Appendix D1

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Lot 52 in DP 831284 and Lot 84 in DP 792945
Belle O'Connor Street, South West Rocks

Proposed Residential Development

Ecological Issues & Assessment Report

August 2009

Whelans InSites Pty Ltd
Level 12/80 Clarence Street Sydney NSW 2000
ph: 02 – 8234 8300 fax: 02 – 9262 6511
email: dfanning@insites.com.au

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Proposed Residential Development

Ecological Issues & Assessment Report

August 2009

Principle Author: F Dominic Fanning	Version: 6	Date: 13th August 2009

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BELLE O'CONNOR STREET, SOUTH WEST ROCKS

PROPOSED RESIDENTIAL DEVELOPMENT

ECOLOGICAL ISSUES & ASSESSMENT REPORT

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PROPOSED RESIDENTIAL DEVELOPMENT

ECOLOGICAL ISSUES & ASSESSMENT REPORT

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PART A — INTRODUCTION & INFORMATION BASE

1 INTRODUCTION

1.1 Background

The subject site (Lot 52 in DP 831284 and Lot 84 in DP 792945) is located to the north of an unformed section of Belle O'Connor Street at South West Rocks (Figure 1), on the mid north coast of NSW. The site has a total area of approximately 39.9 hectares, and is currently zoned *Rural 1(d) – General Rural*, pursuant to the *Kempsey Local Environmental Plan 1987* (LEP 1987).

The subject site forms part of a larger rezoning proposal, involving several portions of land, for which a *Local Environmental Study* (LES) has been prepared by Connell Wagner for Kempsey Local Council and a draft LEP exhibited.

The subject site contains two dwellings (along the southern boundary), and supports areas of cleared and disturbed land, as well as native vegetation including a large area of heath shrubland (Figure 2). Part of the site, mostly in the southwestern portion, has been disturbed through regular slashing. In addition, wide tracks are located throughout much of the site. A narrow creekline (the northern tributary to Saltwater Lagoon) runs along the northern boundary of the subject site, and drains into Saltwater Lagoon to the east (Figure 1).

A *Concept Plan* has been prepared for the proposed development of Lot 52 in DP 831284 and Lot 84 in DP 792945 Belle O'Connor Street, South West Rocks (Figures 1 and 2; Appendix A). An *Environmental Assessment Report* (EAR) has also been prepared in accordance with the *Director-General's Requirements* (DGRs) received for the project (08_0167), pursuant to Part 3A of the *Environment Planning & Assessment Act 1979* (EP&A Act).

1.2 Definitions

For the purposes of this *Ecological Issues & Assessment Report*, the following definitions of relevant areas (Figure 1) apply:

- *subject site* — the area which is the subject of the current Part 3A *Project Application* – Lot 52 in DP 831284 and Lot 84 in DP 792945.
- *study area* — the catchment of Saltwater Lagoon and the area which was the subject of the LES.
- *locality* — an area of 10km around the *subject site*.

Other definitions for terms used in this *Report* are as provided in the attached *Glossary of Terms*, (page 38), and in the relevant statutes and legislation (as documented below).

1.3 Proposed Development

The proposed development of the subject site at South West Rocks is for a residential subdivision of 39.9ha, with approximately 14.3ha of land proposed for conservation purposes (Figure 2; Appendix A). The proposed development includes:

- the creation of 318 residential lots of varying sizes;
- a perimeter road, or where not possible, a 20m *Asset Protection Zone*;
- a playground area, picnic ground with BBQs, and bicycle pedestrian paths located in the *Conservation Area* which occupies the northern part of land;
- two 15m drainage swales running north-south through the site, and a detention basin/bio-retention area located at the end of the eastern swale along the northern periphery of the residential area; and
- a connecting road from the residential area through the property to the northern boundary along the alignment of an existing ground road.

All of the proposed activities are permissible pursuant to the proposed zoning of lands within the subject site

1.4 Scope and Aims of this Report

This *Ecological Issues & Assessment Report*:

- collates the information obtained during the previous and current investigations on the subject site and on adjoining lands;
- provides a description of the vegetation and native biota of the subject site;
- identifies the extent of relevant threatened biota and/or their habitats;
- addresses the likely impacts of development of the site as proposed, taking into consideration the impact amelioration and environmental management measures proposed; and
- considers the relevant statutory requirements pursuant to the requirements of Part 3A of the EP&A Act, and the DGRs for this project. Specific consideration is provided in respect of:
  - the *Environmental Planning & Assessment Act 1979* (EP&A Act);
  - the *Threatened Species Conservation Act 1995* (TSC Act);
  - *State Environmental Planning Policy No. 14 – Coastal Wetlands* (SEPP 14);
  - *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44);
  - the *Water Management Act 2000* (WM Act); and
  - the relevant Council environmental planning instruments.

The specific aims of this *Report* are:

- to identify and describe the native biota, and particularly threatened biota and/or their habitats, on the subject site and on adjoining lands;
- to determine the potential for adverse impacts to be imposed by development of the site as proposed (including its relevant impact amelioration and environmental management measures) upon the natural environment in general and on threatened biota and their habitats in particular;
- to provide advice regarding the development proposal, where appropriate, which seeks to minimise or avoid the imposition of significant adverse impacts and which promotes an appropriate balance between development aspirations and conservation goals; and
- to satisfy the statutory requirements for environmental impact assessment.

2 INFORMATION BASE

2.1 Previous Investigations of the Site and Adjoining Lands

This *Ecological Issues & Assessment Report* is based on several sources of information, as documented below. The *Report* collates and synthesizes data collected during previous investigations of the subject site and nearby lands, as well as other relevant material from nearby sites and information obtained during the supplementary surveys conducted for this *Report*.

A *Flora & Fauna Report* (Connell Wagner 2005) accompanied the LES (Connell Wagner 2007) which was prepared for the study area. The *Flora & Fauna Report* relied heavily on data from previous studies, especially Peter Parker (2002) and Kendall & Kendall (2003). However, the Peter Parker (2002) *Report* did not address Lot 84 in DP 792946, which forms part of the land subject to this current *Report.* In addition, the Connell Wagner 2005 *Report* provides little information on the additional field surveys which were undertaken for that *Report.*

The vegetation mapping included in the LES was reviewed by Environmental InSites and (following an initial site inspection in January 2008) was determined to not constitute an accurate reflection of the vegetation present on the subject site. The mapping in the LES was derived from the Peter Parker (2002) and Kendall & Kendall (2003) *Reports* (whilst possibly suitable for an LES), and is considered not to have been completed at an appropriate scale or accuracy for use in our current *Report.* Neither Peter Parker (2002) nor Kendal & Kendall (2003) recorded any threatened flora species within the subject site.

A *Detailed Wallum Froglet Study* was finalised in 2008 by Connell Wagner, which was intended to build upon the information presented in the original *Flora & Fauna Report* (Connell Wagner 2005). However that *Report* was also based on a "*limited field survey*", and also relied substantially on previous data and literature review. As a consequence, that *Report* provides only an indicative and general representation of possible habitat for the Wallum Froglet.

2.2 Recent Investigations for This Report

More recent ecological investigations of the site have been conducted by Cumberland Ecology (2008) (Appendix B) and by Environmental Insites (this *Report*) as part of the Part 3A application.

The Cumberland *Ecology Report* (Appendix B) is based on a literature review and searches of relevant databases, as well as detailed field investigations which included *inter alia*:

- arboreal and terrestrial mammal trapping;
- an Anabat survey;
- diurnal bird surveys;
- spotlighting and call playback for large forest owls and gliders; and
- fauna habitat assessment.

A review of the Cumberland Ecology data, and the conduct of supplementary site investigations and vegetation mapping, has been undertaken by Environmental InSites in 2008 (as detailed in this *Report*). Supplementary field surveys were undertaken by Environmental InSites (Appendix C) for this *Report* in 2008, and included:

- ground-truthing of previously mapped vegetation communities;
- the collection of updated comprehensive flora species list using the 'Random Meander' technique (Cropper 1993), quadrats and transects over a 2 day period; and
- call playback survey targeting the Wallum Froglet *Crinia tinnula*.

Botanical surveys were undertaken on the 10th and 11th of April 2008 by a qualified botanist, and have been completed in accordance with the *Draft Guidelines* of the Department of Environment & Climate Change (DECC 2004) for species with potential habitat on the subject site. The species composition amongst the each quadrat was generally uniform, with any slight changes being identified and

recorded during the 'Random Meander' survey of the site. It is noted that the DECC (2004) *Draft Guidelines* for sampling vegetation communities recommend additional quadrat surveys to completed however it was determine that the extra effort would not result in a substantial number of species being recorded, especially considering the previous ecological work undertaken on the site (Cumberland Ecology 2008 and Connell Wagner 2005). Research of locally recorded threatened flora species was undertaken prior to the site inspection. These species where targeted during the 'Random Meander' surveys.

Systematic surveys were undertaken in seven 20 x 20 metre quadrats, sampling each vegetation community (Figure 5). Cover abundance for each species recorded within quadrats was allocated on a modified Braun-Blanquet scale. Flora transects of 100 metres length were also undertaken in each community and quadrat survey (Figure 5). The 'Random Meander' method was also utilised to target threatened species, as described by Cropper (1993).

Botanical nomenclature was applied according to Harden (1992-2002) and cross-referenced against updated accepted changes per www.plantnet.com.au or the National Herbarium of New South Wales. Where varieties or subspecies were not able to be accurately determined, specimens were listed at the base species level.

Collected threatened plant species, rare or threatened taxa or regionally significant species were determined against recognised herbarium specimens and/or sent to the National Herbarium of New South Wales for positive verification.

2.3 Additional Information Sources

Additional information has been obtained from a range of sources including:

- published scientific information regarding relevant threatened biota;
- vegetation mapping of the locality (DEC & DNR 2001);
- the *Wildlife Atlas* of the NSW National Parks & Wildlife Service (NPWS)[1]; and
- other investigations of various sites undertaken by a range of environmental consultants in the locality (including those identified above).

Table 1 Survey effort in recent investigations on the subject site.

Date	Survey Type	Survey Effort
Cumberland Ecology		***Nov and Dec 2007***
22.11.07	Hair tubes	600 hair tube-nights
03.11.07 – 07.11.07	Type A and B Elliot traps Type B Elliot traps Cage traps Spotlighting and playback survey	400 trap-nights 120 trap-nights 40 trap-nights 1 person-hour
03.11.07	Anabat survey (2 units)	24 hours
04.12.07	Spotlighting and playback survey Anabat survey (2 units)	1 person-hour 24 hours
05.12.07	Diurnal bird survey Anabat survey (2 units)	3 person-hours 24 hours
06.12.07	Diurnal bird survey Anabat survey (2 units)	3 person-hours 24 hours

[1] The NPWS is now part of the DECC (Department of Environmental & Climate Change) which was previously the Department of Environment & Conservation (DEC).

Environmental InSites		*April and May 2008*
10.04.08-11.04.08	Vegetation surveys	15 person-hours
20.05.08-22.05.08	Wallum Froglet surveys	28 person-hours
10.04.08	General site surveys	3 person-hours

2.4 Consistency with DECC Draft Guidelines

The recent fieldwork by Cumberland Ecology and Environmental InSites has been undertaken in consultation with the *Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities – Working Draft* (DEC 2004). These *Draft Guidelines* had been prepared by the DECC (then the DEC), ostensibly to provide a basis for the conduct of field investigations for threatened biots.

It should be noted that:

- the *Guidelines* are only in *Draft* form and have yet to be debated, finalised or adopted;
- the *Draft Guidelines* note that "*not all the survey methods .. will be appropriate or necessary in all situations, however adequate justification must be provided if appropriate survey methods are not applied*" (emphasis added);
- a review of the DECC *Atlas of NSW Wildlife* and previous field investigations was undertaken prior to the undertaking of field investigations;
- weather observations were taken for all recent fauna surveys;
- flora surveys conducted by Environmental InSites across the site were consistent with the *Draft Guidelines*, over 200 species were recorded on the subject site and it was considered additional quadrats would not result in a significant number of additional species recorded. The following surveys were undertaken:
    - systematic surveys consisted of seven 20 x 20 metre quadrats sampling each vegetation community;
    - cover abundance for each species recorded within quadrats was allocated based on a modified Braun-Blanquet scale;
    - flora transects of 100 metres in length were conducted in each community, associates with the quadrat surveys; and
    - 'Random Meander' methodology was also utilised to target threatened species across the subject site, as described by Cropper (1993);
- the *Draft Guidelines* for amphibians recommend two separate nights of systematic searches, including call playback within appropriate habitat. The field surveys undertaken for this *Report* included surveys over 4 nights and over two seasons (in summer and winter) and call playback;
- general, opportunistic habitat searches were undertaken for reptiles over two seasons;
- diurnal birds were sampled over two seasons in all habitats;
- nocturnal bird call-playback surveys were undertaken over 4 nights by Cumberland Ecology (2008). Additional surveys in accordance with the *Draft Guidelines* were not undertaken given there was no roosting or nesting habitat on the site for large forest owls and the majority of forest areas is to be retained in the *Conservation Area*;
- the survey effort for mammals was consistent with the *Draft Guidelines*. The only method not employed was pitfall traps. Given the level of survey effort employed for mammals, the nature of the habitats present and the listed records of threatened species (including on the DECC Wildlife Atlas), it was determined that the use of pitfall traps was unnecessary; and

- microchiropteran bat surveys were undertaken over 4 nights during appropriate weather conditions, with the Anabat left for 12 hours on each occasion (Table 1). This survey effort surpasses the requirements of the *Draft Guidelines.* While it is acknowledged that not all species can be accurately identified by their echolocation calls, it should be noted that studies have shown that bat detectors can sample significantly more species than harp traps and are much more cost efficient (Hourigan *et al* 2008). In circumstances where species are unable to be confidently identified by their call (for example the Greater Broad-nosed Bat *Scoteanax reuppellii* and Eastern Broad-nosed Bat *Scotorepens orion*) both are assumed to be present as dictated by the precautionary principle. It is therefore likely that surveys on the subject site have over-estimated the number of microchiropteran bat species present.

  Twelve species were recorded on the subject site (Cumberland Ecology 2008) and it was considered that echolocation surveys were adequate for the subject site given that the majority of forest habitat is to be retained within the *Conservation Area*. Harp trapping is not considered necessary in this instance because it is unlikely to provide any additional information. The proposed development would not affect any potential roosting habitat for threatened bat species that utilise or are likely to utilise the site and the design is such that a large amount of potential foraging habitat would be retained and connectivity to surrounding vegetation would also be retained. Given these factors, the proposed development is unlikely to adversely affect microchiropteran bat communities that occur in the locality and further survey is not considered to be necessary given that these conclusions can be confidently drawn from the data that has already been collected.

2.5 Consistency with Director-General's Requirements

The *Director-General's Requirements* (DGRs) for the *Environmental Assessment* (EA) for the proposed residential subdivision at Belle O'Connor Street, South West Rocks (MP08_0167 dated 17th October 2008), covers *Key Issues* which must be addressed. Amongst those Key Issues are matters relating to flora and fauna (Issue No. 9) which include;

- the proposed development incorporates measures to maintain native habitats and resources on the subject site and to ensure their long-viability, both in respect of the project design (by retaining a large area of retained vegetation in the *Conservation Area*) and in management of the project (by implementation of appropriate design and stormwater management treatment measures);
- the protection of approximately 14.3ha of native habitats and vegetation for biodiversity conservation purposes;
- the implementation of a *Vegetation Management Plan* (VMP) within the *Conservation Area* to remove weeds and to control any adverse impacts;
- the provision of supplementary habitat linkages through the subject site by use of the stormwater detention and treatment facilities (detention basins and bio-swales) to provide habitat for the Wallum Froglet and other biota; and
- controls on indirect impacts by the provision of dedicated pedestrian paths and bicycle tracks, by education and signage, and by the avoidance of invasive or inappropriate plant species in landscaping.

In addition, the DGRs require consideration of potential impacts on matters of National Environmental Significance (NES) pursuant to the *Environment Protection & Biodiversity Conservation Act* 1999 (EPBC Act). In that regard, it is noted that *"the Commonwealth Government accredited the NSW environmental assessment process for assessing any impacts of any matters of NES. As a result, if it is determined that an approval is required under the EPBC Act, please contact the Department immediately as supplementary DGRs will need to be issued"*.

The DGRs also require consideration of a number of Guidelines and Policies, and of the *Saltwater Creek & Lagoon Estuary Management Plan* and the *Saltwater Creek Catchment Study*.

The matters raised in the DGRs for the South West Rocks project are considered in Chapter 6 of this *Report*, with environmental management and impact amelioration measures documented in Chapter 7.

3 EXISTING ENVIRONMENT

The subject site at South West Rocks (Lot 52 in DP 831284 and Lot 84 in DP 792945 Belle O'Connor Street, South West Rocks) is approximately 39.9ha in area. The land is generally low-lying with a gentle slope downwards to the northern tributary of Saltwater Creek at its northern boundary (Figure 1). The highest point of the subject site is approximately 6m AHD at the middle of the southern boundary, and the lowest is approximately 1m AHD in the northeastern corner of the site. The majority of the site lies between 4.5m AHD and 2.5m AHD.

The northern tributary of Saltwater Creek is located along the northern boundary of the subject site, which is 1-2 metres wide for the majority of its length within or adjacent to the site. This tributary flows into Saltwater Lagoon (to the northeast of the site). Neither waterbody is, in fact, saline and there is a weir approximately 1,935m downstream of Saltwater Lagoon. Which prevents the incursion of tidal waters. The subject site is low-lying and there are many areas which were water-logged at the time of the surveys, especially in the central and northeastern portions. Saltwater Lagoon forms part of Hat Head National Park which is over 7,500ha in size.

Parts of the subject site have been slashed, especially in the western portion where there are large areas of regenerating heathland. A range of tracks are located across parts of the site, but these are concentrated in the higher ground.

The subject site is located on the urban periphery between the settlements of South West Rocks and Arakoon (Figure 1) on the mid-north coast of NSW (Figure 1). An area of existing large lot residential subdivision is present to the east of the subject site, and Saltwater Lagoon (which is SEPP 14 Coastal Wetland No. 439) is located to the northeast of the site (Figure 1), close to the northeastern corner of the site (Figure 6). The South West Rocks golf course forms the western boundary of the subject site, and an electricity transmission line runs along the southern boundary, along the unsealed section of Belle O'Connor Street. Beyond that to the south, is predominantly cleared agricultural land with scattered trees, some of which has been approved recently for development purposes with the first stage constructed and houses built.

4 FLORA and VEGETATION

4.1 Plant Communities

4.1.1 Vegetation Mapping in This Report

A total of ten vegetation community types have been identified on the subject site during the surveys for this *Report* (Figure 3), including a number of variants of some of the vegetation types:

Vegetation Type 1	Open Forest/Woodland of Needlebark Stringybark
Vegetation Type 2	Open Forest/Woodland of Northern Scribbly Gum
Vegetation Type 3	Open Forest of Broad-leaved Paperbark (Sandplain Variant)
Vegetation Type 4	Open Forest of Broad-leaved Paperbark (Fluvial Variant)
Vegetation Type 5	Low Open Forest/Woodland of Red Mahogany
Vegetation Type 6	Heathland Complex (*Banksia ericifolia* Variant)
Vegetation Type 7	Moist Heathland (*Banksia robur* Variant)
Vegetation Type 8	Moist Heathland (*Leptospermum trinervium* and *Banksia serrata* Variant)
Vegetation Type 9	Sedgeland
Vegetation Type 10	Cleared and Disturbed

Vegetation Type 1 Open Forest/Woodland of Needlebark Stringybark

The upper stratum of this vegetation type is dominated by Needlebark Stringybark *Eucalyptus planchoniana* and Red Bloodwood *Corymbia gummifera*.

The mid-stratum is dominated by Old-man Banksia *Banksia serrata*, Sweet Wattle *Acacia suaveolens*, Lance Beard-heath *Leucopogon lanceolatus var. lanceolatus*, *Persoonia virgata*, *Hibbertia obtusifolia*, Large-leaf Hop-bush *Dodonaea triquetra*, *Polyscias sambucifolia subsp. sambucifolia* and Wedding Bush *Ricinocarpos pinifolius*.

The ground layer is dominated by ferns, grasses, herbs and forbs including Bracken *Entolasia stricta* Wiry Panic *Pteridium esculentum*, Blady Grass *Imperata cyclindica* var. *major*, Blue Flax lily *Dianella caerulea var. product*, Spiny-headed Mat Rush *Lomandra longifolia*, Two-colour Panic *Panicum simile*, *Trachymene incisa subsp. incisa*, *Xanthorrhoea macronema* and *Boronia pinnata.*

This community occurs in the northwestern portion of the site (Figure 3), generally above the 3m AHD contour. The underlying substrate consists of Pleistocene sands that form part of the Clybucca soil landscape unit (Eddie 2000).

This vegetation type has been sampled by Q2 and T2 (Figure 1) and Plate 1 provides a photographic reference of this community.

Despite extensive survey, no threatened flora species were recorded from this community. Further, this vegetation type is not part of any "*endangered ecological community*".

Plate 1 Open Forest/Woodland of Needlebark Stringybark

Vegetation Types 2 Open Forest/Woodland of Northern Scribbly Gum

This vegetation type is dominated by the Northern Scribbly Gum *Eucalyptus signata*, Pink Bloodwood *Corymbia intermedia* and Broad-leaved Paperbark *Melaleuca quinquenervia* in the upper stratum.

The mid-stratum is sparse and comprises of scattered shrubs such as *Polyscias sambucifolia subsp. sambucifolia*, Black She-oak *Allocasuarina littoralis*, *Persoonia virgata*, Large-leaf Hop-bush *Dodonaea triquetra*, Sour Currant Bush *Leptomeria acida* and Broad-leaved Geebung *Persoonia levis*.

The ground layer is diverse, and is grazed by a large number of Eastern Grey Kangaroos. Dominant species include Wiry Panic *Entolasia stricta*, Blady Grass *Imperata cyclindica* var. *major*, Spiny-headed Mat Rush *Lomandra longifolia*, *Trachymene incisa subsp. incisa*, Kangaroo Grass *Themeda australis*, *Microlaena stipoides var. stipoides*, Pale Mat-rush *Lomandra glauca subsp. glauca*, *Pultenaea paleacea var. paleacea* and Swamp Grass-tree *Xanthorrhoea fulva*.

This community adjoins the southern edge of the Open Forest/Woodland of the Needlebark Stringybark community (Figure 3) and generally occurs between the 3m and 4m AHD contours.

This vegetation type has been sampled by Q1 and T1 (Figure 2), and Plate 2 provides a photographic reference of this community.

Despite extensive survey, no threatened flora species were recorded from this community. Further, this community does not form part of any listed "*endangered ecological community*".

Plate 2 Open Forest of Northern Scribbly Gum

Vegetation Type 3 Open Forest of Broad-leaved Paperbark (Sandplain Variant)

The upper stratum of this community predominantly consists of Broad-leaved Paperbark *Melaleuca quinquenervia*. A minor variation occurs in the southern portion of this community with a number of Needlebark Stringybark *Eucalyptus planchoniana* specimens present.

The mid-stratum is generally sparse due to historic rural activities. Dominant species include Fern-leaved Banksia *Banksia oblongifolia*, Large-leaf Hop-bush *Dodonaea triquetra*, *Banksia ericifolia subsp. macrantha*, Cheese Tree *Glochidion ferdinandi var. ferdinandi* and Golden Wattle *Acacia longifolia subsp. longifolia*.

The ground layer consists of Wiry Panic *Entolasia stricta*, Rough Guinea Flower *Hibbertia aspera*, *Ptilothrix deusta*, Swamp Grass-tree *Xanthorrhoea fulva*, NSW Coral Heath *Epacris pulchella*, Two-colour Panic *Panicum simile*, Spiny-headed Mat Rush *Lomandra longifolia* and Raspwort *Gonocarpus teucrioides*.

This community occurs in the central southern portion of the site (Figure 3), and is associated with Pleistocene sands that form part of the Clybucca soil landscape unit (Eddie 2000).

This vegetation type has been sampled by Q7 and T7 (Figure 2), and Plate 3 provides a photographic reference of this community.

Despite extensive survey, no threatened flora species were recorded from this community. This community does not form part of any listed "*endangered ecological community*" (see Chapter 4.3 of this *Report*).

Plate 3 Open Forest of Broad-leaved Paperbark (Sandplain Variant)

Vegetation Type 4 Open Forest of Broad-leaved Paperbark (Fluvial Variant)

The upper stratum of this variant is dominated almost exclusively by the Broad-leaved Paperbark *Melaleuca quinquenervia*, with scattered specimens of Swamp Oak *Casuarina glauca* and Swamp Mahogany *Eucalyptus robusta*.

The mid-stratum is generally absent, although scattered Golden Wattle *Acacia longifolia subsp. longifolia* are present.

The lower stratum is dominated by the Bare-twig Rush *Baumea juncea*, with occasional *Melaleuca thymifolia* and *Leptospermum liversidgei*.

Plate 4 provides a photographic reference of this community.

Vegetation Type 4 is located along the tributary to Saltwater Lagoon (Figure 3), which is located along the northern boundary of the subject site.

Despite extensive survey, no threatened flora species were recorded from this community.

This community does appear to conform to the "*endangered ecological community*" listed as Swamp Scleroplyll Forest on Coastal Flood Plains (SSFCF), as discussed in detail in Chapter 4.3 of this *Report*.

Plate 4 Open Forest of Broad-leaved Paperbark (Fluvial Variant)

Vegetation Type 5 Low Open Forest / Woodland of Red Mahogany

The upper stratum of this vegetation type is approximately 6-10 metres in height, and is dominated by the Red Mahogany *Eucalyptus resinifera subsp. hemilampra*.

The mid-stratum consists of heath species such as Swamp Banksia *Banksia robur*, *Banksia ericifolia subsp. macrantha*, *Leptospermum liversidgei*, Swamp Wattle *Acacia elongata*, Tall Saw-sedge *Gahnia clarkei*, *Persoonia virgata*, *Melaleuca sieberi* and Golden Wattle *Acacia longifolia subsp. longifolia*. The lower stratum is comprised of herbs, forbs, grasses and sedges including Swamp Grass-tree *Xanthorrhoea fulva*, NSW Coral Heath *Epacris pulchella*, Swamp Rice-grass *Leersia hexandra*, Slender Devil's Twine *Cassytha glabella f. glabella*, *Leptocarpus tenax*, Wiry Panic *Entolasia stricta* and Blue Damperia *Dampiera stricta*.

This community occurs in the central eastern portion of the site (Figure 3), and is associated with Pleistocene sands that form part of the Clybucca soil landscape unit (Eddie 2000).

This vegetation type has been sampled by Q6 and T6 (Figure 3) and Plate 5 provides a photographic reference of this community.

Despite extensive survey, no threatened flora species were recorded from this community. This community does not form part of any listed "*endangered ecological community*".

Plate 5 Low Open Forest/Woodland of Red Mahogany

Vegetation Type 6 Heathland Complex *Banksia ericifolia* Variant

This vegetation type occurs over the majority of the eastern and western portions of the site. The community is dominated by *Banksia ericifolia subsp. macrantha*, *Hakea teretifolia* and *Melaleuca sieberi* varying in dominance. Variations within the Heathland Complex are generally based on micro-topographical changes in elevation. This vegetation type occurs on slightly higher ground than the Vegetation Type 7 (see below).

The vegetation on the western portion of the site has been subjected to clearing in the past and is a regenerating form.

The heathland complex is dominated by *Banksia ericifolia subsp. macrantha*, *Hakea teretifolia*, *Melaleuca sieberi*, Old Man Banksia *Banksia serrata*, *Leptospermum liversidgei*, Swamp Wattle *Acacia elongata*, Swamp Grasstree *Xanthorrhoea fulva*, NSW Coral Heath *Epacris pulchella*, *Sprengelia sprengelioides*, *Leptospermum liversidgei*, Fern-leaved Banksia *Banksia oblongifolia*, Ball Honeymyrtle *Melaleuca nodosa*, Scale Rush *Lepyrodia scariosa*, Spreading Rope-rush *Empodisma minus*, Slender Devil's Twine *Cassytha glabella f. glabella*, Wallum Bottlebrush *Callistemon pachyphyllus*, *Lepidosperma neesii*, *Gonocarpus micranthus subsp. ramosissimus*, *Baumea rubiginosa*, *Boronia pinnata*, *Mitrasacme polymorpha*, *Melaleuca thymifolia*, *Schoenus ericetorum*, Swamp Selaginella *Selaginella uliginosa*, *Hibbertia virgata subsp. virgata*, *Xyris complanata* and *Baloskion tetraphyllum subsp. meiostachyum*.

Plate 6 provides a photographic reference of this community.

Despite extensive survey, no threatened flora species were recorded from this community. This community does not form part of any listed "*endangered ecological community*".

Plate 6 Heathland complex *Banksia ericifolia* variant

Vegetation Type 7 Heathland *Banksia robur variant*

This vegetation type occurs in the northeastern portion of the subject site and extends as a finger into the central part of the site (Figure 3). This area is generally low-lying and is dominated by Swamp Banksia *Banksia robur.*

The heathland complex is dominated by Swamp Banksia *Banksia robur, Banksia ericifolia subsp. macrantha*, *Hakea teretifolia*, *Melaleuca sieberi*, Old Man Banksia *Banksia serrata*, *Leptospermum liversidgei*, Swamp Wattle *Acacia elongata*, Swamp Grasstree *Xanthorrhoea fulva*, NSW Coral Heath *Epacris pulchella*, *Sprengelia sprengelioides*, *Leptospermum liversidgei*, Fern-leaved Banksia *Banksia oblongifolia*, Scale Rush *Lepyrodia scariosa*, Spreading Rope-rush *Empodisma minus*, Slender Devil's Twine *Cassytha glabella f. glabella*, Wallum Bottlebrush *Callistemon pachyphyllus*, *Lepidosperma neesii*, *Gonocarpus micranthus subsp. ramosissimus*, *Baumea rubiginosa*, *Boronia pinnata*, *Mitrasacme polymorpha*, *Melaleuca thymifolia*, *Schoenus ericetorum*, Swamp Selaginella *Selaginella uliginosa*, *Hibbertia virgata subsp. virgata*, *Xyris complanata* and *Baloskion tetraphyllum subsp. meiostachyum*.

Plate 7 provides a photographic reference of this community.

Despite extensive survey, no threatened flora species were recorded from this community. This community does not form part of any listed "*endangered ecological community*".

Plate 7 Heathland *Banksia robur* variant

Vegetation Type 8 Heathland *Leptospermum trinervium / Banksia serrata* variant

This vegetation type occurs within the south eastern section of the subject site (Figure 3) within areas slightly elevated from Vegetation Type 6. Within this area the healthland complex grades into vegetation dominated by *Leptospermum trinervium* and *Banksia serrata*.

The heathland complex is dominated by *Leptospermum trinervium,* Old Man Banksia *Banksia serrata, Banksia ericifolia subsp. macrantha*, *Hakea teretifolia*, *Melaleuca sieberi*, *Leptospermum liversidgei*, Swamp Wattle *Acacia elongata*, Prickly Tea-tree *Leptospermum juniperinum*, NSW Coral Heath *Epacris pulchella*, *Sprengelia sprengelioides*, *Leptospermum liversidgei*, Fern-leaved Banksia *Banksia oblongifolia*, Ball Honeymyrtle *Melaleuca nodosa*, Scale Rush *Lepyrodia scariosa*, Spreading Rope-rush *Empodisma minus*, Slender Devil's Twine *Cassytha glabella f. glabella*, Wallum Bottlebrush *Callistemon pachyphyllus*, *Lepidosperma neesii*, *Gonocarpus micranthus subsp. ramosissimus*, *Baumea rubiginosa*, *Boronia pinnata*, *Mitrasacme polymorpha*, *Melaleuca thymifolia*, *Schoenus ericetorum*, Swamp Selaginella *Selaginella uliginosa*, *Hibbertia virgata subsp. virgata*, *Xyris complanata* and *Baloskion tetraphyllum subsp. meiostachyum*.

Plate 8 provides a photographic reference of this community.

Despite extensive survey, no threatened flora species were recorded from this community. This community does not form part of any listed "*endangered ecological community*".

Plate 8 Heathland *Leptospermum trinervium / Banksia serrata* variant

Vegetation Type 9 Sedgeland

This community occurs in the northeastern portion of the site, on land generally below the 2 metre AHD contour and on the southern edge of the Open Forest of Broad-leaved Paperbark – Fluvial Variant (Figure 3).

This vegetation type is dominated by Bare-twig Rush *Baumea juncea*, Angled Lobelia *Lobelia alata*, *Schoenus ericetorum*, *Leptocarpus tenax* and Moth Bladderwort *Utricularia biloba*. Scattered specimens of Wallum Bottlebrush *Callistemon pachyphyllus* were also recorded from this community.

Plate 9 provides a photographic reference of this community.

Despite extensive survey, no threatened flora species were recorded from this community. This community appears to constitute an example of "*endangered ecological community*" listed as Freshwater Wetlands on Coastal Floodplains (FWCF), at least in terms of floristics (see Chapter 4.3).

Plate 9 Sedgeland

Vegetation Type 10 Cleared and Disturbed Land

Areas of land around the existing dwellings in the southern parts of both Lot 52 and Lot 84 Belle O'Connor Street at South West Rocks (Figure 3) have long been modified for residential purposes, including areas which have been cleared of native vegetation and planted for lawns and/or landscaped gardens. There are a number of dwellings or other structures present, as well as access tracks and personal recreation areas.

These parts of the two sites are on the somewhat more elevated land, and do not contain habitat or resources of any particular relevance to native biota.

4.1.2 Vegetation Communities to be removed

Table 2 identifies areas of vegetation to be removed form the subject site (Figure 8). No vegetation will be removed from the Open Forest of Broad-leaved Paperbark (Sandplain Variant), Moist Heathland (*Banksia robur* Variant), or Sedgeland communities.

Table 2 Vegetation Communities – Areas of Removal/Conservation

MU	Vegetation Community	Total Area (ha)	Vegetation to be Conserved (ha)	Vegetation to be Removed (ha)
1	Open Forest/Woodland of Needlebark Stringybark	2.65	2.56	0.09
2	Open Forest/Woodland of Northern Scribbly Gum	5.84	3.37	2.47
3	Open Forest of Broad-leaved Paperbark (Sandplain Variant)	3.76	0.01	3.75
4	Open Forest of Broad-leaved Paperbark (Fluvial Variant)	2.27	2.27	0
5	Low Open Forest/Woodland of Red Mahogany	0.19	0.09	0.1
6	Heathland Complex (*Banksia ericifolia* Variant)	16.15	3.15	12.99
7	Moist Heathland (*Banksia robur* Variant)	1.47	1.47	0.001
8	Heathland (*Leptospermum trinervium* and *Banksia serrata* Variant)	4.58	0.8	3.78
9	Sedgeland	0.62	0.62	0
10	Cleared and Disturbed	2.42	0	2.42

4.1.3 Vegetation Mapping – Other Reports

The vegetation mapping which had been provided in previous *Reports* which included the subject site (Parker & Parker 2002; Kendall & Kendall 2003; Connell Wagner 2004, 2005, 2008) was prepared at a broader scale than that which has been provided in this *Report*. In addition, that vegetation mapping appears to have been based on a vegetation type classification which lacks the refinement of that provided in this *Report*, and did not appear to have been prepared on the basis of extensive walked survey and/or the use of GPS units for accuracy.

In considering *Development Applications* and/or projects proposed on the subject site at South West Rocks, the vegetation mapping provided in this (Environmental InSites) *Report* is preferred, given its higher degree of differentiation of plant communities and its greater accuracy by virtue of its use of GPS technology.

4.2 Native and Introduced Plant Species

A total of 213 plant species have been recorded on the subject site at South West Rocks (Appendix E), including 188 native plant species and 25 (12% of the total) introduced species.

A number of the introduced species are invasive or pernicious weeds, including Crofton Weed, Cobblers Pegs, Quaking Grass, Pampas Grass, Ginger Lilly, Lantana, Blue Passion Flower, Kikuyu, Blackberry and Fireweed.

No threatened plant species have been recorded on the subject during any of the investigations undertaken to date.

4.3 Endangered Ecological Communities

One of the vegetation types on the subject site at South West Rocks, the Open Forest of Broad-leaved Paperbark – Fluvial Variant (Vegetation Type 4), appears to conform to the *Final Determination* of the "*endangered ecological community*" known as *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions* (SSFCF), at least in terms of floristics.

Whether or not the vegetation is located on a "*Coastal Floodplain*" (a "*floodplain*" being a "*level land form pattern on which there maybe active erosion and deposition by flooding where the average interval is 100 years or less*"), is a moot point. Whilst the landscape element on which that vegetation occurs clearly involves a swampy area which is subject to periodic inundation, it does not appear the soils present in that portion of the site, are "*silts, mud, or humic loams soils*". There is thus some considerable doubt as to whether that part of the subject site constitutes a "*Coastal Floodplain*", and therefore whether the vegetation present constitutes the "*endangered ecological community*".

Vegetation Type 4 (the Broad-leaved Paperbark community – Fluvial Variant) is located along and adjacent to tributary to Saltwater Lagoon and in the proposed Conservation Area, which flows across the northern parts of the subject site into the Saltwater Lagoon. That vegetation is of a swampy character, and includes stands and scattered specimens of the Swamp Oak and Swamp Mahogany, both of which are characteristic of the SSFCF community. Similarly, the groundcover stratum is predominantly of the Bare-twig Rush *Baumea juncea*, which is also characteristic of swamp habitats and of the SSFCF community.

By contrast, the areas of Broad-leaved Paperbark Open Forest (Sandplain Variant), which occurs in the southern central parts of the subject site, has a much more xeric character (see below), particularly with respect to the groundcover and mid-stratum layers. Further, the other main canopy species present within this area of Broad-leaved Paperbark Open Forest is the Needlebark Stringybark, which is not a species typical of swamp environments. That eucalypt is not listed as characteristic of the SSFCF in the "*assemblage of species*" identified in the *Final Determination* for that "*endangered ecological community*".

The mid-storey and groundcover layers in these areas of Broad-Leaved Paperbark Open Forest also display more xeric characteristics, particularly given the presence of species such as *Banksia ericifolia*, the Swamp Grass-tree *Xanthorrhoea fulva* and NSW Coral Heath *Epacris pulchella*, and lower densities of sedges and other moisture loving plants in the understorey.

In addition, these areas of the subject site (*ie* those on which the Sandplain Variant of the Broad-leaved Paperbark Open Forest are located) are well above the 1:100 year floodline. They are not, therefore, relevantly part of a "*coastal floodplain*", even if other parts of the subject site closer to the watercourse itself may be considered part of such a "*floodplain*".

The Broad-Leaved Paperbark Open Forest – Sandplain Variant (Vegetation Type 3) located on the subject site at South West Rocks is not an example of the SSFCF community because:

- only a few (7 in total or 12%) of the plant species which are characteristic of the SSFCF community were recorded within that Vegetation Type;
- only a few of the plant species recorded within that Vegetation Type are characteristic of the SSFCF community (16%);
- the Vegetation Type is not of a typical swampy nature, and the understorey reflects the more xeric conditions within this part of the site;
- the Sandplain Variant of the community is not "*associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains*";
- several of the species which are characteristic of Vegetation Type 3 are not swamp plant species, and do not occur in areas where inundation occurs for extended periods of time; and
- that area of vegetation is located well above the 1:100 year floodline, and would therefore not reasonably be regarded even as part of the "*floodplain*" of the tributary.

The sedgeland vegetation present in the northern parts of the subject site may also conform to the "*endangered ecological community*" listed as Freshwater Wetlands on Coastal Floodplains (FWCF). However, identification of that vegetation as constituting the "*endangered ecological community*" is equivocal because:

- only 7 of the plant species present within that area of vegetation are listed in the "*Characteristic Assemblage of Species*" identified in the *Final Determination* for the FWCF community;
- the dominant species located in that community *are not includ*ed *in the "Characteristic Assemblage of Species*"; and
- there are *uncertainities regardi*ng *whether the subject site is loca*te*d on a "coastal floodplain".*

Whether or not vegetation type 4 and 9 do constitute example*s of the "endangered ecological community*" is moot, however, because in both cases the communities are located at some distance from proposed development activities on the subject site at South West Rocks and are located in the proposed Conservation Area. In both instances, the vegetation is separated by a substantial distance of greater that 70m, from development areas. Further, the development design has incorporated management of stormwater volumes and quality so as to avoid adverse impacts on those swamp communities. There is, therefore, no likelihood of a "*significant effect*" being imposed on the "*the endangered ecological community*", even assuming that they are in fact present on the subject site at South West Rocks.

4.4 Threatened Plant Species

As noted above, Environmental InSites has identified 213 flora species on the subject site (Appendix E). No threatened plant species have been recorded on the subject site during the investigations undertaken to date, despite searches for species known to occur in the locality.

Five threatened flora species were recorded in a 10km search of the DECC Wildlife Atlas (2008) around the site (Appendix D). However, the subject site does not contain habitat for any of these species.

5 FAUNA and FAUNA HABITATS

5.1 Fauna Habitats

The subject site and surrounding lands support a range of fauna habitats associated with open forest, swamp forest and wet heathland vegetation. The subject site is also directly connected to forested wetlands and sedgelands associated with Saltwater Lagoon to the northeast. Saltwater Lagoon forms part of Hat Head National Park which is over 7,500 ha in size and contains similar fauna habitats to that of the subject site.

Sections of the subject site, especially within the southwestern portion have been cleared, and these areas generally exhibit lower structural diversity and in turn lower habitat diversity and quality. Grazing mammals such as the Eastern Grey Kangaroo were frequently observed in these areas of the subject site.

In addition to the areas which have been disturbed through regular slashing, there are two areas which are highly modified and degraded around the two existing houses. These areas include lawns and managed gardens, both which provided very limited habitat or resources for most native fauna.

Tree-hollows, which provide roosting/denning habitat for hollow-obligate species, are prevalent throughout the forested sections of the site, predominately within the areas which are dominated by the Scribbly Gum and Broad-leaved Paperbark (in the northwest). The majority of the Scribbly Gums are located outside of the proposed development area but there are some hollows in some of the mature Broad-leaved Paperbarks which are within the development area. However, these hollows are unlikely to be very deep and only provide habitat for a limited number of fauna species.

The closed heath within the central and southern sections of the site provides habitat for a range of bird species (particularly honeyeaters and finches), native rodents (such as the Swamp Rat), reptiles and amphibians. This vegetation occurs on gently sloping terrain, with the lower areas towards the tributary to Saltwater Lagoon in the northern portion of the site, containing small ephemeral ponds vegetated by sedges. These ephemeral ponds provide potential breeding habitat for the Wallum Froglet, although this species was not recorded within the subject site during the current survey, despite intensive surveys. Wallum Froglets were recorded calling to the south of the subject site, within a flooded paddock.

There are no rock outcrops or other similar features present on the site, and no major pools or ponds.

Those areas of the subject site which are proposed for development activities include the existing disturbed and modified portions of the subject site, as well as much of the vegetation that has been subjected over a long period to slashing, grazing and/or the creation of access tracks. Additionally, only a very small area of forest vegetation will be removed or affected by the proposal, and that is of lower conservation value than those portions of the site which have been identified as both of high conservation value and worthy of protection and retention (particularly along the northern part of the subject site as part of the proposed Conservation Area).

5.2 Fauna Assemblage

Targeted and opportunistic fauna surveys undertaken by Cumberland Ecology (2008) and Environmental InSites, have recorded 134 native fauna species within the subject land, including 21 mammals, 98 birds, and 11 amphibians (Appendix F). In addition, four introduced species have been recorded on the site.

Surveys of the subject site have identified ten threatened fauna species listed on the TSC Act (see Chapter 5.3) including the Wallum Froglet, Squirrel Glider, Grey-headed Flying Fox and several microchiropteran bats (Figure 4). Most of the threatened fauna species identified within the subject site (with the exception of Wallum Froglet) are forest-dependent, and would not be affected to any significant extent by the proposed development, as the forested sections of the subject site are largely to be retained in a Conservation Area.

As noted in Chapter 2 of this *Report*, the cumulative survey effort for fauna more than satisfies the *Draft Guidelines* (DEC 2004) for threatened biota.

5.2.1 Birds

The avifauna recorded on the subject site consists of a mixture of species generally recorded in areas of coastal woodland and heath in the region. The species recorded reflect the variety of foraging resources (such as insects, (Appendix F) seeds, fruit, nectar, sap, lerps, manna and small vertebrates) and nesting habitats (such as the few hollow-bearing trees and dense heathland) present within the subject site and on adjoining lands (especially around Saltwater Lagoon).

Four broad guilds of birds were identified during the survey, including:

- a few waterbirds utilising the tributary and areas of standing water;
- large and more aggressive species which prey on vertebrates and large invertebrates, and which cover large distances while foraging (*eg* the Brahminy Kite, Brown Falcon, Southern Boobook and Kookaburra). These birds generally have large home ranges;
- granivorous and nectarivorous terrestrial species which utilise forests and heathlands (*eg* the Rainbow Lorikeet, Scaly-breasted Lorikeet and the wattlebirds); and
- smaller and more cryptic terrestrial birds which utilise dense heath for shelter (*eg* the Superb Fairy Wren, Eastern Spinebill and the smaller honeyeaters).

Despite surveys over two seasons, however, no bird listed as a "*threatened species*" on the TSC Act have been recorded on the subject site, although Cumberland Ecology (2008) did record possible feeding signs of the Glossy Black Cockatoo, which is listed as "*Vulnerable*" on the TSC Act. The chewed she-oak cones, which indicate the presence of the Glossy Black Cockatoo, were located in woodland in the northern part of the site, although the resources available for Glossy Black Cockatoos on the subject site are extremely limited in distribution and abundance.

A number of threatened bird species have been recorded in the vicinity of the subject site during the current field surveys, including several observations of the Osprey flying over Saltwater Lagoon and near the Macleay River, and a pair of Black-necked Storks (or Jabirus) within Saltwater Lagoon. The conservation significance of the subject site and its relevance for these threatened bird species is discussed in further detail in Chapter 5.3 of this *Report*.

5.2.2 Reptiles

No reptile species were recorded on the subject site during the field surveys, despite investigations by several ecologists over a number of years. However, it is likely that a range of widespread and abundant reptile species would occur on the subject site on occasions, given the vegetation, the depth of leaf litter in place and the availability of water.

It is not considered likely that any threatened reptile species would occur on the subject site, given the habitats and resources present.

5.2.3 Amphibians

During the field investigations, 11 amphibian species were recorded on the subject site or along tributary to Saltwater Lagoon (Appendix F).

Cumberland Ecology (2008) sighted the Wallum Froglet *Crinia tinnula* in the forest community within the *Conservation Area* (Figure 4), and heard the species calling from the woodland areas in the north of the site.

Environmental InSites undertook extensive targeted field surveys for the Wallum Froglet in May 2008 during mild calm conditions following rain, which are considered optimum for targeting this species (Appendix F). Call playback was undertaken at 54 sites both within the subject site and in the local area. No Wallum Froglets were heard calling within the subject site, although they were recorded calling in low numbers to the south and previous records to the north.

No other threatened amphibian species has been identified on the land, and none are considered likely to be present given the nature of the site and the habitats present.

The conservation significance of the subject site and its relevance for the Wallum Froglet is discussed in further detail in Chapter 5.3.

5.2.4 Mammals

The habitats and resources within the subject site support a variety of mammal species, with a total of 24 species recorded during the field investigations, including 21 native and 3 introduced mammal species (Appendix F). Of the native species identified, one utilises arboreal habitats, five are predominantly terrestrial and thirteen are aerial species.

The open forest and woodland communities provide habitats and resources for arboreal mammal species, such as the Common Brushtail Possum and the Squirrel and Sugar Gliders. These arboreal marsupials, all frequently recorded throughout the forested areas in the region, utilise tree-hollows as dens and exhibit varying levels of tolerance to disturbance.

Individuals of the Squirrel Glider were recorded during the tree-mounted Elliott trap survey (Cumberland Ecology 2008, Appendix B) in the northwestern section of the site, within the *Conservation Area* (Figure 4). This species was also recorded on several nights during spotlighting surveys within the Open Forest community, most of which is within the *Conservation Area*. There are few hollow-bearing trees within the Needlebark Stringybark Open Forest (Figure 3), but tree-hollow resources for the species are present within the Northern Scribbly Gum Open Forest/Woodland and the Broad-leaved Paperbark Open Forest (Sandplain Variant) communities.

Large macropods, including the Eastern Grey Kangaroo and Swamp Wallaby, were recorded during the field investigations on the subject site. These species graze on the grasses and understorey species of the forests and woodlands of southeastern Australia. Small terrestrial mammals, (the Northern Brown Bandicoot, Dusky Antechinus and Swamp Rat), were also recorded. Such species are common residents of bushland in the locality, and are relatively disturbance-tolerant, utilising resources in the vicinity of residential development.

Flying-foxes and microchiropteran bats are generally highly mobile and wide-ranging species, and are unlikely to be dependent on a single area of bushland for their foraging requirements. Whilst a variety of such species (Appendix F) utilise the site for foraging purposes, critical roosting resources for many of the species (particularly caves or tree-hollows) are either not present on the site, or are present only in relatively small numbers (tree-hollows). Many of the hollow-bearing trees present are in areas of vegetation to be retained within the forest communities.

Three introduced mammal species were recorded on the subject site – the European Rabbit, Black Rat and Domestic Mouse (Appendix F). Rabbits are known to compete with many native herbivorous mammals for foraging resources and can cause high levels of disturbance within the understorey. The introduced Black Rat also predates on the eggs of native birds.

5.3 Threatened Species

5.3.1 General Considerations

Ten threatened fauna species have been recorded, primarily within the northern portion of the subject site during the field surveys of 2007 and 2008 (the Yellow-bellied Sheath-tail Bat, Eastern Free-tail Bat, Hoary Wattled Bat, Little Bent-wing Bat, Greater Broad-nosed Bat, Eastern Cave Bat, Squirrel Glider, Grey-headed Flying Fox, Wallum Froglet and Glossy Black Cockatoo). All of the "*threatened species*" which have been recorded are listed as "*Vulnerable*" on Schedule 2 the TSC Act.

Other threatened fauna species known to occur in the general vicinity (*eg* the Osprey, Black-necked Stork and other microchiropteran bats) could potentially utilise the subject site, particularly given its connectivity with larger tracts of vegetation in the vicinity, especially Saltwater Lagoon. The subject site only contains marginal or limited foraging habitat for these species, however, and the vegetation present is not regarded as of particular value or significance for any such species given the extent of other more appropriate habitat and resources present in the locality.

Table 3 Threatened fauna recorded on the subject site or on immediately adjoining land.

Species	Habitat Requirements	Records	Significance of Site
Yellow-bellied Sheath-tail Bat	Forages in a diverse range of habitats; roosts in tree-hollows	Ultrasonic call detection (Anabat)	Small loss of foraging habitat; few hollow-bearing trees to be removed; substantial habitat retained within the *Conservation Area* and Reserves in the locality
Eastern Free-tail Bat	Forest and woodland for foraging; tree-hollows for roosting	Ultrasonic call detection (Anabat)	Small loss of foraging habitat; few hollow-bearing trees to be removed; substantial habitat retained within home range in the *Conservation Area* and Reserves in the locality
Hoary Wattled Bat	Open forest and woodland and coastal scrub; roosts in tree-hollows in eucalypts	Ultrasonic call detection (Anabat)	Small loss of foraging habitat; few eucalypt hollow-bearing trees to be removed; substantial habitat retained within the *Conservation Area* and Reserves in the locality
Little Bent-wing Bat	Well timbered areas; roosts in caves	Ultrasonic call detection (Anabat)	Small loss of foraging habitat; no roosting habitat available; substantial habitat retained within the *Conservation Area* and Reserves in the locality
Greater Broad-nosed Bat	Prefers moist gullies; roosts in hollow tree trunks and branches	Ultrasonic call detection (Anabat)	Small loss of limited foraging habitat; few hollow-bearing trees to be removed; substantial habitat retained within home range in the *Conservation Area* and Reserves in the locality
Eastern Cave Bat	Tropical mixed woodland and wet sclerophyll forest; roosts in caves	Ultrasonic call detection (Anabat)	Small loss of foraging habitat; no roosting habitat available; substantial habitat within the *Conservation Area* and Reserves in the locality
Grey-headed Flying Fox	Variety of habitats; roosts in large camps	Visual sighting	No camps were recorded; small loss of foraging habitat; substantial habitat retained within the *Conservation Area* and adjoining Reserves in the locality
Squirrel Glider	Forest and woodland for foraging; tree-hollows for	Recorded in Open Forest via Elliot trapping and	The majority of the eucalypt forest is to be retained within the *Conservation Area*; small loss of

	nesting or denning	spotlighting	foraging habitat
Wallum Froglet	Paperbark swamps and sedgelands	Visual and aural	Small loss of foraging habitat; all potential breeding habitat to be retained in the *Conservation Area*; breeding and refuge habitat is available in adjoining Conservation Reserves
Glossy Back Cockatoo	*Allocasuarina* forest for foraging; large tree-hollows for nesting	Feeding signs only	Very limited loss of foraging habitat; substantial habitat retained within the *Conservation Area* and Reserves in the locality

Yellow-bellied Sheath-tail Bat *Saccolaimus flaviventris*

The Yellow-bellied Sheath-tail Bat roosts singly or in groups of up to six, in tree-hollows and buildings. This species flies high and fast over forested canopies when foraging, except in open country. it forages across a broad range of habitats but defends its aerial foraging space. Its seasonal movements are unknown, but there is speculation about a migration to southern Australia in late summer and autumn (DEC 2005).

The Yellow-bellied Sheath-tail Bat was recorded within the subject site by ultrasonic call detection. The majority of hollow-bearing trees are to be retained within the forest communities in the northern portion of the subject site, which is to be retained for conservation purposes under the proposed development plan (Figure 3). Consequently, most of the potential roosting habitat for the Yellow-bellied Sheath-tail Bat will be retained, along with extensive areas of potential foraging habitat.

Eastern Free-tail Bat *Mormopterus norfolkensis*

The Eastern Free-tail Bat is a tree-dwelling (Allison & Hoye 1995) insectivorous bat which is often located in dry eucalypt forest and coastal woodlands, although individuals have also been captured within riparian zones, wet sclerophyll forest and rainforest (Allison & Hoye 1995). This species forages above the canopy or in unobstructed corridors in open areas (Strahan 1995) on either winged or wingless ants (Allison 1989). This species has been recorded roosting in small colonies in hollows or under loose bark (Australian Museum 2004).

The Eastern Free-tail Bat was recorded on the subject site by ultrasonic detection. As for the Yellow-bellied Sheath-tail Bat, the retention of most of the hollow-bearing trees within the forest communities in the northern portion of the subject site will retain most of the potential roosting habitat as well as extensive areas of potential foraging habitat for this species.

Hoary Wattled Bat Chalinolobus nigrogriseus

In NSW, the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common (DEC 2005). Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat (DEC 2005).

The Hoary Wattled Bat was recorded within the subject site by ultrasonic call detection (Cumberland Ecology 2008). Habitat for this species will be retained within the forest communities in the northern parts of the subject site, which is to be retained for conservation purposes under the proposed development plan (Figure 3).

Little Bent-wing Bat *Miniopterus australis*

The Little Bent-wing Bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges or in similar structures. This species breeds in large aggregations in a small number of known caves, and may travel hundreds of kilometres from feeding home ranges to breeding sites (Law 1996; Wilson 1982).

The Little Bent-wing Bat has a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub, where it forages below the canopy for insects (DEC 2005).

The Little Bent-wing Bat was recorded within the subject site by ultrasonic call detection (Cumberland Ecology 2008). No roosting habitat for this species is present within the subject site, and the forested sections of the site are likely be of sub-optimal quality given the species' preference for moist eucalypt forests.

Greater Broad-nosed Bat *Scoteanax rueppellii*

The Greater Broad-nosed Bat is found in a variety of habitats ranging from woodlands, to moist and dry eucalypt forest and rainforest (Hoye & Richards 1995). This species prefers open habitats in which the animals can fly straight and direct, and is known to utilise artificial openings in forests, with favoured habitats being river and creek corridors (Hoye & Richards 1995). Individuals have been recorded roosting in tree-hollows, cracks and fissures in the trunk and boughs of stags, and under exfoliating bark. A recent study on the north coast of NSW by Campbell (2001) found roosting habitat in a *Melaleuca* swamp woodland habitat (Wallum) in areas of low relief.

The Greater Broad-nosed Bat was recorded within the subject site by ultrasonic call detection (Cumberland Ecology 2008). Habitat for this species will be retained within the forest communities in the northwestern section of the subject site, which is to be retained as a *Conservation Area* under the proposed development plan (Figure 3).

Eastern Cave Bat Vespadelus troughtoni

The Eastern Cave Bat is a very poorly known species. It is a cave-roosting bat that is usually found in dry open forest and woodland near cliffs or rocky overhangs (DEC 2005). It has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals (DEC 2005). It is also occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour (DEC 2005).

The Eastern Cave Bat was recorded within the subject site by ultrasonic call detection (Cumberland Ecology 2008). No roosting habitat is present within the subject site. Potential foraging habitat occurs within the forested sections of the subject site, which will be retained as part of the proposed development (figure3).

Grey-headed Flying Fox *Pteropus poliocephalus*

The Grey-headed Flying Fox forages in a variety of habitats including wet and dry sclerophyll forests and paperbark swamps. This species roosts in large camps during the summer, and animals usually disperse during winter.

The Grey-headed Flying Fox was recorded by spotlighting and calls during evening feeding activities by Cumberland Ecology (2008). No roost sites or 'camps' of this species have been recorded on the subject site, although individuals or small groups could temporarily camp on the site.

Foraging resources for the Grey-headed Flying Fox are particularly provided by the flowering paperbarks and by some of the eucalypts on the site. Flying foxes have a nightly feeding range of 20km to 50km (Churchill 1998), and the subject land thus represents only a minute portion of the species' foraging range.

Squirrel Glider *Petaurus norfolcensis*

The Squirrel Glider utilises a variety of open forest communities and woodland vegetation within eastern NSW, and relies on moderate-sized tree-hollows for den sites. This species generally occurs in small family groups scattered though large areas of open forest and woodland, although populations are also known to occupy modified woodland and open forest patches though urban environments.

The Squirrel Glider was recorded within the forested section of the subject site by Cumberland Ecology (2008) in the area to be retained. Habitat and resources for the Squirrel Glider will be retained as part of the proposed development.

Wallum Froglet *Crinia tinnula*

Wallum Froglets are confined to acid swamps of the 'Wallum' (sand plain swamp) country (Cogger 1996), inhabiting swamps with a pH reading between 4.3 and 5.2 (Barker *et al* 1995). Characteristic vegetation of these areas includes paperbark forests and woodlands, swamp heaths and sedgelands. These areas generally derive their acidity from humic acids leached by groundwater passing through organic layers on and below the sand. The acidic groundwater 'breaks out' in swales and other depressions.

Only a few frog species, including the Wallum Froglet, appear to be able to tolerate the acidic conditions, whereas other more common species are excluded from these areas because of their intolerance of acids. Conversely, these Wallum species do not appear to readily compete with other frog species in neutral water conditions.

Breeding generally occurs in late winter following rainfall. Information is limited for wild populations, but studies that have been undertaken indicate that single eggs are attached to fine submerged stems of grasses or reeds, with tadpoles appearing approximately 6 days thereafter (Anstis 2002).

Within the subject site, small sedge ponds within the closed heath, such as those within the northern section of the subject site (within the *Conservation Area*), are good breeding habitat for the Wallum Froglet. Some marginal habitat may exist within the development area, during periods of heavy rainfall.

The core refuge and breeding habitat for this species is within the wet heath and sedgeland areas, located in the northern portion of the subject site, contained wholly within the *Conservation Area*. Non-breeding areas which may be utilised by this species during periods of heavy rainfall would also include the forested areas with an open groundcover layer in the *Conservation Area* in the northwest of the site. Flooded paddocks to the south of the subject site also constitute suitable habitat for the species, and the Wallum Froglet was heard calling from this area during the current survey.

This species was recorded within the subject site by Connell Wagner (2003) and by Cumberland Ecology in 2007 in the northern portion of the site. Despite intensive surveys in appropriate weather conditions in May 2008 (this study), however, the Wallum Froglet was not located within the subject site during the current survey period.

The distribution of the local population for this species is likely to include land to the north and south of the subject site and around Saltwater Lagoon, where they were heard calling during the May 2008 surveys. The Wallum Froglet has also been recorded within vegetation of Hat Head National Park to the south and within the Saltwater Lagoon Reserve to the east of the subject site (NPWS Wildlife Altas). Beyond this, there is large area of potential Wallum Froglet habitat within the South West Rocks locality, particularly in Hat Head National Park, approximately 2 to 3 kilometres south of the subject site.

Glossy Black Cockatoo *Calyptorhynchus lathami*

This species inhabits woodlands and open forests on low nutrient soils characterised by a middle stratum with abundant *Allocasuarina* (she-oaks) on which the species is dependent for food. The Glossy Black Cockatoo breeds in either dead or live hollow-bearing trees (in very large tree-hollows) within woodlands or remnant woodlands. Roosts are in the canopy of leafy eucalypts less than one kilometre from the feed site and within 30 metres of the nesting tree (Higgins 1999).

Suitable food trees (*Allocasuarina* spp.) for the Glossy Black Cockatoo only occur across the site in low numbers, and there is consequently only very limited foraging resources for the species within the subject site.

The Glossy Black Cockatoo was identified by the presence of chewed cones of the Forest She-oaks within the woodland areas of site within the conservation lands.

6 IMPACT ASSESSMENT

6.1 General Considerations

The proposed development of the subject site at South West Rocks for a residential development (Figure 2) will involve the removal of approximately 24.95ha of mostly heathland and Broad-leaved Paperbark Open Forest/Woodland. A tributary to Saltwater Lagoon runs in an easterly direction along the northern boundary of the subject site, but is located at least 150m from the development area. The extent of the proposed development area is more than 50m beyond the 1:100 year flood contour (Figure 1).

The majority of the vegetation which is to be removed from the proposed development portions of the subject site at South West Rocks is either one of the several forms of low heath (including areas which have been regularly affected by agricultural activities) and/or areas of modified Paperbark Forest (Sandplain Variant) in somewhat more elevated parts of the site. These plant communities and habitat types are widespread in the general locality, and are extremely well represented in the extensive coastal conservation reserves in the area, including in the nearby Hat Head National Park (which occupies 7,524ha).

Whilst the proposed development (as noted above) will require the removal of areas of native vegetation from the subject site, there are a number of relevant considerations in assessing the potential or likely impacts of the proposal, including:

- the proposed development also incorporates measures to maintain native habitats and resources on the subject site and to ensure their long-viability, both in respect of the project design (by retaining a large area of retained vegetation in the *Conservation Area*) and in management of the project (by implementation of appropriate design and stormwater management treatment measures);
- the protection of 14.3ha of native habitats and vegetation for biodiversity conservation purposes within the Conservation Area;
- the implementation of a *Vegetation Management Plan* (VMP) within the *Conservation Area* to remove weeds and to control any adverse impacts (Appendix G);
- the provision of supplementary habitat linkages through the subject site by use of the stormwater detention and treatment facilities (detention basins and bio-swales) to provide habitat for the Wallum Froglet and other biota; and
- controls on indirect impacts by the provision of dedicated pedestrian paths and bicycle tracks (Figure 2), by education and signage, and by the avoidance of invasive or inappropriate plant species in landscaping.

The proposed development includes a playground within the *Conservation Area* (Figure 2), in an area of open woodland with limited or disturbed (slashed) understorey. The playground will be placed within a natural setting and no removal of mature trees is required (other than safety reasons). Playgrounds are permissible within the proposed *7(b) - Environmental Protection (Habitat) Zone* for this area.

The proposed development also includes the retention of approximately 14.3 hectares of high quality habitat along the tributary to Saltwater Lagoon. This *Conservation Area* includes several vegetation types including, open forest, sedge and heath communities. Formal bicycle and pedestrian paths are proposed within the *Conservation Area*, which may also include seating at appropriate locations with limited impacts to vegetation. It is proposed that the provision of these paths will discourage the creation of informal tracks through the *Conservation Area*, which has the potential to impact on the environs of the area.

As discussed in detail above (Chapter 5), the subject site at South West Rocks is characterised predominantly by heathland vegetation with varying extents of disturbance, mainly due to a regular slashing regime, especially in the western portion. Open Forest and Woodland is present in the more

elevated parts of the site, particularly in the northwest, the majority of which will be retained for conservation purposes. Other vegetation within the subject site includes sedgeland and fluvial vegetation at the lower elevations of the site, which will also be retained.

The proposed development includes the construction of two 15 metre wide swales through the development area (Figure 2; Appendix A). The plantings within these swales have been designed on the basis of advice from Whelans InSites, involving appropriate flora species to provide habitat links for the Wallum Froglets to move through the landscape as required.

It is acknowledged that the site is identified as forming part of a regional corridor (Scotts 2003) although the east-west link that this corridor is indicated to provide is not functional as there is no continuity in vegetation in this area. As shown in Figure 9, the corridor is indicated to cross the suburban areas of South West Rocks and the golf course to the west before arriving at the subject site and due the lack of functionality further consideration of this "regional corridor" is not warranted. The subject site provides part of a linkage between Saltwater Lagoon to the north and vegetation within Hat Head National Park to the south. This linkage would be maintained as part of the proposed development.

With the exception of providing north-south linkages for amphibians there is limited forested connection between the subject site and the adjoining sites to the north and south. There are several residential developments proposed to the south of the site and on Phillip Drive which are likely to further fragment any existing north south corridor.

In addition to the swales through the development area (which retain north-south linkages) the proposal also retains existing east-west linkages through the retained land in the *Conservation Area*. However, given that the subject site adjoins a Golf Course to the west and residential beyond that, the east-west linkage does not continue beyond the western boundary of the subject site. Examples of all native vegetation present on the subject site are retained within the *Conservation Area*, providing a range of fauna habitats in this *Area*.

The proposed development (Figure 2) includes a perimeter road along the boundary to the *Conservation Area*. No residential development activities will be located outside the proposed perimeter road, which provides a clearly defined boundary.

Given those circumstances, and given the large areas of forested and riparian areas to be retained, it cannot be construed as likely that development of the land as proposed would adversely affect native biota (flora, fauna, habitats or communities) to any significant or relevant extent.

It is also to be noted that the potential impacts arising or which may arise from development of the subject land as proposed are to be considered in the light of the impact amelioration and environmental measures for the project, which are detailed in Chapter 8 of this *Report*. It is also to be assumed and anticipated that development of the site (including all necessary excavation, land clearing, construction and bushfire management requirements) will be undertaken in an environmentally sensitive manner, applying all appropriate current "*best practice*" methods and measures to maintain water quality (including with respect to possible acid sulphate soils), to protect adjoining natural vegetation, and to control sediment discharge and runoff.

6.2 Part 3A Considerations

6.2.1 Director-General's Requirements

The *Director-General's Requirements* (DGRs) for the residential subdivision on the subject site at South West Rocks have been received from the Department of Planning (Ref 08_0167). The DGRs were provided pursuant to Part 3A of the EP&A Act, and identify *inter alia* that the *Environmental Assessment* for the proposal must include:

- *"consideration of impacts, if any, on matters of National Environmental Significance, pursuant to the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*";

- "*consideration of the consistency of the project with the objects of the Environmental Planning and Assessment Act 1979*";
- "*a draft Statement of Commitments, outlining environmental management, mitigation and monitoring measures to be implemented to minise any potential impacts of the project*"; and
- a specific assessment of impacts on flora and fauna including:
    - to "*assess the potential direct and indirect impacts of the development on flora and fauna taking into consideration impacts on any threatened species, populations, ecological communities and/or critical habitat and any relevant recovery plan in accordance with 'DECC's Guidelines for Threatened Species Assessment (2005)'. Provide measures for the conservation of flora and fauna, where relevant.*
    - to "*outline measures for the conservation of existing wildlife corridor values and/or connective importance of any vegetation on the subject land"*;
    - to *"address measures to protect and manage the riparian corridor and adjacent aquatic habitats"*; and
    - to "*address the impacts of any native vegetation clearing including details of an offset strategy, where relevant, to ensure that there is no let loss of native vegetation".*

With respect to the assessment of flora and fauna issues regarding the proposed development, the DGRs identify two *State Government Technical and Policy Guidelines* that need to be addressed:

- the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities. Working Draft* (DEC 2004); and
- the *Draft Guidelines for Threatened Species Assessment Under Part 3A of the Environmental Planning & Assessment Act 1979* (DEC 2005).

6.2.2 Objects of the EP&A Act

The relevant "*objects*" of the EP&A Act with respect to ecological issues are:

- "*the proper management, development and conservation of natural and artificial resources ... for the purpose of promoting the social and economic welfare of the community and a better environment*";
- "*the promotion and co-ordination of the orderly and economic use and development of land*";
- "*the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats*"; and
- the achievement of "*ecologically sustainable development*".

Given those considerations, the proposed development on the subject site at Belle O'Connor Street, South West Rocks satisfies the "*objects*" of the EP&A Act, particularly with respect to:

- the conservation of biodiversity in New South Wales;
- the protection and conservation of threatened biota and their habitats; and
- the achievement of "*ecologically sustainable development*" (ESD) outcomes.

In this latter regard, the proposed development does not contravene the *Precautionary Principle*, which is one of the underlying principles of ESD. In particular, the proposal incorporates appropriate "*measures to prevent environmental degradation*" designed to avoid "*threats of serious or irreversible environmental damage*".

6.2.3 Draft DECC Guidelines

The investigations of the subject site at South West Rocks, including the incorporation of information from other sites in the vicinity, satisfactorily address the survey and assessment *Guidelines* for threatened biota prepared by the (then) Department of Environment & Conservation (DEC 2004, 2005).

The *Guidelines for Threatened Species Assessment*, prepared by the Department of Environment & Conservation (DEC)[2] and the Department of Primary Industries (DPI) for assessments pursuant to Part 3A of the EP&A Act, have been addressed above with respect to the assessment and evaluation of likely impacts of the proposed development.

In particular, the *Draft Guidelines* (DEC 2005) identify a number of "*steps in the assessment process*", including:

- Step 1 – *Preliminary Assessment*, which *"is primarily a desktop assessment involving searches of relevant databases .. and literature reviews to identify a list of threatened species which could potentially occur In the area*";
- Step 2 – *Field Survey and Assessment*. The conduct of those surveys is also discussed in the *DEC Draft Guidelines*, and has been addressed in this *Report* in Chapters 2, 3 and 4;
- Step 3 – *Evaluation of Impacts* (which is the subject of this Chapter of the *Report*);
- Step 4 – *Avoid, Mitigate and Then Offset*, which involves "*the description and justification of measures to mitigate any adverse effects*" (as discussed in Chapter 8 of this *Report*); and
- Step 5 – *Key Thresholds* (which is also discussed in this Chapter of the *Report*).

Step 3 of the DEC *Draft Guidelines* (2005) indicate that the "*magnitude and extent of impacts*", and their significance is "*related to the conservation importance of the habitats, individuals and populations likely to be affected*" by the proposal. The *Draft Guidelines* state that the "*impacts will be more significant*" if:

- "*areas of high conservation value are affected*"; or
- "*individuals animals, and/or plants and/or sub populations that are likely to be affected by the proposal play an important role in the long-term viability of the species, population or ecological community*"; or
- "*habitat features that are likely to be affected by the proposal play an important role in maintaining the long-term viability of the species, population or ecological community*"; or
- "*the duration of impacts are long-term*"; or
- "*the impacts are permanent and irreversible*".

Areas of High Conservation Value

The proposed development of the subject site has concentrated development activities within those portions of the subject site which have been assessed in this *Report* as having lower conservation values by virtue of:

- the nature of the vegetation types present; and/or
- previous and existing disturbance; and/or
- the relevance of those areas of vegetation to threatened biota known or expected to occur in the general locality.

The approach which has been adopted coincides to some extent with areas affected by the 1:100 year floodline, at least in the northeastern part of the subject site which is proposed to be retained as a

[2] The DEC is now the Department of Environment & Climate Change (DECC).

Conservation Area. This area contains vegetation which (in part at least) may constitute the "*endangered ecological community*" known Swamp Sclerophyll Forest on Coastal Floodplains (SSFCF), adjacent to tributary. This portion of the subject site also contains the core and important habitat for the Wallum Froglet (see Chapter 6), being that area to which the species would retreat during periods of drought and within which it would be capable of breeding.

The *Conservation Area* which runs across the northern parts of the subject site also contains the Open Scribbly Gum Woodland vegetation (in the northwestern part of the site) which is known to provide habitat and resources for the Squirrel Glider, Grey-headed Flying Fox and microchiropteran bats. This area represents the greatest extent of woodland and open forest habitat present on the subject site, and constitutes the majority of suitable habitat for these species on the site.

Given those considerations, the majority of the "*areas of high conservation value*" on the subject site have been retained in the *Conservation Area* across the northern part of the site. The development activities on the site are appropriately located in areas of greater disturbance or modification and or in areas of lower conservation value.

Importance of Individual Biota

As noted above, most of the important and significant habitats and resources for the relevant threatened biota are to be maintained within the *Conservation Area* across the northern parts of the subject site at South West Rocks (Figure 2). Furthermore, for those threatened species known or likely to occur on the subject site at South West Rocks, there are substantial areas of suitable habitat and resources in the immediate vicinity and general locality, including extensive areas of potentially suitable habitat and resources within the adjoining Saltwater Lagoon Reserve and nearby Hat Head National Park.

With specific reference to the various threatened species known to occur on the subject site at South West Rocks:

- the overwhelming majority of suitable habitat for the Squirrel Glider (including most of the hollow-bearing trees on the subject site), is contained within the *Conservation Area* in the northern parts of the subject site, particularly in the northwest. It is not likely that individuals of that species would be adversely affected by the proposed development of the site such that the "*long-term viability*" of that species and/or "*local population*" of the species would be adversely affected;
- similarly, most of the suitable foraging resources and habitat of particular value for microchiropteran bats will be retained within the *Conservation Area*. Whilst some bat species are known to utilise heathland habitats for foraging purposes to some extent, the retention both of a significant area of those communities on the subject site in the Conservation Area as well as a substantial extent of suitable foraging habitat and resources throughout the general locality will ensure that individuals of those species are not so affected as to reduce the "*viability*" of any local populations. In addition, few roosting resources for microchiropteran bats will be removed from the development portion of the subject site;
- the most important and critical habitat for the Wallum Froglet on the subject site (being the lowest elevation moist heath vegetation in the northeastern part of the site) is to be retained and protected both by its inclusion in the *Conservation Area* and its separation from the development footprint, and by the implementation of appropriate water quality management and hydrological regimes within the development to ensure the maintenance of that vegetation as suitable habitat for the Wallum Froglet. In this regard, it is not considered likely that individuals of the species would be so adversely affected by the proposed development as to render the "*local population*" of that species at risk. Furthermore, a drainage swale planted with sedges and appropriate herb species is to be constructed through the centre of the eastern part of the proposed development to provide a link for the Wallum Froglet, should there be any movement through the landscape; and
- the subject site contains only very limited resources for Glossy Black Cockatoos, and this species is highly mobile and wide-ranging. On that basis, the loss of some small areas of

Allocasuarina from the subject site will not adversely affect either individuals or a "*local populatio*n" of that species.

Given the considerations above, and the implementation of an appropriate management regime within the *Conservation Area* on the subject site at South West Rocks, it is the opinion of the authors of this *Report* that development of the subject site as proposed, with its integrated environmental impact amelioration and environmental impact measures, does not represent an activity likely to have an significant adverse impact upon either "*individual animals and/or plants and/or subpopulations*" of threatened biota or on "*the long-term viability of the species, population, or ecological community*".

Importance of Habitat Features

The subject site contains a range of habitat features most of which have been retained in the *Conservation Area* along the northern boundary of the site. The following habitat features are to be retained within the *Conservation Area*:

- breeding, foraging and shelter habitat for the Wallum Froglet;
- nesting and foraging habitat for the Squirrel Glider;
- foraging resources for the Glossy-black Cockatoo;
- hollow-bearing trees within the woodland communities; and
- representation of all vegetation community types recorded on the subject site;

Those areas of the subject site at South West Rocks which are proposed for development activities support some of the vegetation types and habitat resources which are present in the *Conservation Area* on the site. However, the areas on the site proposed for development activities do not contain habitat or resources that will not be retained within the *Conservation Area*, and are in many instances modified or disturbed in any case.

The array of investigations which have been undertaken on the subject site demonstrate that the development will not involve the removal any wildlife habitats or the loss of any resources which are regarded as of particular "*importance*" for any native, including threatened, species. In addition, the creation of the *Conservation Area* will ensure that the relevant "*habitat features*" of the subject site are retained and managed in perpetuity for biodiversity purposes.

Duration of Impacts

Obviously within the development area, the impacts (in terms of the removal of habitat and resources) will be permanent.

However, the development has been designed and is to be undertaken in an environmentally sensitive manner which avoids the imposition of long-term adverse impacts upon the retained natural environment in general or upon adjoining habitats and resources for native (including threatened) biota.

Permanent and Irreversible Impacts

As noted above, the impacts upon habitats and resources within the development footprint of the site will be "*permanent and irreversible*". However, that matter has been taken into consideration in addressing the significance of the likely or potential impacts of the proposed development on the natural environment in general and threatened biota in particular.

In respect of both the "*duration of impacts*" and the imposition of "*permanent or irreversible impacts*", the proposed development design has been cognisant of the ecological constraints afforded by important elements of the environment on the subject site, and adjacent to it. The project has:

- identified the areas of 'high conservation' value;
- confined the proposed development to those areas to which are of lesser conservation significance or value; and
- incorporated an array of environmental management and impact measures (see Chapter 7) which are designed specifically to avoid the imposition of adverse impacts upon retained natural vegetation and habitats, both on the subject site itself and in the immediate vicinity.

6.2.4 Environment Protection & Biodiversity Conservation Act

The *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act), of the Commonwealth of Australia, seeks *inter alia*:

- "*to provide for the protection of the environment, especially those aspects of the environment that are Matters of National Environmental Significance*";
- "*to provide ecologically sustainable development*"; and
- "*to promote the conservation of biodiversity*".

Implementation of the EPBC Act requires *inter alia* consideration as to whether a development or activity is likely to impose adverse impacts on "*Matters of National Environmental Significance*" including *inter alia* listed threatened biota and migratory species.

The Grey-headed Flying Fox, which was recorded foraging on the subject site, is listed as "*Vulnerable*", and sixteen other species listed as "*Migratory*" on the EPBC Act have also been recorded on the subject site (Appendix F).

All of the species which either are or could potentially be of relevance with respect to the EPBC Act are highly mobile and wide-ranging. Many are migratory or nomadic, and none would reside on the subject site.

Further, that part of the subject site proposed for development activities does not constitute a significant element of the resources for any individuals of the species listed on the EPBC Act within their normal home ranges. It is not likely that an individual of any such species would be reliant on or dependent on those parts of the subject site proposed for development activities for their survival, even on a local basis. There is no likelihood of a "*significant impact*" being imposed on any such biota listed on the EPBC Act as a result of the proposed development of the site at South West Rocks.

The proposed development will have no relevant effect with the respect to nuclear activities, Commonwealth lands, World Heritage properties, Ramsar wetlands or the Commonwealth marine environment.

Given those considerations, there is no relevant issue with respect to the EPBC Act. There is no proposal to or requirement for 'referral' of the proposed development to the Commonwealth for the purposes of assessment or for an approval by the Federal Minister for the Environment.

6.3 State Environmental Planning Policy No. 14 – Coastal Wetlands

Saltwater Lagoon, which is located to the northeast of the subject site, and adjoining wetland vegetation extending into the northern parts of the site, is identified and mapped as a Coastal Wetland (No. 439 – Figure 6) on *State Environmental Planning No. 14 Policy – Coastal Wetlands* (SEPP 14).

The proposed development is set back from of the SEPP 14 Wetland by at least 50m (Figure 6), and has incorporated a range of stormwater treatment measures designed specifically *inter alia* to avoid the discharge of contaminants, the modification of the hydrological regime or the imposition of adverse impacts upon the SEPP 14 Wetland.

6.4 State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44) aims to protect the Koala and its habitat by identifying matters for consent authorities to consider during the assessment of relevant *Development Applications* (DAs) or proposals. In particular, SEPP 44 contains definitions of "*potential koala habitat*" and "*core koala habitat*" to be applied in consideration of developments within Local Government Areas (LGAs) listed on Schedule 1 of the *Policy*.

The Kempsey LGA is listed on Schedule 1 of SEPP 44 as an area to which the *Policy* applies, and the subject land is greater than 1ha in area. Consequently, SEPP 44 applies (at least theoretically) to the subject land.

Schedule 2 of SEPP 44 provides a list of tree species which are recognised as food trees utilised by the Koala. Only one of the relevant tree species is present on the subject site at South West Rocks (the Northern Scribbly Gum *Eucalyptus signata*), and this species constitutes more than 15% of the "*tree component*" of the forested parts of the site. As a consequence, the subject site does constitute "*potential koala habitat*", as defined in SEPP 44[5].

However, there are no recent records of Koalas either on the subject site or in the locality. There is, consequently, no "*resident population*" of Koalas, and the site cannot therefore constitute "*core koala habitat*".

Given those circumstances, there is no requirement pursuant to SEPP 44 for the preparation of a *Koala Plan of Management* (KPoM) for the subject site.

6.5 Impacts of Stormwater Management Regime

An *Engineering Services Report* (Martens 2008), which *inter alia* includes consideration of stormwater management, has been prepared for the Subject Site. Two upslope catchment drains traverse the site, from flowing through two shallow vegetated swales (Figure 2). The eastern swale will discharge into a narrow artificial wetland located along the northern edge of the perimeter road (Figure 2) and the western swale will discharge into an outlet spreader. There will be no piped discharges into the *Conservation Area*.

The artificial wetland into which the eastern swale discharges is located within the *Conservation Area* (Appendix A). However, that wetland has been designed and will be planted out to reflect and enhance the surrounding environs. The artificial wetland will be used as the 'end-of-line' treatment, and planted with indigenous macrophytes and wetland species. This will assist in filtering out nutrients and sediments prior to the water being discharged into the *Conservation Area*, and will also provide additional habitat for native biota. The wetland will also incorporate a flow spreading and infiltration function to maintain the current groundwater regime to the downstream habitats.

Due to the flat very gentle slopes of the subject site, a system of roadside swales will be used to provide on-site drainage. The swale system will allow for the infiltration of stormwater, thus maintaining groundwater levels and flow regime. The swales will also act as a water treatment facility by removing suspended solids and nutrients. Both major swales will be vegetated as per the *Landscape Plan* prepared by EDAW (Appendix A), in consultation with Whelans InSites, ensuring that they are appropriate for use by the Wallum Froglet.

The stormwater management system has been designed so that downstream water-dependent species and ecosystems are not affected by the project, including SEPP 14 *Coastal Wetland* No. 439. This is particularly important given the downstream vegetation contains breeding, foraging and shelter habitat for the Wallum Froglet.

6.6 Saltwater Creek & Lagoon Estuary Management Plan

The *Saltwater Creek & Lagoon Estuary Plan* (the EMP) documents issues of relevance for the Saltwater Lagoon and Saltwater Creek, but focuses particularly on Saltwater Creek between the Lagoon and the ocean. Most of the *Management Strategies and Options* in Chapter 6 of the EMP are related to activities along Saltwater Creek downstream of Saltwater Lagoon, although some of those matters are also of relevance to the upstream catchment of Saltwater Lagoon.
The proposed development at Belle O'Connor Street, South West Rocks will not adversely affect the implementation of the EMP for Saltwater Lagoon and Saltwater Creek.

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[5] SEPP 44 defines "*potential koala habitat*" as "*areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component*".

The proposal incorporates measures designed specifically to avoid the imposition of adverse impacts upon Saltwater Lagoon and the habitats in the low-lying parts of the subject site, along the tributary to Saltwater Lagoon which is located along the northern boundary of the subject site. In addition, retention of approximately 14.3ha land along the northern boundary of the subject site for conservation biodiversity purposes, including most of the swamp communities along the tributary to Saltwater Lagoon will contribute to the protection of the Lagoon and its associated habitats, and the provision of an east-west corridor to the golf course.

It is of particular relevance that the development design incorporates a range of stormwater management and water quality control measures specifically intended to maintain appropriate hydrologic regimes and to avoid the discharge of contaminants and pollutants into the downstream habitats streams and catchment.

7 IMPACT AMELIORATION and ENVIRONMENTAL MANAGEMENT MEASURES

The proposed development of the subject site at South West Rocks (Figure 2) incorporates a range of environmental management and impact amelioration measures which are intended *inter alia* to protect retained elements of the natural environment on the subject site and on adjoining lands. The design elements of the proposal, including the impact amelioration and environmental management measures proposed, and reservation of approximately 36% of the site (14.3ha) for conservation purposes, substantially limit the potential for significant adverse impacts to be imposed on the natural environment in general or on threatened biota in particular.

Nevertheless, development activities (including excavation, land clearing and construction activities) should be undertaken in a manner which seek to avoid imposing adverse impacts upon natural environments, both on the land itself and downstream.

Specific impact amelioration and environmental management measures to be implemented as part of the proposed development at South West Rocks (in addition to the retention and management of the 14.3ha *Conservation Area*) include:

- the preparation of an 'in-principle' *Vegetation Management Plan* (Appendix G) which has been prepared for this *Report* which outlines the general principles of a more detailed plan which would be prepared following an approval. This *Plan* details the management of some minor activities, such as paths and playgrounds, within the *Conservation Area.*
- the sensitive and appropriate management of *Asset Protection Zones* (APZs) both to ensure the provision of appropriate bushfire protection and to facilitate the use of those areas by native biota (including threatened species);
- the retention of hollow-bearing trees and mature trees in preference over smaller or younger specimens; where tree removal is required for bushfire protection purposes;
- the clearing of understorey for bushfire protection purposes in a patchy manner, retaining areas of shrubs and avoiding the potential for the introduction of weeds, subject to bushfire safety requirements;
- the planting of stormwater detention basins and drainage swales in a manner which provides additional habitat and/or movement opportunities for native fauna, especially the Wallum Froglet (Appendix A);
- the use of sediment fences and other appropriate control measures during excavation, clearing and construction activities to avoid erosion and sediment discharge and/or the discharges of other contaminants into the natural environment;
- the implementation of a management regime during the construction process to ensure that no wastes (including building rubble, garbage, contaminants, fuels, oils, paints or other chemicals) are discharged from the construction area, and that all such wastes and contaminants are appropriately managed;
- the avoidance of invasive or noxious plant species in subsequent landscaping within the development area;

- the collection of native vegetation removed from development areas and its re-use within the *Conservation Area* for bushland rehabilitation and/or landscaping purposes or the provision of that material to Council for bushland management and rehabilitation purposes;
- the destruction or appropriate removal of weeds; and
- the implementation of a *Vegetation Management Plan* (VMP) (Appendix G) for the vegetation to be retained in the north of the subject site (the *Conservation Area*).

It is assumed that development activities on the subject site at South West Rocks will be undertaken in accordance with the standard array of current environmental management measures and current 'best practice' standards, as appropriate.

8 CONCLUSIONS

The proposed residential development of the subject site at South West Rocks will require the removal of native and/or modified vegetation over an area of approximately 25.6ha on the site. The project also involves the rehabilitation, maintenance and retention of approximately 14.3ha of native vegetation and wildlife habitats for biodiversity conservation purposes.

As noted above, some of the areas of vegetation which are to be removed for development purposes on the subject site have long been modified or disturbed as a result of ongoing/and agricultural activities, or are associated with existing buildings on the site. However, some of the vegetation to be removed is in a natural condition similar or identical to the vegetation which is to be retained in parts of the subject site (within the *Conservation Area*).

In addition to the retention, rehabilitation and maintenance of approximately 14.3ha of vegetation for biodiversity conservation purposes, the proposed development has incorporated an array of environmental management and impact amelioration measures including, but not limited to:

- the use of a peripheral road and drainage swale system to manage interactions between developed portions of the site and the *Conservation Area*;
- the planting and maintenance of the bio-retention swales and detention basins with native indigenous vegetation to provide habitat and resources for native fauna (including the threatened Wallum Froglet);
- the provision of appropriate landscaping and management protocols during development activities to protect native vegetation (Appendix G); and
- the provision of appropriate signage, recreation facilities and public pathways to avoid the imposition of uncontrolled impacts on the *Conservation Areas*.

The proposed development of the subject site constitutes an appropriate and reasonable balance between development aspirations and biodiversity conservation goals at this location. Retention of approximately 14.3ha of native vegetation for biodiversity conservation purposes, and the implementation of appropriate impact and amelioration measures within the proposed development, constitute an appropriate response to the principles of *Ecologically Sustainable Development* (ESD).

GLOSSARY

Activity	means: (a) the erection of a building; (b) the carrying out of a work in, on, over or under land; (c) the use of land or of a building or work; and (d) the subdivision of land, and includes any act, matter or thing for which provision may be made under Section 26 of the EP&A Act and which is prescribed for the purposes of this definition, but does not include: (e) any act, matter or thing for which development consent under Part 4 is required or has been obtained; or (f) any act, matter or thing which is prohibited under an environmental planning instrument.
DA	*Development Application* prepared pursuant to the EP&A Act.
Development	in relation to land, means: (a) the erection of a building on that land; (b) the carrying out of a work in, on, over or under that land; (c) the use of that land or of a building or work on that land; and (d) the subdivision of that land, but does not include any development of a class or description prescribed by the regulations for the purposes of this definition.
DGRs	*Director-General's Requirements*.
Director-General	*the Director-General of the Department of Planning*.
Endangered Ecological	"*an ecological community specified in Part 3 of Schedule 1*" of the TSC Community Act.
Endangered Population	"*a population specified in Part 2 of Schedule 1*" of the TSC Act.
	EP&A Act *Environmental Planning & Assessment Act 1979*.
Key Threatening Process	"*a threatening process specified in Schedule 3*" of the TSC Act.
Locality	"*the area within a 10km radius of the study area*" (DGRs).
NPWS	NSW National Parks & Wildlife Service.
Proposal	"*the development, activity or action proposed*" (DGRs).
Recovery Plan	"*a plan prepared and approved under Part 4*" of the TSC Act.
Region	"*a bioregion defined in a national system of bioregionalisation that is determined (by the Director-General by order published in the Gazette) to be appropriate for those purposes*" (TSC Act).
SIS	*Species Impact Statement* prepared pursuant to s.109, s.110 and s.111 of the TSC Act.
Subject Site	the area which is the subject of the current Part 3A Project Application – Lot 52 in DP 831284 and Lot 84 in DP 792945.
Study Area	the catchment of Saltwater Lagoon and the area which was the subject of the LES..
Threatening Process	"*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*" (TSC Act).
Threatened Species	"*a species specified in Part 1 or 4 of Schedule 1 or in Schedule 2*" of the TSC Act.
TSC Act	*Threatened Species Conservation Act 1995*.

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Figure 1 Subject Site - Belle O'Connor Street, South West Rocks

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NOTES:

1.0 Aerial photograph supplied by Malbec

2.0 All features are approximate only and subject to detailed survey

No	Date	Revision Details

SCALE	1:6,000 @A3
CO ORDS	MA
DATUM	MA
DATE OF PLAN	19-08-2020
CHECKED BY/DATE	19-08-2020
APPROVED BY/DATE	19-08-2020
JOB REF	20STSV
DG REF	20STSV-MC05

Figure 2 **Proposed Development - Belle O'Connor Street, South West Rocks**

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NOT TO SCALE

NOTES

1.0 Plan prepared by EDAW
Received 191108

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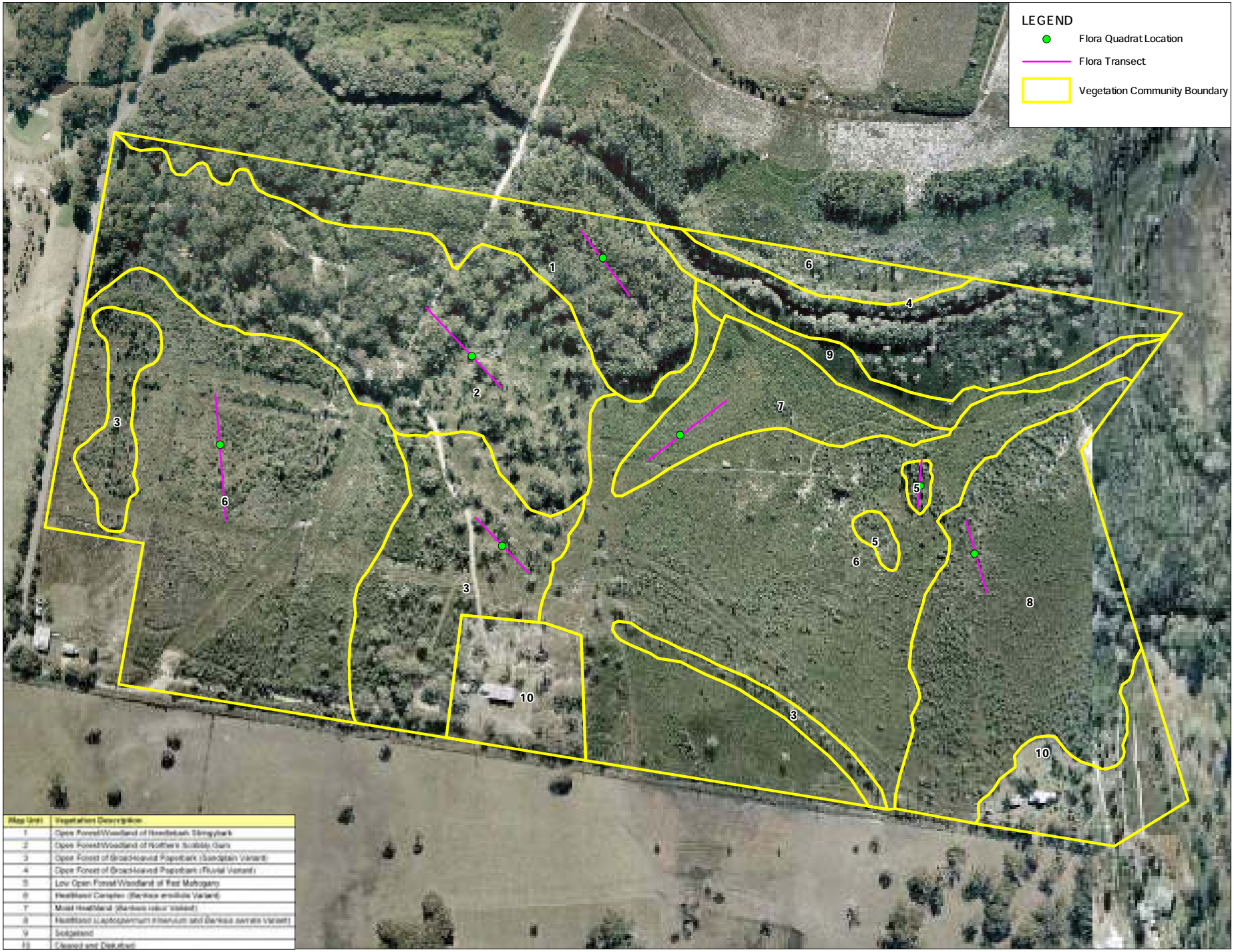
Malbec Lands - South West Rocks » **Subdivision Plan**

Figure 3

Vegetation Communities - Belle O'Connor Street, South West Rocks



Map Unit	Vegetation Description
1	Open Forest/Woodland of Needlebark Stringybark
2	Open Forest/Woodland of Northern Scribbly Gum
3	Open Forest of Broad-leaved Paperbark (Swampy Variant)
4	Open Forest of Broad-leaved Paperbark (Fluvial Variant)
5	Low Open Forest/Woodland of Red Mahogany
6	Heathland Complex (Banksia ericifolia Variant)
7	Moist Heathland (Banksia robur Variant)
8	Heathland (Lepidosperma limicola and Banksia aemula Variant)
9	Sedgeland
10	Cleared and Disturbed

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Sydney, NSW 2000
DX 288 Sydney
t: 02 8234 8300
f: 02 9262 6511

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NOTES:

1.0 Aerial photograph courtesy of Malbec Properties

2.0 Vegetation mapping undertaken by field survey by Environmental InSites May 2008

3.0 All features are approximate only and subject to detailed survey

No.	Date	Revision Details

SCALE:	1:3,000 @ A3
CO-ORDS:	MGA
DATUM:	N/A
DATE OF PLAN:	30-05-2008
CHECKED BY/DATE:	19-08-2009
APPROVED BY/DATE:	19-09-2009
JOB REF:	D927EV
GIS REF:	D927EV-M-003A

N

Figure 4 Threatened Species Locations - Belle O'Connor Street, South West Rocks

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NOTES:

1.0 Threatened species recorded by Cumberland Ecology and Whelans InSites

2.0 Aerial photography courtesy of Malbec Properties

3.0 Conservation area digitised from SWR Lot Layout Plan © EDAW 2008

4.0 All features are approximate only and subject to detailed survey

No.	Date	Revision Details

Figure 5

Field Surveys - Belle O'Connor Street, South West Rocks

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NOTES:

1.0 Field surveys by Canberra Ecology and Wallaroo InSites

2.0 All features are approximate only and subject to detailed survey

No	Date	Revision Details

SCALE	1:3,000 @A3
CO ORDS	MA
DATUM	MA
DATE OF PLAN	19-09-2019
CHECKED BY/DATE	19-09-2019
APPROVED BY/DATE	19-09-2019
JOB REF	DB/TBV
DG REF	DB/TBV-MOD

N

Figure 6 Local context of the subject site at Belle O'Connor Street, South West Rocks

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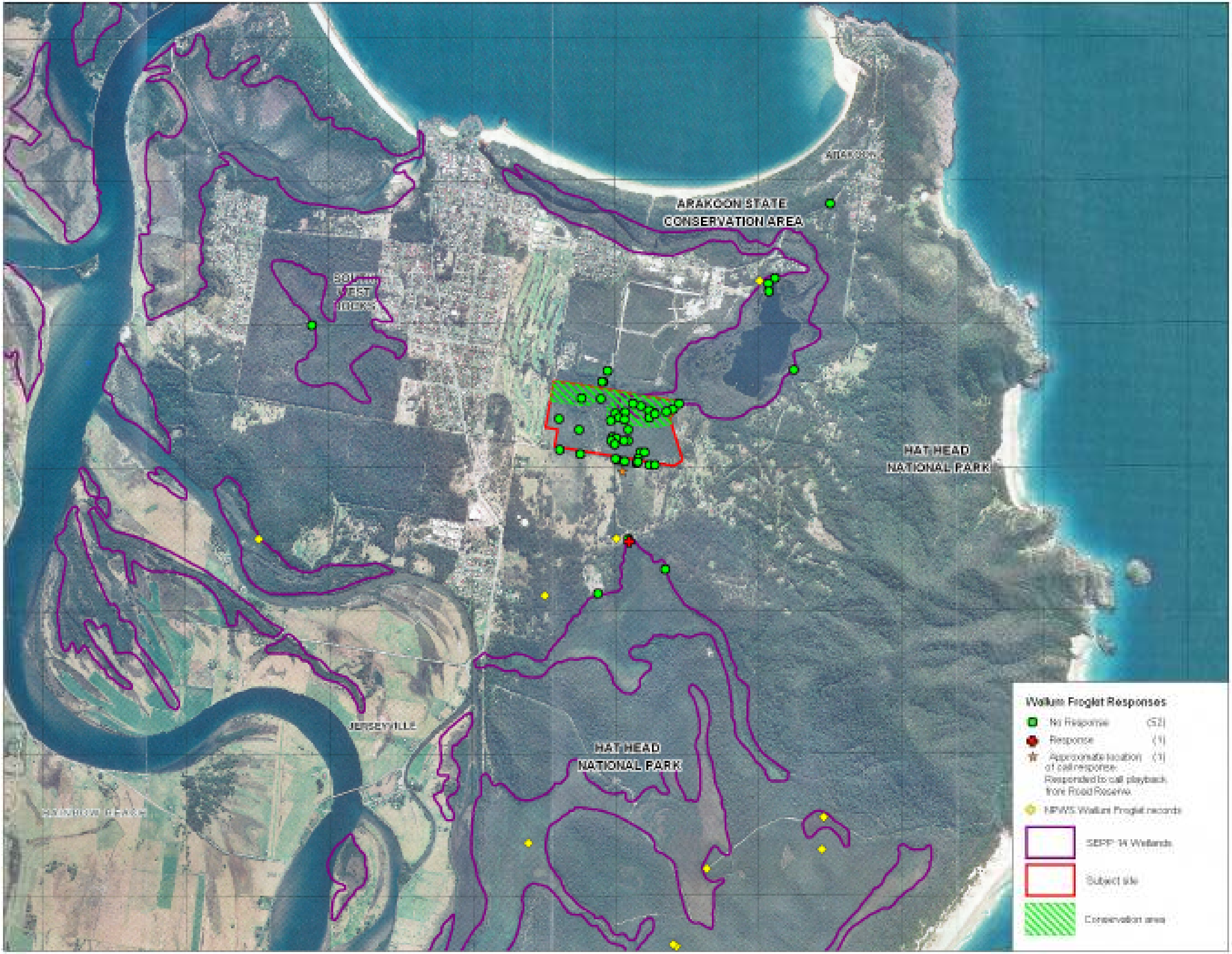
NOTES:

1. Aerial photography © DFSC Land and Property Information
2. SEPP 14 Wetland data digitised from NSW Department of Planning SEPP No. 14 Coastal Wetlands, Amendment No. 11 1:25000, Map 27 of 62, dated 1991
3. All BASEFIRES © 2009 MapInfo
4. All features are approximate only and subject to detailed survey

Figure 7 Wallum Froglet call playback and response at South West Rocks



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NOTES:

1.0 STREETPRO ©2006 MapInfo

2.0 Aerial photography © 2002 Land and Property Information

3.0 Wallum Froglet call-response survey carried out by Environmental Insites 20th-22nd May 2008

4.0 Wallum Froglet records © DECC 2008 License No. CON80001

5.0 SEPP 14 Wetland data digitised from NSW Department of Planning SEPP No. 14 Coastal Wetlands, Amendment No 11, 1:25000, Map 27 of 82, dated 1998

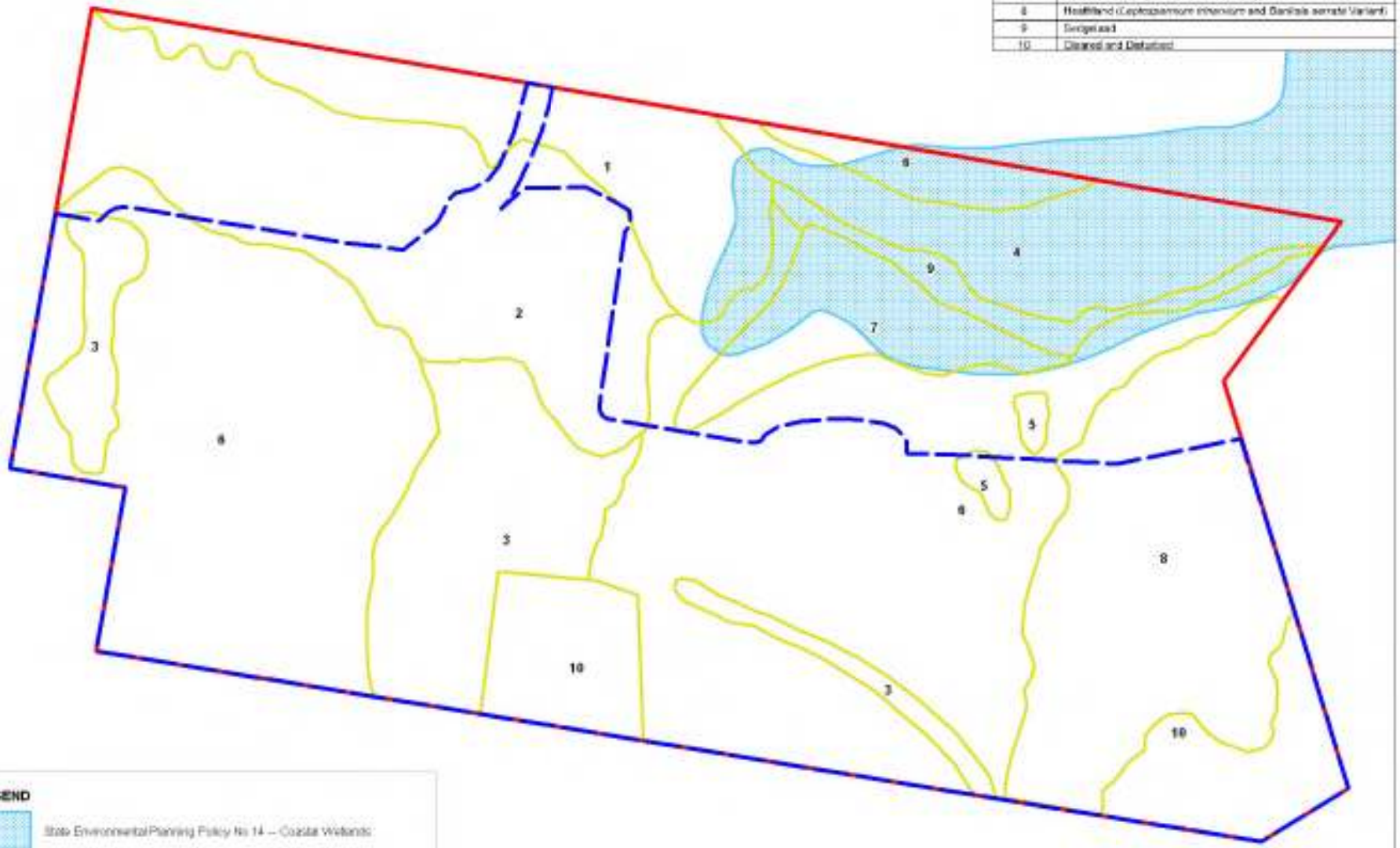
6.0 Conservation area digitised from SWR Lot Layout Plan C EDAW July 2008

7.0 All features are approximate only and subject to detailed survey

No	Date	Revision Details

Figure 8 Vegetation communities, SEPP 14 Wetlands and the proposed development

Map Unit	Vegetation Description
1	Open Forest/Woodland of Swedebank Stringybark
2	Open Forest/Woodland of Northern Scribbly Gum
3	Open Forest of Broad-leaved Paperbark (Sandplain Variant)
4	Open Forest of Broad-leaved Paperbark (Fluvial Variant)
5	Low Open Forest/Woodland of Red Mahogany
6	Heathland Complex (Banksia ericifolia Variant)
7	Moist Heathland (Banksia robur Variant)
8	Heathland (Leptospermum trinervium and Banksia serrata Variant)
9	Sedgeland
10	Cleared and Disturbed



LEGEND

- State Environmental Planning Policy No 14 – Coastal Wetlands
- Development footprint
- Subject site
- Vegetation boundaries

MALBEC PROPERTIES

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NOTES:

1.0 Development footprint digitised from map by EDAW (November 2008)

2.0 Vegetation mapping (delineation) by field survey by Environmental Insites May 2008

3.0 SEPP 14 wetland digitised from hardcopy map, NSW Department of Planning SEPP No. 14 Coastal Wetlands Map 27 of 62, dated 1986

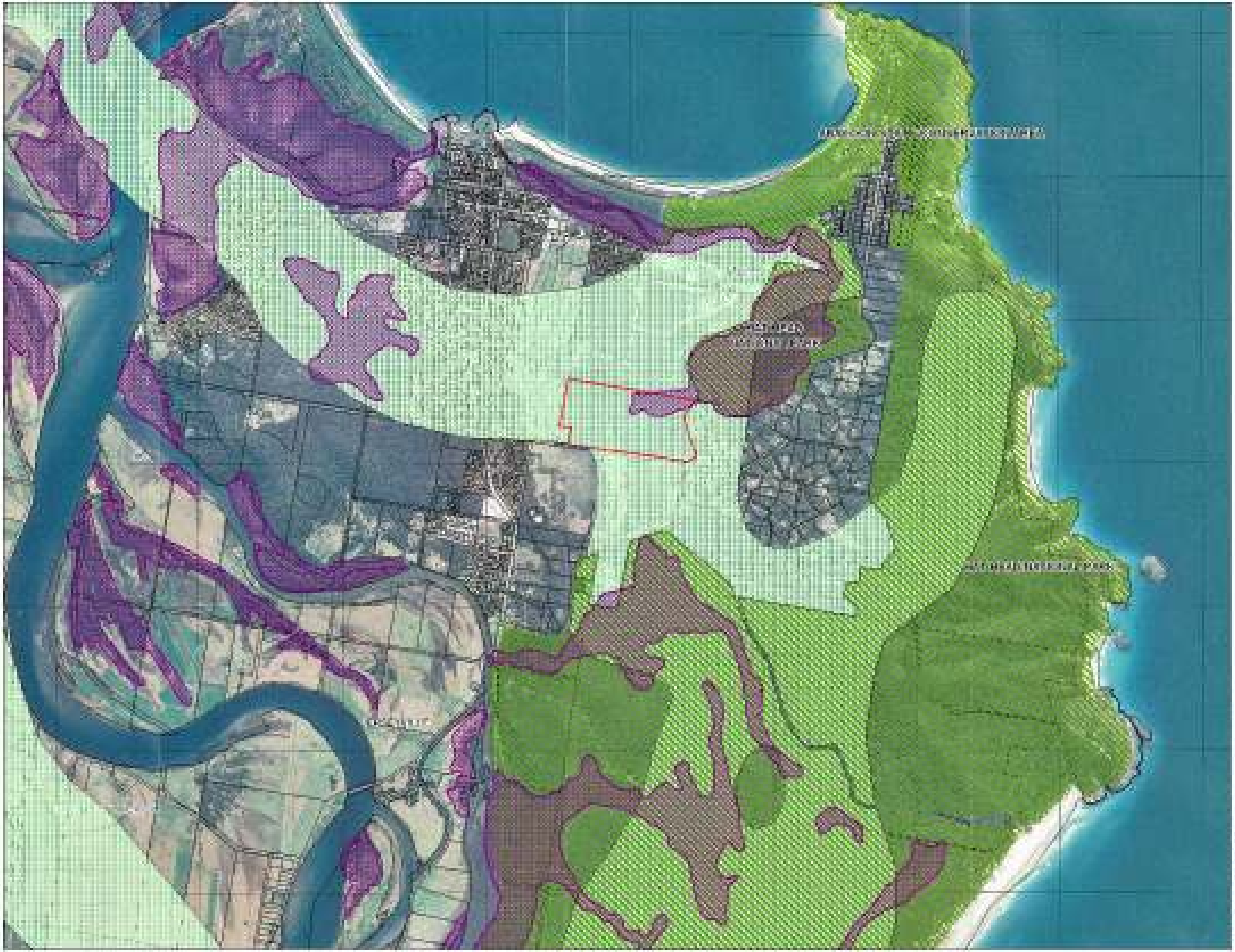
4.0 All features are approximate only and subject to detailed survey

No.	Date	Revision Details

SCALE	1:3,000 @ A3
CO ORDS	MGA
DATUM	MR
DATE OF PLAN	26.03.2009
CHECKED BY/DATE	26.03.2009
APPROVED BY/DATE	26.03.2009
JOB REF	DB/TSV
DG REF	DB/TSV-MC01

N

Figure 9 DECC Wildlife corridor at the subject site at Belle O'Connor Street, South West Rocks



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NOTES

1.1 Aerial photography © DEC Land and Property Information

2.1 SEPP 14 Wetland data digitised from NSW Department of Planning SEPP No. 14 Coastal Wetlands, Amendment No. 11, 1:25000, Map 27 of 92, dated 1996

4.1 All features are approximate only and subject to detailed survey

LEGEND

- Subject site
- DCDB
- SEPP 14 Wetlands
- Parks
- DECC Regional Wildlife Corridor

No.	Date	Revision Details

SCALE	1:25,000 @ A3