, on any areas of critical habitat.

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

There are no current recovery plans or threat abatement plans that are relevant to any species occurring or potentially occurring in the study area. The proposed development, therefore, is not required to be consistent with any objectives or actions of any recovery or threat abatement plans.

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.

A number of key threatening processes (KTPs) are relevant to the proposed development, the most pertinent being the 'clearing of native vegetation' and the 'loss of hollow-bearing trees'. The proposed development involves the modification of up to 59 hectares of habitat for this species. While the proposed development will increase the influence of KTPs within the study area, the impacts of these are not regarded to be significant in relation to the loss of habitat for this species, given the amount of habitat to be retained within the study area, as well as the existing levels of similar habitat within the local Medowie area, including the adjacent Medowie State Conservation Area.

Conclusion

The proposed development will not result in a significant impact on the large-eared pied-bat (*Chalinolobus dwyeri*).

APPENDIX 5

Assessment of Significance (Commonwealth EPBC Act 1999)

Appendix 5 – Assessment of Significance under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

A search of the Department of Environment, Water, Heritage and the Arts (DEWHA) Protected Matters Database identified threatened and migratory species (EPBC Act listed) known to occur or considered likely to occur, on the basis of habitat modelling, within 10 kilometres of the Study Area. No EPBC Act listed endangered populations or threatened ecological communities (TECs) are known or have potential to occur within the Study Area.

Two EPBC Act listed threatened fauna species (being the grey-headed flying-fox (*Pteropus poliocephalus*) and the large-eared pied-bat (*Chalinolobus dwyeri*)) are considered under this assessment of significance, as they have both been recorded in the Study Area.

An additional two species (being the swift parrot (Lathamus discolor) and regent honeyeater (*Anthochaera phrygia*) have also been included, on the basis of potential habitat, however neither have been recorded in the Study Area.

The aim of this assessment is to determine whether the proposed development is likely to have a significant impact on any EPBC Act matters of national environmental significance (MNES). In this instance, MNES with potential to occur within the Study Area include:

- listed threatened species (including endangered and vulnerable species); and
- listed migratory species.

Each category is addressed separately below.

Endangered Species

The vegetation of the Study Area provides some potential habitat for the swift parrot (Lathamus discolor) and regent honeyeater (*Anthochaera phrygia*). This habitat primarily comprises the swamp mahogany (*Eucalyptus robusta*), which occurs in small numbers in the Swamp Sclerophyll Forest EEC. The proposed development will retain the majority of the swamp sclerophyll forest EEC recorded within the study area (less approximately 2.8% due to smoothing), as well as a 50 metre buffer to development (where practical). Areas of EEC and other vegetation to the east of the existing easement will also be retained and protected as part of the proposed development. It is envisaged this retained vegetation will be formally protected by way of rezoning, a Development Control Plan (DCP), a covenant on the title, or similar formal mechanism.

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to endangered species, occurrences include but are not limited to:

- a geographically distinct regional population, or collection of local populations; or
- a population, or collection of local populations, that occurs within a particular bioregion.

The swift parrot (*Lathamus discolor*) has not been recorded from the Study Area during surveys. An occurrence of this species within the local area is not likely to be a distinct *population* (or *sub-population*) of this species on mainland Australia. Records of this species on the coast and coastal slopes of the Great Dividing Range are widespread, and its distribution can vary seasonally in response to mass flowering of key eucalypt species.

The regent honeyeater (*Anthochaera phrygia*) has not been recorded within the Study Area during surveys, although the Study Area contains some suitable habitat for this species. A record of this species within the local area is not likely to comprise a distinct *population* (or *sub-population*) of this species within Australia. Records of the distribution of this species are widespread, with occurrences occurring on both sides of the Great Dividing Range, and its distribution can vary seasonally in response to mass flowering of key eucalypt species.

As the proposed development is only likely to impact on a small proportion of key habitat for this species (being the modification of approximately 2.8% of the EEC), it is not likely that the proposed development will pose a potential impact to these species. As such, no further assessment for these species is required.

Vulnerable Species

The grey-headed flying-fox (*Pteropus poliocephalus*) and the large-eared pied-bat (*Chalinolobus dwyeri*) were recorded in the study area. An assessment according to the DEWHA principal significant impact guidelines is provided below for these vulnerable species.

In this case, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

Based on an assessment of the above criteria, the study area does not support an *important population* for either the grey-headed flying-fox (*Pteropus poliocephalus*) or the large-eared pied bat (*Chalinolobus dwyeri*). As such, no further assessment for these species is required.

Migratory Species

A number of migratory species were recorded or have potential to occur in the study area, however given the nature of the impacts of the proposed development, none were regarded to have potential to be reasonably impacted by the proposed development (**Appendix 3**). As such, no further assessment for any EPBC Act listed migratory species is required.

Conclusion

From the assessment of significance, it is concluded that the project will not pose a significant impact on matters of NES as listed under the Schedules of the EPBC Act. The proposal is not a controlled action, and will not require referral to the Minister for determination.

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