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Biodiversity Management Plan – Tanilba Northern Dune Extension

Sibelco Australia Limited

Tanilba Northern Dune Extension
Oyster Cover Road, Oyster Cove, NSW 2318

February 2014

Biodiversity Management Plan – Tanilba Northern Dune Extension

Tanilba Northern Dune Extension
Oyster Cover Road, Oyster Cove, NSW 2318

Kleinfelder Report Number: WB13R_89345_135909

Prepared for:

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ABBREVIATIONS

AEMR	Annual Environmental Management Report
BMP	Biodiversity Management Plan
CKPoM	Comprehensive Koala Plan of Management
DP	Deposited Plan
DP&I	Department of Planning and Infrastructure
EEC	Endangered Ecological Community (category of Threatened Ecological Community)
EMP	Environmental Management Plan
EP&A Act	*Environmental Planning and Assessment Act* 1979
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectare
HWC	Hunter Water Corporation
LGA	Local Government Area
LMP	Landscape Management Plan
LTMS	Long Term Management Strategy
Northern Offset	Portions of Lots 11, 12 and 13 DP 601306
OEH	Office of Environment and Heritage (NSW)
PSC	Port Stephens Council
SEPP 44	State Environmental Planning Policy 44 – Koala Habitat Protection
Sibelco	Sibelco Australia Limited
Southern Offset	The entirety of Lot 24 DP 579700
SCA	State Conservation Area
TSC Act	*Threatened Species Conservation Act 1995*

1. INTRODUCTION

1.1 BACKGROUND

Sibelco Australia (Sibelco) has an existing consent to extract white silica sand from the Tanilba Northern Dune located in the Oyster Cove area, in the Port Stephens Council (PSC) Local Government Area (LGA). The sand extraction area is situated on either side of Oyster Cove Road, on an elevated sand dune known as the Tanilba Northern Dune, Oyster Cove, in the Port Stephens Council LGA, in the Hunter Region of New South Wales.

Approval has been granted by the Minister for Planning and Infrastructure (DP&I) to extend the quarrying activities by 9 ha in an area to the north of the existing extraction operations. The extension project was a Major Project assessment considered under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This project is labelled the Tanilba Northern Dune Extension Project, and located within Lots 11, 12 and 13 DP 601306; Lot 408 DP 1041934; and Lots 1 and 2 DP 408240 (**Figure 1**).

This Biodiversity Management Plan (BMP) has been prepared to satisfy Schedule 3, Condition 15 of the Tanilba Northern Due Extension Project Approval (MP 09_0091) dated 8th March 2013 (the Proect Approval – DP&I, 2013).

1.2 SCOPE AND OBJECTIVES

This BMP forms a part of the suite of integrated management plans and monitoring programs that have been development to support the overriding Environmental Management Strategy (EMS).

This BMP provides a framework for the management and monitoring of biodiversity in the retained vegetation within the biodiversity offset areas (areas located within the application area and off-site). The core objectives for plan are to comply with Condition 15 of the Project Approval (MP 09_0091) that requires Sibelco to implement a BMP that will:

a) Be prepared:

- By a suitably qualified person(s), approved by the Director-General; and
- In consultation with Council (PSC) and Office of Environment and heritage (OEH).

b) Be submitted to the Director-General for approval prior to commencing quarrying operations;

c) Address both the project site and offset areas;

d) Provide for the retention of hollow-bearing trees, wherever practicable;

e) Ensure the establishment and on-going monitoring (at least 6 years) of a least 2 nest boxes for each tree hollow removed during clearing;

f) Include a program to undertake targeted surveys for the novel *Uperoleia sp.*;

g) Identify any areas within the offset areas requiring rehabilitation and or/ revegetation and implement a program for this;

h) Include a detailed description of the measures that would be implemented, including the procedures to be implemented for:
   - Enhancing the quality of existing vegetation, fauna habitat and wildlife corridors;
   - Landscaping the site to minimise any visual impacts of the project;
   - Maximising the salvage of resources within the approved disturbance area – including vegetative, soil and cultural heritage resources – for beneficial reuse in the offset areas and/ or rehabilitation;
   - Minimising the impacts of the project on fauna, including undertaking pre-clearance surveys and minimising the use of insecticides, herbicides, pesticides and biocides;
   - Controlling weeds and feral pests;
   - Maintenance of a buffer zone at the northern edge of the extraction area;
   - Controlling access;
   - Minimising edge effects; and
   - Bushfire management; and

i) Include:
   - Management measures;
   - Monitoring procedures;
   - Performance indicators; and
   - Reporting frameworks,

with particular reference to the novel *Uperoleia sp.*, Koala, and Wallum Froglet.

- Study Area
- Northern Biodiversity Offset Area
- Southern Biodiversity Offset Area
- Project Application Area
- Extraction Area (Tanilba Northern Dune Extension)
- Approved Extraction Area (Tanilba Northern Dune)
- Haul Route
- Sub-arterial Road
- Local Road
- Track
- State Conservation Area

Metres
0 75 150 300 450 600 750
N

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LPI - 2009
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Tanilba Northern Dune Extension

Sibelco
Tanilba Northern Dune Extension
Oyster Cover Road, Tanilba Bay NSW

FIGURE:
1

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The Project Approval also requires the preparation of a Landscape Management Plan (LMP) which requires some similar management actions as this BMP. For operational and administrative simplicity, these plans apply to the site as follows:

- Management measures for the extraction area (disturbance area within the application area) will be addressed in the LMP; and
- Management of the approved Biodiversity Offset Areas will be addressed in this BMP.

A reference for where specific consent conditions are addressed is outlined in **Appendix 1**.

1.3 CONSULTATION AND PLAN DEVELOPMENT

As per Condition 15(a) of the Tanilba Northern Dune Extension Project Approval (MP09_0091) this BMP has been developed by Kleinfelder in consultation with PSC and OEH. Consultation documentation is included in **Appendix 2**.

1.4 LONG TERM SECURITY FOR OFFSETS

Schedule 3, Condition 16 of the Project Approval (MP 09_0091) outlines that one of the following mechanism for protecting the biodiversity offsets in perpetuity must be entered into by Sibelco:

- A BioBanking agreement in respect of the proposed offset areas with the Minister for the Environment, in accordance with Part 7A of the *Threatened Species Conservation Act 1995*, to implement the Biodiversity Offset Strategy; or
- An agreement with OEH to transfer the offset areas into the national parks estate, to the satisfaction of the Director-General.

The Project Approval dictated that an agreement must be entered into by 31st December 2013, this due date is now 30th April 2014 (as per letter dated 17/12/2013 from Howard Reed of NSW Planning & Infrastructure).

Sibelco are currently in negotiations with OEH for the handover of the offset areas to the National Park Estate.

2. STATUTORY REQUIREMENTS

2.1 STATUTORY APPROVALS

Table 1 details the statutory approvals and licences relevant to the BMP for the Tanilba Northern Dune Extension.

Table 1: Statutory approvals for the Tanilba Northern Dune Extension relevant to this BMP.

Project Number	Approval Description	Date Approved	Legislation	Authority
MP 09_0091	Tanilba Northern Dune Extension Project	8th March 2013	Part 3A EP&A Act	DP&I

The relevant conditions to this BMP of the Project Approval (MP09_0091) are detailed in **Appendix 1**, and included:

- Condition 15 – Biodiversity Management Plan; and
- Condition 16 – Long-term Security of Offsets.

In addition to the conditions above Sibelco made a series of commitments in relation to biodiversity. These commitments are included within **Appendix 3**, with resulting actions incorporated within the management procedures detailed within **Section 5**.

2.2 LEGISLATIVE REQUIREMENTS

Key legislative requirements applicable to the project are presented in **Table 2**.

Table 2: Statutory approvals for the Tanilba Northern Dune Extension relevant to this BMP.

Legislation/ Policy	Relevance
NSW EP&A Act	Project Approval granted under Part 3A of the EP&A Act.
NSW *Threatened Species Conservation Act 1995* (TSC Act)	Impact to species listed under Schedules 1 and 2 of the TSC Act were considered within the assessment and approval of the project.
NSW *Native Vegetation Act 2003* (NV Act)	Pursuant to Section 75U of the EP&A Act, authorisations to clear native vegetation is not required as approval is granted by the Minister for Planning under Part 3A.

Legislation/ Policy	Relevance
NSW *Noxious Weeds Act 1993*	Noxious weed species have been identified within the Extension Area. These weeds will be treated in accordance within their Class under the act.
State Environmental Planning Policy 44 Koala Habitat Protection	Two feed trees listed under Schedule 2 of SEPP 44 were identified within the Study Area (Extension Area and surrounds). Potential Koala habitat was identified outside the disturbance area and will not be directly impacted on by the operations.
Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)	The project was referred to the Minister for the Environment on 2nd August 2012 (Ref. No. 2012/6492). The project was deemed 'not controlled action', and can proceed provided it is carried out in accordance with the referral

3. EXISTING ENVIRONMENT & POTENTIAL IMPACTS

3.1 LOCAL SETTING

The Tanilba Northern Dune Extension Project comprises land owned by the Crown, the Hunter Water Corporation and Sibelco, located on the Tilligerry Peninsula. The site comprises part of an elevated dune system known as the Tanilba Northern Dune. This dune system is located to the south and east of Oyster Cove (Oyster Cove Road passes through the original dune system) and to the west of the township of Tanilba Bay (**Figure 1**).The Environmental Assessment Report (ERM, 2012) provides a detailed description of the site.

3.2 ECOLOGICAL VALUES

Kleinfelder (formerly Ecobiological) carried out an ecological assessment of the lands associated with the Tanilba Northern Due Extension and surrounding areas (study area shown in **Figure 1**) in 2007 and 2009.

3.2.1 Vegetation Communities

A total of eight vegetation communities and two variations were mapped within the study area (extraction area, northern offset and additional areas to the west) and the southern offset.

Vegetation communities within the study area and the southern offset are outlined in **Table 3**, **Figure 2** and **Figure 3**, and are discussed in the following sections.

Table 3: Vegetation communities within the study area (surveyed by Kleinfelder, 2007 and 2009 as part of Flora and Fauna Impact Assessment)

Vegetation Community	Area (ha)				
	Extraction Area	Northern Offset	Southern Offset	Additional Lots within Study Area	Total
Coastal Sand Apple – Blackbutt Forest	2.7 ha	0.8 ha	5.1 ha	0.4 ha	**9.0 ha**
Coastal Sand Apple – Blackbutt Forest – Degraded	1.4 ha	-	-	-	**1.4 ha**

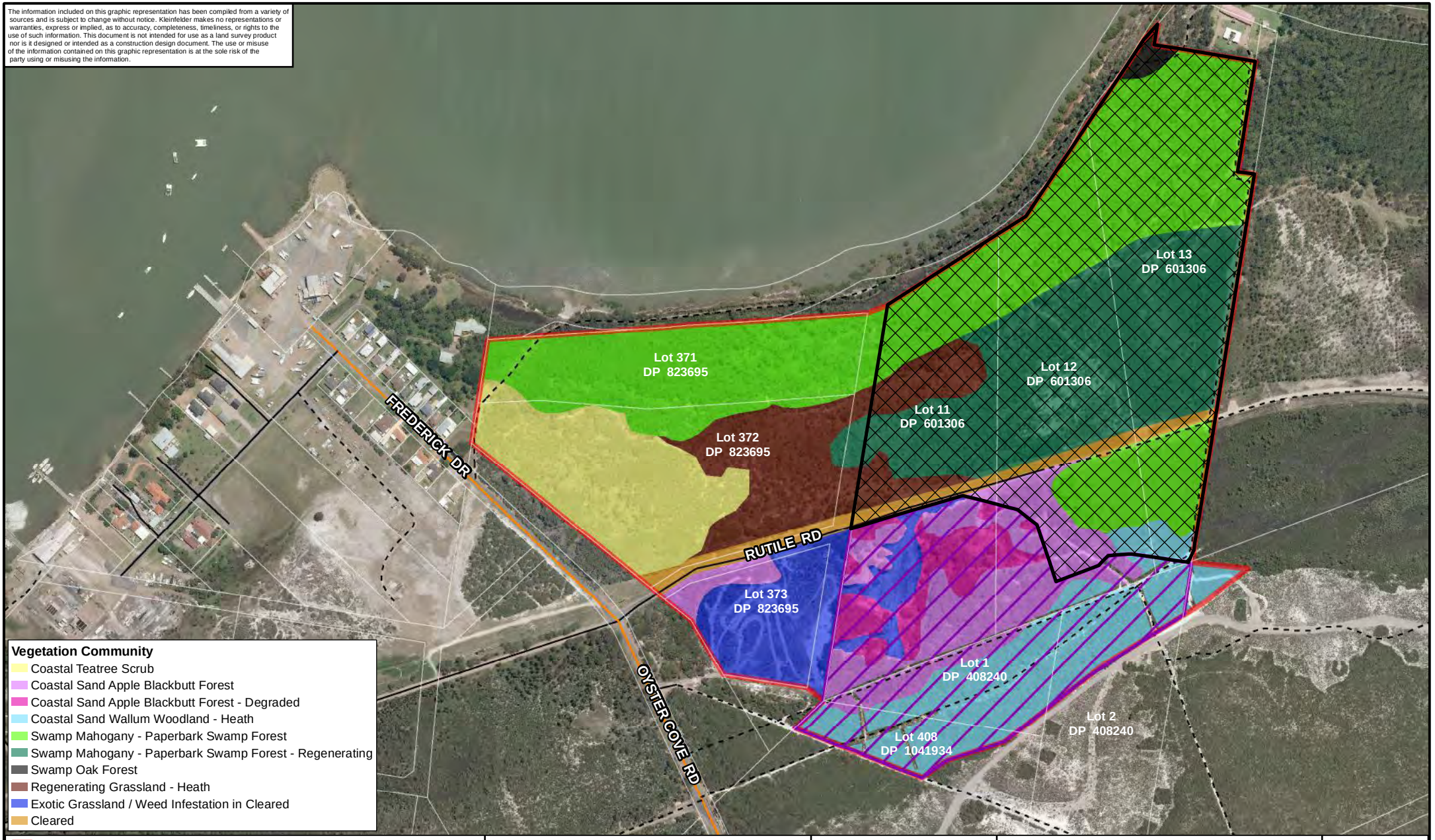
Vegetation Community	Area (ha)				
	Extraction Area	Northern Offset	Southern Offset	Additional Lots within Study Area	Total
Coastal Sand Wallum Woodland – Heath	3.8 ha	0.3 ha	-	0.2 ha	**4.3 ha**
Swamp Mahogany – Paperbark Swamp Forest	-	8.0 ha	4.3 ha	4.7 ha	**17 ha**
Swamp Mahogany – Paperbark Swamp Forest - Regenerating	-	7.2 ha	-	0.2 ha	**7.4 ha**
Swamp Oak Forest	-	0.2 ha	-	-	**0.2 ha**
Regenerating Grassland – Heath	-	1.1 ha	-	2.4 ha	**3.5 ha**
Exotic Grassland/ Weed Infestation in Cleared	0.6 ha	-	-	2.2 ha	**2.8 ha**
Cleared	-	0.7 ha	-	0.5 ha	**1.2 ha**
Coastal Teatree Scrub	-	-	-	3.8 ha	**3.8 ha**
Total per area	**8.5 ha**	**18.3 ha**	**9.4 ha**	**14.4 ha**	

3.2.1.1 Coastal Sand Apple – Blackbutt Forest

This community is located on the higher dunes within the proposed extraction area. The community also occurs in the southern offset area. It is a tall open forest to 25-30 m, with dense shrubby layer to 3-4 m, and the herbaceous ground stratum is sparse.

Angophora costata (Smooth-barked Apple) and *Eucalyptus pilularis* (Blackbutt) co-dominant canopy layer, merging with a higher abundance of *Corymbia gummifera* (Red Bloodwood) closer to the Coastal Sand Wallum Woodland – Heath ecotones. The shrubby mid stratum is dominated by *Montoca elliptica* (Tree Broom-heath), *Leptospermum trinervium* (Flaky-barked Tea Tree) and *Banksia serrata* (Old-man Banksia), and common shrub species include *Acacia ulicifolia* (Prickly Moses), *Acacia longifolia* (Sydney Golden Wattle), *Dillwynia retorta* and *Leucopogon* species. The ground layer was sparse and typically comprised *Pteridium esculentum* (Common Bracken), *Dianella caerulea* (Blue Flax-lily), *Eriostemon australasius* and scattered *Gonocarpus teucrioides* (Raspwort) and *Hibbertia* species.

Areas of the Coastal Sand Apple – Blackbutt Forest were mapped separately as degraded due to the high level of disturbance and weed abundance within these areas.



Study Area
Northern Biodiversity Offset Area
Extraction Area (Tanilba Northern Dune Extension)
Sub-arterial Road
Local Road
Track

Metres
0 25 50 100 150 200 250

N

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Vegetation Communities Within the Study Area (Extraction Area & Northern Offset)

Sibelco
Tanilba Northern Dune Extension
Oyster Cover Road, Tanilba Bay NSW

FIGURE:
2

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Southern Biodiversity Offset Area
State Conservation Area
Sub-arterial Road
Local Road
Track

Vegetation Community
Coastal Sand Apple Blackbutt Forest
Swamp Mahogany Forest
Wet Heath

Metres
0 15 30 60 90 120 150

N

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Vegetation Communities Within the Southern Offset

Sibelco
Tanilba Northern Dune Extension
Oyster Cover Road, Tanilba Bay NSW

FIGURE:
3

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3.2.1.2 Coastal Sand Wallum Woodland – Heath

This community is found along the southern lower lying parts of the extraction area. This community varied from low woodland (to 8 m tall) with a dense shrubby mid stratum consisting of heath species to 3 m and an open shrub layer to 1 m. The ground stratum was moderate to sparse throughout. The Wallum Heathland had similar composition without the Woodland tree canopy.

The canopy species include *Eucalyptus piperita* (Sydney Peppermint) and *Corymbia gummifera* (Red Bloodwood). The dominant mid stratum species are *Banksia aemula* (Wallum Banksia), *Leptospermum trinervium* (Flaky-barked Tea Tree), *Monotoca elliptica* (Tree Broom-heath) and *Xanthorrhoea glauca* with *Melaleuca nodosa* (Prickly-leaved Tea Tree) becoming more common in the low heath. The wallum community has a low heathy shrub stratum dominated by scattered regrowth of *B. aemula* and *L. trinervium*, with a moderate ground cover of *Leucopogon* species, *Woollsia pungens*, Fabaceae species (*D. retorta*, *Aotus ericoides* and *Acacia suaveolens* (Sweet Wattle)) and sedges including *Caustis recurvata*, *Hypolaena fastigiata* and *Leptocarpus tenax*.

3.2.1.3 Swamp Mahogany – Paperbark Swamp Forest

Occurs across the majority of the offset area to the north of the extraction area and it also occurs in the Southern Offset Area.

The community is dominated by *Eucalyptus robusta* (Swamp Mahogany) and *Melaleuca quinquenervia* (Broad-leaved Paperbark) in the canopy with a dense groundcover of *Pteridium esculentum* (Common Bracken) and *Imperata cylindrica* (Blady Grass) on the higher grounds, where recent fires have occurred, and a higher abundance of ferns on the wetter areas, including *Blechnum indicum* (Swamp Water Fern) and *Hypolepis muelleri* (Hard Ground Fern). Some areas had semi-permanent water holes and subsequently had reeds and other water specific species.

A large area of regenerating Swamp Mahogany – Paperbark Swamp Forest occurs in the central section of the study area where sand extraction has historically occurred.

This community forms part of the *Swamp Sclerophyll Forest of Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions* EEC, listed under the TSC Act

3.2.1.4 Swamp Oak Forest

A small area of this community is located in the north eastern corner of the study area; within in the northern biodiversity offset area. This community is dominated by *Casuarina glauca* (Swamp Oak) with *Parsonsia straminea* (Common Silkpod) vine. The mid layer was absent and the ground cover had a dense layer of *Kennedia rubicunda* (Dusty Coral Pea) and *P. esculentum*. The sedges, herbs, grasses and ferns associated with this vegetation community were typical salt tolerant species including *Juncus kraussii* subsp. *australiensis* (Sea Rush).

This community forms part of the *Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions* EEC, listed under the TSC Act.

3.2.1.5 Regenerating Grassland – Heath:

Within the study area where sand extraction has historically occurred and the native regrowth is not in high abundance, these areas tended to be dominated by grass species including *Eragrostis curvula* (African Lovegrass), *Poa labillardieri* (Tussock), *Melinis repens* (Red Natal Grass) and *Digitaria sanguinalis* (Summer Grass). Some scattered trees included *A. costata*, *Leptospermum laevigatum* (Coast Teatree) and *Banksia integrifolia* (Coast Banksia). Few shrub species were found in the grassland areas.

3.2.1.6 Exotic Grassland / Weed Infestations in Cleared Areas

A portion of the proposed extraction area in the north-west has been disturbed as a result of previous construction for former dwellings on Lots 12 and 13 and a maintenance shed on Lot 11 used in association with strip mining on adjoining lands to the north.

The weed composition is typical of disturbance with exotic tussocks in the grasslands, and a pine plantation extending into the Apple Blackbutt community. The weed composition in the disturbed areas is outcompeting native regrowth.

3.2.1.7 Coastal Teatree Scrub

Coastal Teatree Scrub community located adjacent to Oyster Cove Road is dominated by *L. laevigatum* with some scattered *B. integrifolia* and *A. longifolia*. This section of the study area is outside the extraction area and will not be in the offset strategy.

3.2.2 Fauna

During the surveys of the study area 115 fauna species were recorded (**Appendix 4**). These included eight frog species, 14 reptile species, 67 bird species, 13 bat species and five arboreal and eight terrestrial mammal species. Introduced species such as House Mouse, Red Fox and Black Rat were recorded in the study area.

3.2.2.1 Fauna Habitat

A range of habitat types have been identified within the extension area, including the following:

- **Woodland and Heath Vegetation:** The majority of the Coastal Sand Apple – Blackbutt community appears to be a remnant, while only a portion of the Coastal Sand Wallum Woodland – Heath appears to be remnant. Both communities are structurally diverse with three to four habitat layers present and a high presence of Hollow-bearing Trees which provide foraging and breeding habitat for a range of amphibian, reptile, mammal and bird species;
- **Swamp Vegetation:** The remnant Swamp Mahogany – Paperbark Swamp Forest in the north of the study area is structurally diverse with three to four habitat layers, a dense ground cover and multiple Hollow-bearing Trees. The regenerating area of Swamp Forest has a sparser vegetation cover, lacks dense ground cover and Hollow-bearing Trees. These areas provide a range of foraging and breeding habitats for common and threatened species that occur in the locality;
- **Hollow-bearing Trees:** A total of 36 Hollow-bearing Trees were identified within the study area (**Figure 4**), within the extraction area:
  - There are a total of 17 Hollow-bearing Trees with 38 hollows (20 small, 16 medium and two large);
  - Hollow-bearing Trees 16, 17, 18 and 20 (**Figure 4**) will be retained within the extraction area, these trees contain 12 hollows (seven small, four medium and one large); and
  - Total hollows to be removed from the extraction area is 26 (13 small, 12 medium and one large) within 13 trees.
- **Koala Habitat:** Vegetation mapping confirmed the vegetation running along the northern boundary of the study area (outside extraction area) as preferred Koala habitat as defined under SEPP 44 (**Figure 5**). Preferred Koala feed trees were also recorded within the regenerating Swamp Mahogany Paperbark – Swamp Forest and in a small patch of Swamp Mahogany forest to the south of the existing powerline easement. The Coastal

Sand Apple – Blackbutt Forest was determined to represent Supplementary Koala habitat and the Coastal Sand Wallum Woodland Heath community, marginal habitat (Port Stephens Koala Habitat Mapping; Port Stephens Council, 2007). Historical records from the NPWS Atlas suggest that the proposed extraction area forms part of a movement corridor and it has therefore been mapped as Preferred Linking Habitat over Supplementary and Marginal Habitat. There are no preferred Koala food trees within the proposed extraction area; and

- **Wallum Froglet Habitat:** Large areas of habitat contain calling Wallum Froglets occurs within the study area. One area was identified in the north within Swamp Mahogany Paperbark – Swamp Forest around Big Swan Bay, and a second area within the Swamp Mahogany Paperbark – Swamp Forest (regenerating and remnant) on either side of Rutile Road (**Figure 5**). Buffers of approximately 50 m will be retained between the extraction area and these areas of habitat within the offsets (with the inclusion of the visual amenity buffer).

3.2.2.2 Threatened and Migratory Species

No threatened flora species were recorded within the Tanilba Northern Dune Extension.

A total of 11 threatened fauna species were recorded during field surveys in 2007 and 2009 within the study area (**Table 4** and **Figure 6**). Three migratory terrestrial species with suitable habitat within the extraction area listed under the EPBC Act were recorded in the study area; *Monarcha melanopsis* (Black-faced Monarch), *Rhipidura rufifrons* (Rufous Fantail) and *Haliaeetus leucogaster* (White-bellied Sea-Eagle).

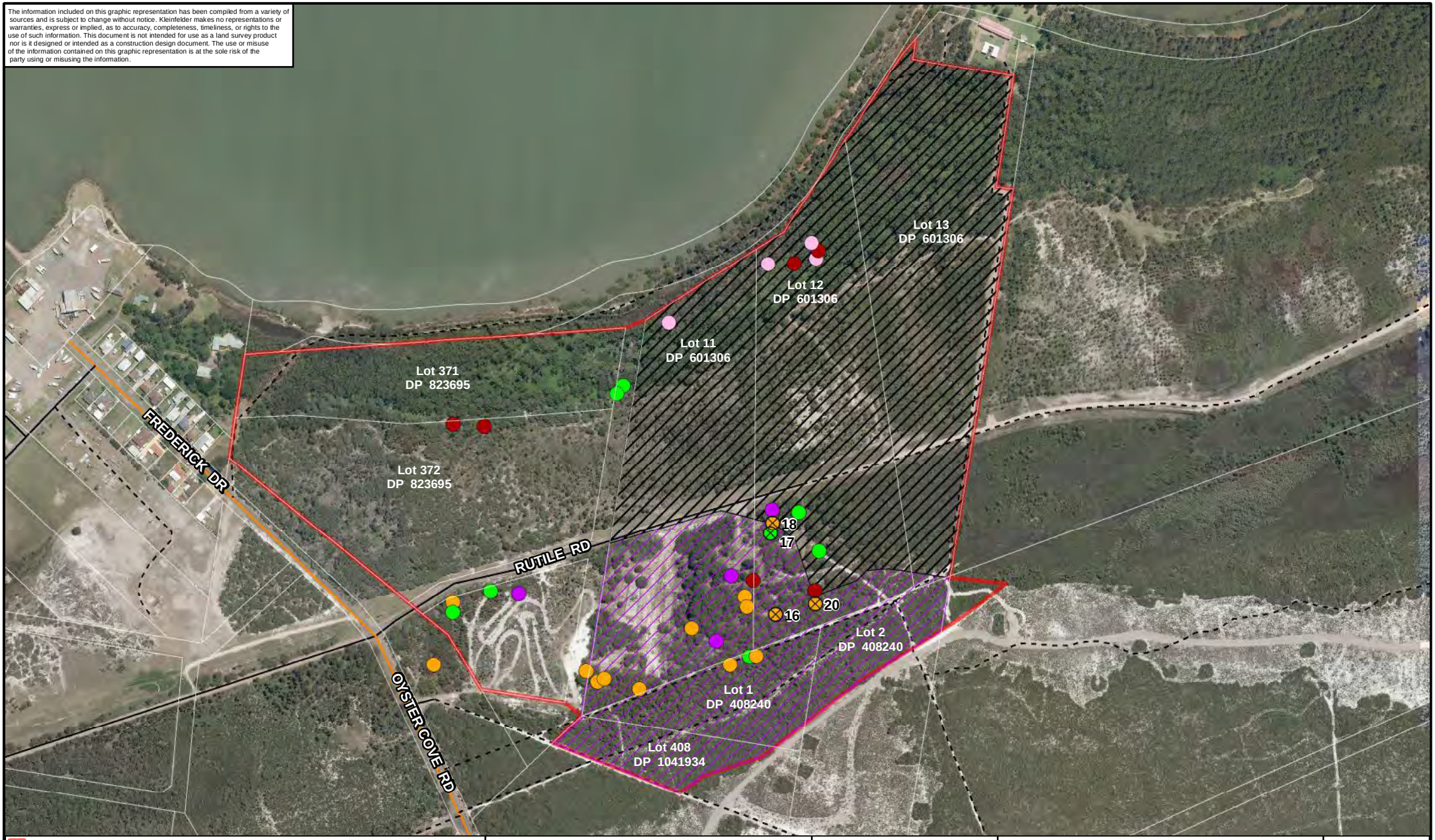
Table 4: Threatened fauna species recorded during 2007 and 2009 field surveys

Scientific Name	Common Name	TSC Act	EPBC Act
Amphibians			
Crinia tinnula	Wallum Froglet	V	-
Birds			
Glossopsitta pusilla	Little Lorikeet	V	-
Daphoenositta chrysoptera	Varied Sittella	V	-
Mammals			
Miniopterus australis	Little Bentwing-bat	V	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-
Mormopterus norfolkensis	Eastern Freetail-bat	V	-
Petaurus norfolcensis	Squirrel Glider	V	-
Phascolarctos cinereus	Koala	V; EP	V
Pseudomys novaehollandiae	New Holland Mouse	-	V

Scientific Name	Common Name	TSC Act	EPBC Act
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-
E = Endangered; V = Vulnerable			

* Koalas are listed as Vulnerable throughout NSW under the TSC Act, the Koala population at Hawks Nest and Tea Gardens (including the Northern Dune site) is listed as an Endangered Population under the Act.

A previously undescribed amphibian species (*Uperoleia sp. nov*.) was captured in the extraction area during fauna surveys within Coastal Sand Apple – Blackbutt Forest. Genetic tests confirmed that the specimens belonged to an undescribed species (Clulow 2008). A separate study and report (Clulow 2009) was commissioned by Sibelco (formerly Unimin Australia Ltd) to determine a preliminary distribution of the species in the Tomago and Myall Lakes Sandbed systems (which are local to where the species was discovered). This study found that this species is well distributed throughout the Tomago and Tomaree sandbeds, and that it appears to be reasonably abundant where it occurs.



Study Area
Extraction Area (Tanilba Northern Dune Extension)
Northern Biodiversity Offset Area
Sub-arterial Road
Local Road
Track
Retained Hollow-bearing Tree (Labelled - Hollow-bearing trees to be retained within the Extraction Area)

Hollow-bearing Tree - Species

- *Angophora costata*
- *Corymbia gummifera*
- *Eucalyptus pilularis*
- *Eucalyptus robusta*
- Dead Stag

Metres
0 25 50 100 150 200 250

N

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Hollow-bearing Trees Within the Study Area

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Tanilba Northern Dune Extension
Oyster Cover Road, Tanilba Bay NSW

FIGURE: 4

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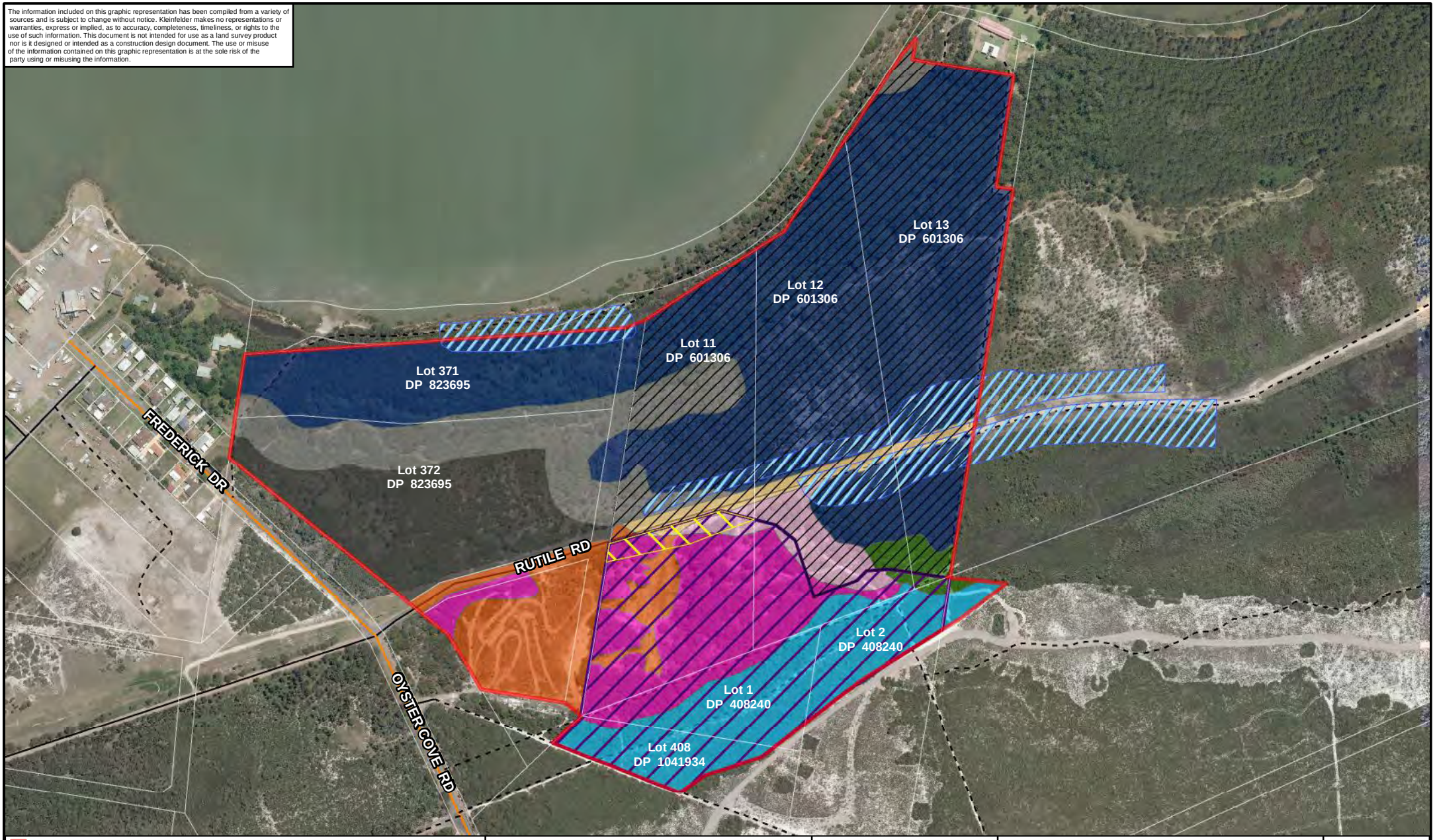

Study Area
Northern Biodiversity Offset Area
Extraction Area (Tanilba Northern Dune Extension)
Visual Amenity and Connectivity Buffer
Habitat containing calling Wallum Froglets
Sub-arterial Road
Local Road
Track

Koala Habitat
Prefferred Koala Habitat
Link over Supplememtary Koala Habitat
Buffer over Supplememtary Koala Habitat
Buffer over Marginal Koala Habitat
Link over Marginal Koala Habitat
Buffer over Other Vegetation
Link over Other Vegetation
Buffer over Cleared Land
Link over Mainly Cleared Land

Metres
0 25 50 100 150 200 250
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Koala Habitat Mapping & Calling Wallum Froglet Habitat Within the Study Area

Sibelco
Tanilba Northern Dune Extension
Oyster Cover Road, Tanilba Bay NSW

FIGURE:
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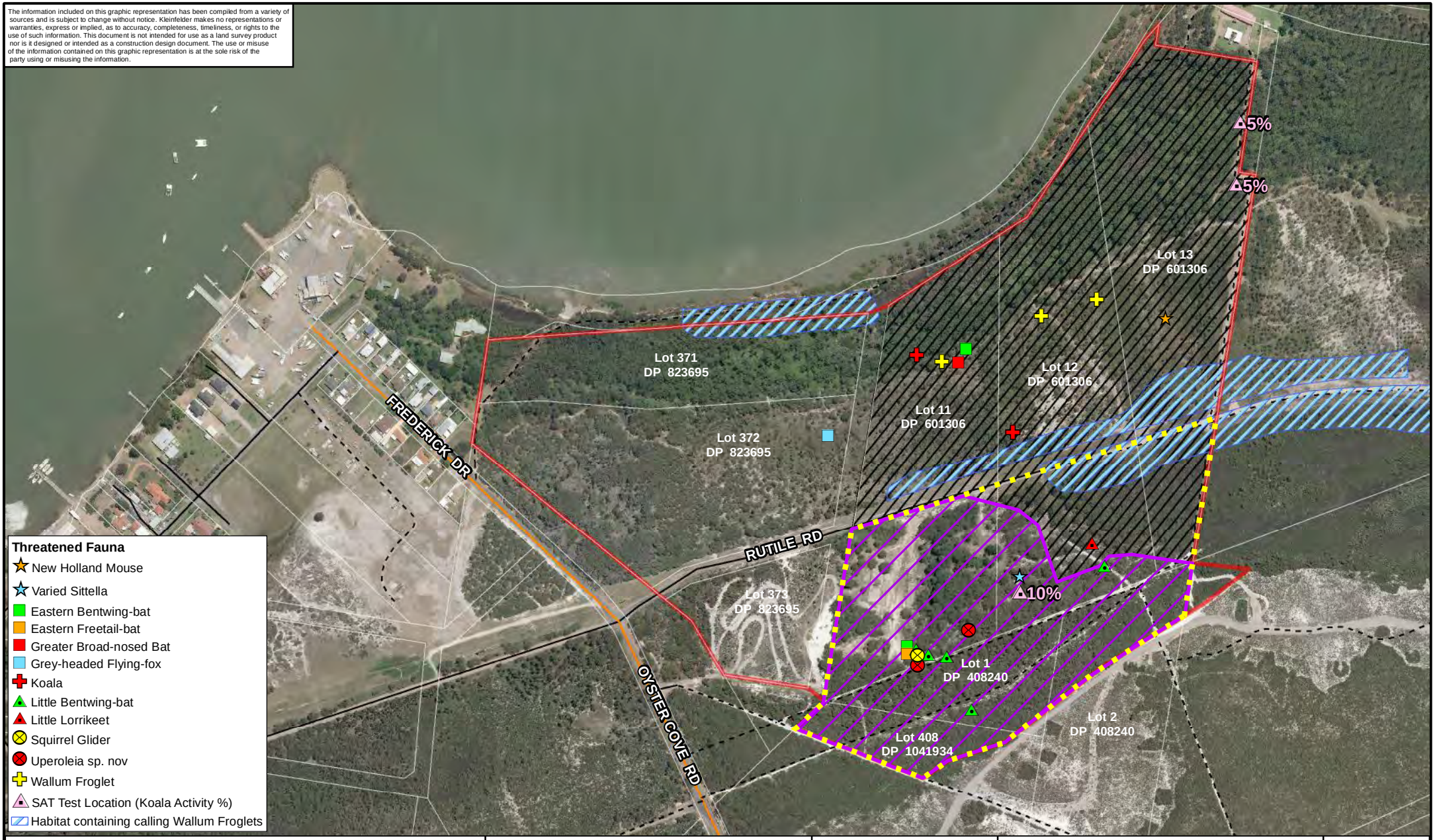

Study Area
Project Application Area
Northern Biodiversity Offset Area
Extraction Area (Tanilba Northern Dune Extension)
Sub-arterial Road
Local Road
Track

Metres
0 25 50 100 150 200 250

N

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(CLIENT) - PROJECT: (89345) - 135909
DATE DRAWN: 9/10/2013 09:20 Version 1
DRAWN BY: gjoyce
DATA SOURCE:
LPI - 2009
NearMap - 2011

Threatened Fauna Species Within the Study Area

Sibelco
Tanilba Northern Dune Extension
Oyster Cover Road, Tanilba Bay NSW

FIGURE:
6

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3.3 POTENTIAL IMPACTS TO BIODIVERSITY

3.3.1 Direct Impacts

Direct impacts of sand extraction within the Tanilba Northern Dune Extension Area are summarised in **Table 5**. As the extraction will not remove sand greater than 0.7 m above the predicted water table, it has been determined that there will not be direct impact to groundwater quality or to the hydrology of the surrounding area.

Table 5: Summary of direct impacts of the Tanilba Northern Dune Extension sand extraction project

Impact	Threatened and significant species directly affected

Clearing of 8.2 ha of native vegetation which comprises:
• Coastal Sand Apple – Blackbutt Forest (4.2 ha) and Coastal Sand Wallum Woodland – Heath (4 ha);
• Removal of 13 Hollow-bearing Trees;
• Koala Habitat:
  ○ Supplementary Koala Habitat (Coastal Sand Apple – Blackbutt Forest);
  ○ Marginal Koala Habitat (Coastal Sand Wallum Woodland – Heath); and
  ○ 0.5 ha of Koala Habitat Buffer.
	Species recorded within the extraction area:
	• Koala (from scats);
	• Squirrel Glider;
	• Insectivorous bats (four species);
	• *Uperoleia sp. nov*.; and
	• Varied Sittella.
	
	Migratory species recorded within the extraction area:
	• Black-faced Monarch
	
	Additional species recorded within study area:
	• Koala (sighted);
	• New Holland Mouse;
	• Grey-headed Flying-fox;
	• Little Lorikeet; and
	• Wallum Froglet.
	
	Additional migratory species recorded within study area:
	• Rufous Fantail; and
	• White-bellied Sea-Eagle.

Short to medium term interruption to existing wildlife corridor	Species likely to be impacted are: • Koala; • Squirrel Glider; • *Uperoleia sp. nov*. ; • Insectivorous bats; • Varied Sittella; and • Migratory species with suitable breeding and foraging habitat within the proposed extraction area (i.e. Black-faced Monarch, Rainbow Bee-eater, Rufous Fantail, Satin Flycatcher)

3.3.2 Indirect Impacts

Potential indirect impacts of the sand extraction project within the extension area include:

- Loss of breeding opportunities;
- Loss of shade/ shelter;
- Erosion, sedimentation;
- Weed invasion and biotic edge effects;
- Use of biocides, pollution (oil/chemical spills); and
- Rubbish dumping and increased human activity.

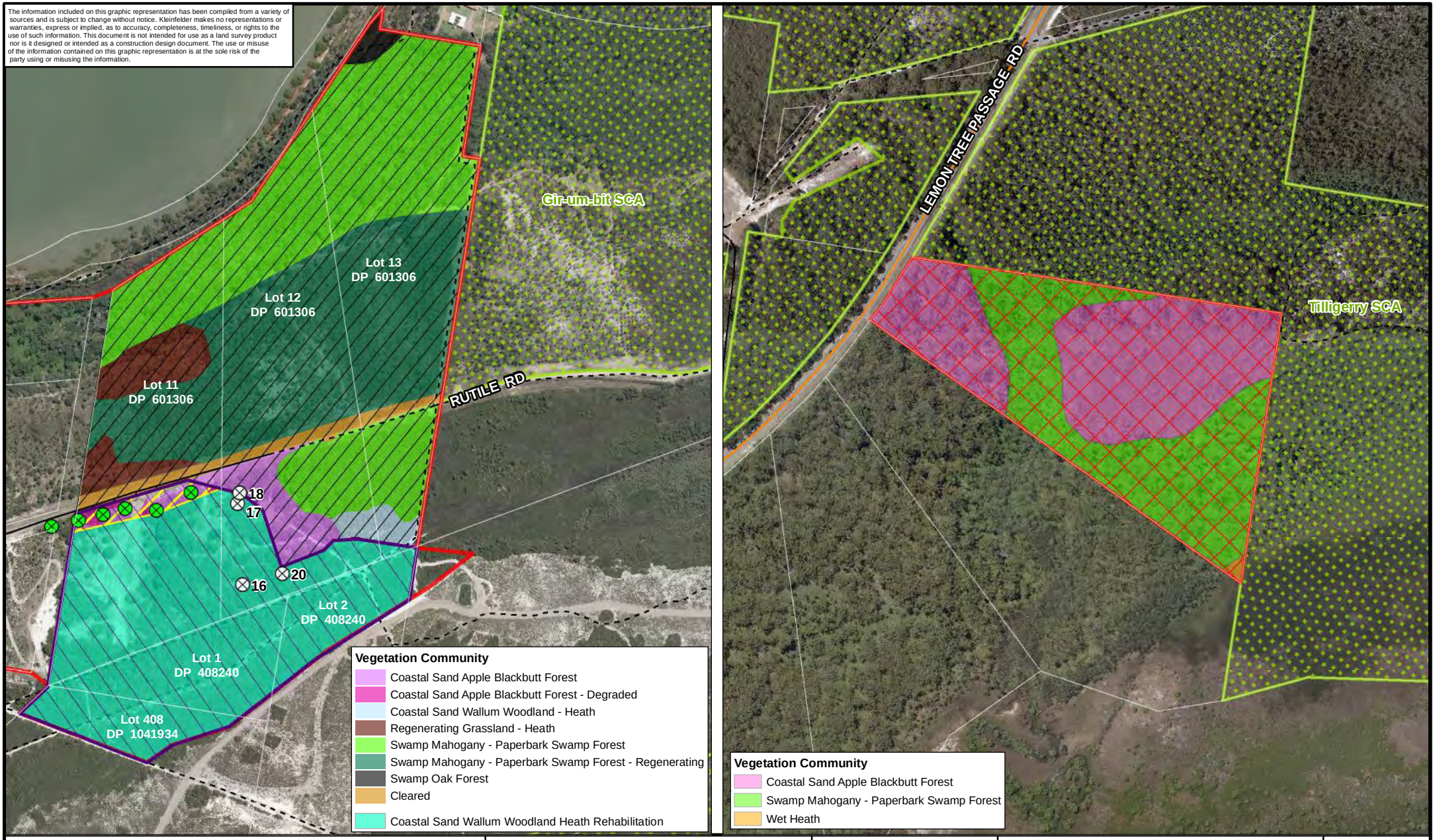
4. BIODIVERSITY OFFSET STRATEGY

4.1 SUMMARY OF OFFSET STRATEGY

The biodiversity offsets strategy comprises of a Northern Offset area and a Southern Offset area (**Figure 7**). The biodiversity attributes for these offset areas will be:

- Total of 27.7 ha within portions of Lots 11, 12 and 13 DP 601306 (northern offset) and the entirety of Lot 24 DP 579700 (southern offset) (shown in **Figure** 7):
  - 25.9 ha of native vegetation:
    - 12.3 ha of Swamp Mahogany – Paperbark Swamp Forest;
    - 7.2 ha of Regenerating Swamp Mahogany – Paperbark Swamp Forest;
    - 5.9 ha of Coastal Sand Apple – Blackbutt Forest;
    - 0.3 ha of Coastal Sand Wallum Woodland – Heath; and
    - 0.2 ha of Swamp Oak Forest.
  - Approximately 1.1 ha of Regenerating Grassland – Heath 0.7 ha of cleared land within the northern offset (both classified as cleared land) (shown in **Figure 7**);
- Provision of two nest boxes for each tree hollow removed from the disturbance area (see **Section 5.1.2**);
- Management of direct and indirect impacts for all Biodiversity Offset Lands, with specific management and monitoring of the novel *Uperoleia sp.*, Koala and Wallum Froglet (See **Section 5.1.4**);
- A program to undertake targeted surveys for the novel *Uperoleia sp.*(see **Section 5.1.4**); and
- Implementation rehabilitation/revegetation plan within degraded areas of offsets (see **Section 5.1.5**).

For the purposes of the biodiversity offset strategy the Swamp Oak Forest (within Lot 13 DP 601306) and Wet Heath (within Lot 24 DP 579700) were, in both cases, to be included in the surrounding Swamp Mahogany – Paperbark Swamp Forest. The justification for this inclusion into the greater vegetation type is these two community areas are less than 0.25 ha, and for approvals and ongoing management purposes can constitute a part of the Swamp Mahogany – Paperbark Swamp Forest.



Study Area
Northern Biodiversity Offset Area
Southern Biodiversity Offset Area
Extraction Area (Tanilba Northern Dune Extension)
Sub-arterial Road
Local Road
Track
State Conservation Area
Visual Amenity and Connectivity Buffer
Retained Hollow-bearing Tree (Labelled)
Trees to be retained

Metres
0 25 50 100 150 200 250
N

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DRAWN BY: gjoyce
DATA SOURCE: LPI - 2009

Biodiversity Offsets & Final Landform & Vegetation Within the Extraction Area

Sibelco
Tanilba Northern Dune Extension
Oyster Cover Road, Tanilba Bay NSW

FIGURE: 7

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5. BIODIVERSITY MANAGEMENT PLAN

5.1 MANAGEMENT MEASURES

The biodiversity management measures for the vegetation within the offsets for the Tanilba Northern Dune Extension Area are outlined in **Table 6**. Sibelco will appoint a staff member to the role of Safety and Environment Coordinator (or similar) who will be responsible for ensuring that all management measures required for biodiversity management are implemented.

Management measures for the offset areas outlined in **Table 6** will be conducted for the life of the extraction operations (including all rehabilitation works); post operations management measures will be in accordance with either a BioBanking agreement, or an agreement with OEH (for inclusion of the offsets in the national park estate).

Table 6: Management measures and responsibilities for biodiversity management of Sibelco Northern Dune Extension Area offsets

Item	Action	Trigger/ Timing	Reporting
5.1.1 General Management Measures			
A.	**Inductions** The site induction will contain the following: • All people entering the site will be made aware of environmentally sensitive habitat and surrounding vegetation and that access to these areas is limited to authorised people only; • Procedures to reduce weed spread; and • General fire awareness and response procedures	During site inductions for staff and contractors	Nil

Item	Action	Trigger/ Timing	Reporting
B.	**Controlling Site Access** • Only authorised personnel are allowed to enter the site; all contractors must undergo site induction prior to entering the site; and • The boundaries of the northern biodiversity offset area will be protected through delineation barriers (e.g. felled trees, sand mounds and fencing) and the retention of vegetation along boundaries to control access to the area. • The western boundary of the southern biodiversity offset area (off Lemon Tree Passage Road) is the only exposed boundary potentially requiring access control. It has a small frontage to the road, dense vegetation along this boundary, and hence is unlikely to require specific access control devices. Monitoring and maintenance of this boundary should occur during monitoring.	At all times	Nil
C.	**Hydrocarbon Spills** The procedure for handling hydrocarbon spills is outlined in the EMP and is in line with procedures in place within the existing approved Northern Tanilba Dune (to the south of the extension area). The plan provides for an emergency response strategy to effectively minimise, manage, record and remediate any hydrocarbon spills, so as to minimise environmental impacts.	In the event of a hydrocarbon spill	AEMR
5.1.2 Prior to Operations			
A.	**Long-term Security for Offsets** Prior to the commencement of operations, and/ or before 30th April 2014 (unless otherwise agreed to by the Director General), an offset agreement will be established in accordance with **Section 1.4**.	Prior to operations and/ or 30th April 2014	AEMR
B.	**Nest Box Installation and Monitoring** A next box installation program will be implemented at a replacement ratio of 2:1 to replace the 26 hollows being removed from the extraction area. The next box installation and monitoring program will be as follows: • Nest boxes will be erected in the northern offset. Nest boxes should be installed within Coastal Sands Apple Blackbutt Forest and the northern section of the Swamp Mahogany – Paperbark Forest where mature canopy trees and suitable erection locations occur; • The installation of all nest boxes will be supervised by a suitably trained ecologist to ensure appropriate site selection and installation techniques. The site selection of each nest box (location in the landscape and the position on the host tree) is important to ensure that the habitat that the nest box is installed in is appropriate for the intended target fauna species; • Nest boxes will be installed prior to the commencement of operations to provide alternative den and/ or next sites for any displaced fauna; • Nest box design will be selected to replace the natural sizes removed (i.e. 13 small, 12 medium and one (1) large); and • Annual monitoring of the nest boxes will occur for a period of six (6) years to record uptake of the nest boxes and attend to any nest box maintenance issues.	Erection of nest boxes prior to clearing and annual monitoring	AEMR

Item	Action	Trigger/ Timing	Reporting
5.1.3 During Vegetation Clearing in the Extraction Area			
A.	During vegetation clearing within the extraction area resources from the disturbance area will be utilised either on the rehabilitation or within the northern offset (as outlined in **Section 4.3.3** of the LMP), these will include: • Habitat resources, including large organic debris and habitat hollows; • Any available plant material that can be collected for brush matting and topsoil will only be utilised within the disturbance area for rehabilitation (as outlined in **Section 4.3.2** of the LMP); and • If during vegetation clearing and/ or topsoil stripping any items of Aboriginal cultural heritage are identified procedures outlined in the Cultural Heritage Management Plan will be followed.	During vegetation clearing within the extraction area	AEMR
5.1.4 Biodiversity Offset Monitoring			
A.	**<u>Vegetation and Habitat Monitoring</u>** A monitoring program will occur within the offsets to ensure the vegetation and fauna habitat qualities present within the Biodiversity Offsets are being maintained and or enhanced (methodology outlined in **Section 5.2**). The monitoring program will be conducted by suitable trained ecologist and will include: • **Quantitative Monitoring:** Vegetation quadrats and fauna habitat assessments. • **Qualitative Monitoring** of the offset areas to identify management issues and potential threats the Biodiversity Offsets; and	Initial monitoring within first three months of operations	AEMR
	• **Targeted Fauna Monitoring** will be implemented across all offset areas to monitor the Koala, Wallum Froglet and the novel *Uperoleia sp*. and ensure they are properly managed.	Initial monitoring prior to operations	AEMR
5.1.5 Habitat Restoration and Rehabilitation			
A habitat restoration and rehabilitation program will be implemented across all offset areas (including the visual amenity buffer along the northern boundary of the extraction area). The program will be conducted for the life of operations within the extraction area (including rehabilitation) (approximately three years). The program will involve a combination of weed and pest management and a revegetation program within disturbed areas of the offsets. The program will aim to enhance the integrity and quality of the vegetation and habitat within the offsets and reduce edge effects on the surrounding NPWS estates (Gir-um-bit SCA and Tilligerry SCA).		

Item	Action	Trigger/ Timing	Reporting
A.	**Habitat Status Inspections** • An initial inspection of all offset areas will be conducted to identify areas requiring weed and pest control. The initial inspection will be conducted by a suitable qualified ecologist prior to the commencement of operations.	Initial inspection within 3-moths of operations commencing	AEMR
	• Subject to negotiation with OEH, annual inspections, to monitor weeds, pests and revegetation areas, will be conducted during monitoring of the offsets.	Annual inspections	AEMR
B.	**Weed and Pest Management** Weed and pest management will be implemented within all retained vegetation within the offsets (including the visual amenity buffer along the northern boundary of the extraction area): • Weed and pest management will be conducted by a suitably qualified personnel with a focus on the recommendations of the inspections; • Control of weeds will predominantly be through manual removal to limit the use of chemicals. Chemical controls will only be utilised where there are significant infestations;	Annual management	AEMR
	• Before any machinery/ vehicle enter into the offset areas (when and if operating off any formed roads), it must be cleaned to remove all soil and plant material so to limit the introduction and spread of weeds and soil pathogens;	Prior to entering site	Nil
	• All haul vehicles and loaders will be sprayed with a copper oxychloride fungicide and records will be assessed bi-monthly; and • Vehicle access to the offsets will be restricted to authorised personnel.	At all times	
C.	**Rehabilitation Program** Within the offset areas the Regenerating Grassland – Heath has been identified as requiring rehabilitation (the vegetation within all other areas of the Biodiversity Offsets is either self-sustaining or has the capacity for natural regeneration). A general method for rehabilitation within the offsets is included in **Section 5.3** and involves: • Rehabilitation of the Regenerating Grassland – Heath to the surrounding Swamp Mahogany – Paperbark Swamp Forest through seeding and planting of appropriate species; and • Specific details on rehabilitation will be negotiated with OEH and appended to this Management Plan.	Annually	AEMR

Item	Action	Trigger/ Timing	Reporting
5.1.6 Bushfire Management			
A.	Existing tracks/ fire breaks will be maintained across the site, in condition suitable for any bushfire emergency vehicles to traverse. Signage at the access points will indicate whether roads have thoroughfare or are 'No Through Roads'.	As maintenance is required	AEMR
B.	An emergency management plan will be prepared prior to operations to outline procedures in the event of a bushfire	Prior to operations	AEMR
5.1.7 Additional Measures for Threatened Fauna Species Protection			
These management measures are in addition to the management measures outlined in above sections			
A.	**Koala Protection** • Staff and contractors will be made aware of the possibility of encountering Koalas during work activities. All staff and contractors working in the offsets will be made aware of the known Koala habitat. This will be achieved by placing a map of the identified Koala habitat at Sibelco's site office in view of staff and contractors and through inductions and Toolbox Talks; • Speed limits of 20 km/ hr are signposted and enforced across the site; and	At all times	Nil
	• The rehabilitation program within the offsets will also aim to expand and enhance the availability of habitat for the Koala through the use of *Eucalyptus robusta* (Swamp Mahogany); which is a preferred Koala feed tree.	During revegetation program	AEMR
B.	**Wallum Froglet** • There will be a minimum vegetation buffer of approximately 50 m between the disturbance area, and any areas identified as Wallum Froglet breeding habitat during offset monitoring; and • As outlined in **Section 4.3.8** of the LMP, site stabilisation and erosion control will occur across the disturbance area to mitigate against potential offsite impacts to habitat from soil disturbance.	During operations (as outlined in LMP)	Nil
C.	**Indirect impact to Fauna** The use of herbicides, pesticides, insecticides and biocides within the all area (extraction area and offsets) will be limited so to reduce the impacts on threatened species, their habitat and food resources. When chemicals are to be used techniques that limit the quantity being used will be utilised and less harmful chemicals will be preferential. Weed and pest control to be conducted by a suitably qualified person/contractor.	At all times	AEMR

5.2 BIODIVERSITY OFFSET MONITORING

The monitoring protocol within the Biodiversity Offset Areas should consist of:

- Quantitative Monitoring to assess the vegetation and fauna habitat features within the offsets and ensure biodiversity values are being maintained or enhanced;
- Qualitative Monitoring (Inspections) to identify threats to the conservation value of the offsets and identify management actions to be conducted; and
- Targeted fauna monitoring of:
  - *Uperoleia sp. nov.* to identify the habitat preferences of the species;
  - Koala determine if the species is utilising the Preferred Koala Habitat (Swamp Mahogany – Paperbark Swamp Forest) and the Supplementary Habitat (Coastal Sand Apple – Blackbutt Forest) within the Biodiversity Offsets; and
  - Wallum Froglet to identify breeding habitat, detect changes in recruitment success and assess impacts of the mine.

Specific monitoring methodologies for the Biodiversity Offset Areas will be determined in negotiations with OEH and appended to this Management Plan. The monitoring methodology for the Biodiversity Offsets should include requirements for

- Sampling methodology
- Monitoring frequency;
- Monitoring locations;
- Performance indicators; and
- Reporting requirements.

5.3 REVEGETATION METHODOLOGY

Within the Biodiversity Offset areas the Regenerating Grassland – Heath has been identified as requiring rehabilitation. The vegetation within all other areas of the Biodiversity Offsets is either self-sustaining or has the capacity for natural regeneration.

The Regenerating Grasslands – Heath is surrounded by mature Swamp Mahogany – Paperbark Swamp Forest to the north and regenerating Swamp Mahogany – Paperbark Swamp Forest to the east. Based on this surrounding vegetation type and the position of the

Regenerating Grasslands – Heath within the landscape, it is most suitable to rehabilitate these areas to Swamp Mahogany – Paperbark Swamp Forest.

To aid in the re-establishment of native vegetation within the Regenerating Grassland - Heath, a combination of methods outlined in the following sections may be used. Specific methodology will be determined by negotiations with OEH and appended to this Management Plan.

5.3.1 Species Selection and Revegetation Method

Revegetation efforts will focus on establishing canopy and mid-storey species within Regenerating Grassland – Heath, while understorey species will naturally regenerating once the canopy is established. The most appropriate species for rehabilitation are outlined in **Table 7**. The rehabilitation effort will also aid in extending the area of suitable habitat for the Koala through the reintroduction of *Eucalyptus robusta* (Swamp Mahogany), a preferred Koala feed tree.

Methods of re-establishment, in order of preference, are listed below and are abbreviated as:

B Brush matting

D Direct Seeding

P Propagation and planting

Table 7: Species and methods for re-vegetation within the Tanilba Northern Dune Extension offsets

Scientific Name	Common Name	Mode of Re-establishment
Acacia longifolia	Sydney Golden Wattle	D
Eucalyptus robusta	Swamp Mahogany	D, P, B
Callistemon salignus	White Bottlebrush	D, P, B
Glochidion ferdinandi	Cheese Tree	P
Melaleuca quinquenervia	Broad leaf Paperbark	D, P, B
Melaleuca styphelioides	Prickly-leaved Tea Tree	D, P, B

5.3.1.1 Direct Seeding

Seed for direct seeding will be sourced locally from within the biodiversity offset areas, and will be treated and sown in the soil rather than broadcast. Harvesting of mature seed and direct sowing into areas requiring revegetation at the most appropriate time of year (usually autumn or spring) will be undertaken.

5.3.1.2 Brush Matting

Brush matting facilitates direct seeding, provides a protected microclimate for developing seedlings, and adds nutrients to the soil. Large branches and whole plants are preferred for matting because they will not move in the wind. When collecting material for brush-matting care will be taken so to not collect heavily in one area of the offsets; a maximum 10% collection of seed or brush matting materials from a collection area must be adhered to for these efforts.

Where possible individual plant species (especially *Leptospermum*, *Melaleuca* and *Eucalyptus* species) will be harvested when they are bearing mature seed rather than immediately prior to clearing. Bradysporous (seed retaining) species are best harvested and spread in autumn whereas geosporous (seed shedding) species are best harvested immediately prior to annual seed release in late spring.

5.3.1.3 Propagation and Replanting

Seed will be collected from the offset areas and supplied to a local nursery for propagation. Planting programs in the offset areas would be best undertaken in the months March through to October for optimum seedling establishment success.

6. REPORTING FRAMEWORK

Reporting, as required for the Tanilba Northern Dune Extension Project, will occur through the AEMR. The following summarises the reporting requirements of this BMP:

- Outline of the Biodiversity Offset Agreement entered into for the long-term security of the Biodiversity Offsets;
- Details and results of the Nest Box Installation and Monitoring Program;
- Details of resources installed within the Biodiversity Offsets from the Extraction Area;
- A comprehensive review of the biodiversity areas monitoring results over the past year, which includes:
  - A comparison of the results against the previous year;
  - Assessment against performance indicators; and
  - Identify trends in the monitoring data over the life of the project.
- Describe the management works (including revegetation) that were carried out in the previous year, and the works that are proposed to be carried out over coming year.

The AEMR will be distributed to PSC, OEH, DP&I and also be made publically available on Sibelco's website.

Specific details on reporting for the Biodiversity Offsets Areas will be determined during negotiations with OEH and appended to this Management Plan.

7. BMP REVIEW

This BMP will be reviewed and/ or updated annually, or within three months of a:

- Submission of an Annual Environmental Management Report;
- Submission of an Independent Environmental Audit; and
- Modification to the conditions of the Project Approval that has the potential to alter impacts.

In order to assess the performance of the BMP the following aspects will be considered:

- Are the performance indicators being met? And are these indicators still appropriate?
- Do the management actions still fulfil the objectives?
- Were the management actions and reporting completed as specified within the plan?
- Are aspects of the plan now obsolete, inefficient or ineffective?

The response to these aspects will inform the update of the BMP.

7.1 ROLES AND RESPONSIBILITIES

The Sibelco Operations Manager has the overall responsibility for works undertaken at the Tanilba Northern Dune Extension and the biodiversity offset areas. The appointed Safety and Environment Coordinator, reports to the Operations Manager, and is responsible for implementation of the management measures detailed in **Table 6**, engaging appropriately qualified personnel to undertake required actions, engage stakeholders appropriately to assist with actions as relevant, and review of this BMP.

Other mining personnel and contractors involved in construction and operation activities will be required to follow the directions of Sibelco and abide by the requirements of this plan.

8. REFERENCES

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APPENDIX 1. RELEVANT PROJECT APPROVALS

Condition	Condition Requirement	Section where Addressed (in this BMP unless otherwise indicated)
15	The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Director-General. This plan must: a) Be prepared: ❍ By suitably qualified person(s), approved by the Director-General; and ❍ In consultation with Council and OEH; b) Be plan must be submitted to the Director-General for approval prior to commencing quarrying operations; and	This document is the Biodiversity Management Plan and has been prepared by Kleinfelder for approval by the DG.
	c) Address both the project site and the offset areas;	Offset areas (including retained vegetation within the application area) addressed in this BMP. Extraction area addressed in LMP.
	d) Provide for the retention of hollow-bearing trees, wherever practicable;	Section 4.3.2 of the LMP
	e) Ensure the establishment and on-going monitoring (at least 6 years) of at least 2 nest boxes for each tree hollow removed during clearing;	Section 5.1.2
	f) Include a program to undertake targeted surveys for the novel *Uperoleia sp.*;	Section 5.1.4 and Section 5.3.3 of this BMP, and Section 4.3.2 of the LMP.
	g) Identify any areas within the offset areas requiring rehabilitation and/ or revegetation and implement a program for this;	Section 5.1.5 and Section 5.2
	h) include a detailed description of the measures that would be implemented, including the procedures to be implemented for: • enhancing the quality of existing vegetation, fauna habitat and wildlife corridors;	Section 5.1.5
	• landscaping the site to minimise any visual impacts of the project;	Section 4.3.11of the LMP
	• maximising the salvage of resources within the approved disturbance area – including vegetative, soil and cultural heritage resources – for beneficial reuse in the offset areas and/or rehabilitation areas	Section 5.1.3 of this BMP and Section 4.3.3 of the LMP

Condition	Condition Requirement	Section where Addressed (in this BMP unless otherwise indicated)
	• minimising the impacts of the project on fauna, including undertaking pre-clearance surveys and minimising the use of insecticides, herbicides, pesticides and biocides;	Section 5.1.7 of this BMP and Section 4.3.2 of the LMP
	• controlling access;	Section 5.1.1
	• minimising edge effects; and	Section 5.1.5
	i) Include: • Management measures; • Monitoring procedures; • Performance indicators; and • Reporting frameworks, With particular reference to the novel *Uperoleia sp.*, Koala and Wallum Froglet	Section 5.1.4 and Section 5.3
16	By 30th April 2014 (as per letter dated 17/12/2013 from Howard Reed of NSW Planning & Infrastructure), or otherwise agreed to by the Director-General, the Proponent shall: a) enter into a Biobanking agreement in respect of the proposed offset areas (**Figure 5** and **Figure 6**, of this BMP) with the Minister for the Environment, in accordance with Part 7A of the Threatened Species Conservation Act 1995, to implement the Biodiversity Offset Strategy; or b) enter into an agreement with OEH to transfer the offset areas into the national parks estate, to the satisfaction of the Director-General.	Section 1.4 and Section 5.1.2

APPENDIX 2. STAKEHOLDER CONSULTATION

APPENDIX 3. RELEVANT STATEMENTS OF COMMITMENTS

Issue	Mitigation measure/ Commitment	Section where Addressed
Ecology	Hollow bearing trees 16, 17, 18 and 20 (refer to Figure 2.2, Northern Dune Submission Report) to be retained.	Section 4.3.2 of the LMP
	• Avoidance of the use of biocides and implementing erosion and sediment controls;	Section 5.1.7 of this BMP and Section 4.3.6 and Section 4.3.7 of the LMP
	• Incorporating implementation of pre-clearing surveys, a fauna displacement mitigation protocol, Koala mitigation measures, next box installation and monitoring, and a monitoring plan for the Wallum Froglet (as detailed in Annex M of the EA);	Section 5.1.7, Section 5.1.2 and Section 5.2.4 of this BMP and Section 4.3.2, Section 4.3.3, Section 4.3.7 of the LMP
	• Staged rehabilitation of the extraction area (to be supported by a Vegetation Rehabilitation Management Plan), to be conducted in the same fashion as successful rehabilitation of Sibelco's existing approved extraction areas directly to the south; and	Section 4.3.5 of the LMP
	• Implementation of an offset strategy as detailed in Section 11.6.4 of the EA	Section 1.4 and Section 5.1.2 of this BMP
Vegetation Clearing	At least one week prior to any vegetation clearing, a survey of habitat trees will be conducted in the planned clearing area in accordance with the survey methodology outlined in Section 11.6.1 of the EA	Section 4.3.2 of the LMP
	Pre-clearing surveys will be conducted to check for the presence of any Koalas within the proposed extraction area	
	Hollow-bearing trees will be left standing for two nights after the surrounding vegetation has been cleared to encourage any native fauna species utilising the habitat hollows to self-relocate. The actual felling of any habitat trees will be attended by a suitably experienced fauna ecologist in order to ensure the safety of any fauna found to be in the hollows. On all occasions, trees having potential habitat hollows should be 'soft felled' by an experienced machine operator in accordance with the procedure outlined in Section 11.6.1 of the EA	Section 4.3.3 of the LMP.
Fauna Displacement Protocol	A fully qualified, experienced and licenced ecologist will supervise clearing and encourage movement of any displaced animals into adjoining vegetation	Section 4.3.3 of the LMP.
	Captured fauna and/ or displaced fauna will be relocated to adjacent habitat by an ecologist. During tree removal or any other construction activity, Fauna Displacement Protocols outlined in Section 11.6.2 of the EA will be followed in the case of any injured animal	

Issue	Mitigation measure/ Commitment	Section where Addressed
Wallum Froglet Management Plan	A management plan for the Wallum Froglet (*Crinina tinnula*) will be developed in accordance with the management guidelines outlined under Section 6 of the National Recovery Plan for the Wallum Sedgefrog and Other Wallum-dependent Frog Species. In particular this will include: • Minimising affects from soil disturbance; • Ensuring sufficient retention of vegetation particularly around breeding sites; and • Monitoring the habitat condition and frog numbers to ensure the threats to the speices are properly managed. This should be undertaken with sufficient regularity and should preferably be carried out a year or more before development starts and continue for the duration of extraction operations, including rehabilitation works	Section 5.1.7 and Section 5.2.4 of this BMP.
Nest box installation and monitoring program	A next box installation and monitoring program will be implemented on a ratio of 2: 1 to replace 38 hollows present in 17 Hollow-bearing Trees mapped within the proposed extraction area. Nest boxes should be erected prior to clearing commencing in order to provide alternative dens and / or nest sites for any displaced fauna.	Section 5.1.2 of this BMP.
	Nest boxes are to be erected within the Proposed Offset Areas on Lots 11, 12 and 13. Nest box design should be selected to replace the natural hollow sizes removed (i.e. 20 small, 16 medium and 2 large) and will target insectivorous bats, gliders and possums. Annual monitoring for a minimum 6-year period post installation is recommended to record uptake of the nest boxes and to attend to any maintenance issues. A brief letter confirming annual inspection of the nest boxes and documentation of results should be provided to OEH.	
Vegetation Management and Monitoring Plan	Wee Management and Vegetation Management and Monitoring Plans will be prepared for the rehabilitation area and proposed Offset Ares on Lots 11, 12, 13 and 24, which will include a through and intensive program to protect the adjoining forested wetland communities against weed invasion, and surface and underground run-off that may occur both during and after sand extraction activities. The management and monitoring plans will consider: • The nature and control of sediment run-off during the extraction phase particularly as a result of an exceptional storm event; • The volume path and content of stormwater discharging from the site during and after extraction; • The handling of hydrocarbon spills on the site; • Existing flow regime of surface and groundwater flow from the proposed extraction area into the forested wetlands; and • Weed invasion.	Section 5.1.4, Section 5.1.5 and Section 5.2 of this BMP, and Section 4.3.1, Section 4.3.7 and Section 4.3.9 of the LMP
Biodiversity Offset Strategy	A Biodiversity Offset strategy will be adopted as outlined in detail in Appendix P of the EA. Biodiversity offsets are proposed on lands currently owned by Sibelco, comprising portions of Lots 11 to 13, DP601306 (approximately 18.35 ha) and all of lots 24, DP579700 (approximately 9.44 ha) (the offset lands). A secure offset mechanism (through Voluntary Conservation Agreement or other similar tool for management in perpetuity) will be placed over these offset lands which will result in permanent protection and management of the land and result in numerous ecological benefits.	Section 1.4 and Section 5.1.2 of this BMP.

APPENDIX 4. FAUNA SPECIES RECORDED IN STUDY AREA

KEY: Sw = Swamp (Swamp Mahogany – Paperbark Swamp Forest); DS = Dry Sclerophyll (Coastal Sand Apple – Blackbutt Forest); H = Heath (Coast Sand Wallum Woodland – Heath); Ae = Aerial; Aq = Aquatic; # = threatened under TSC Act; ^ threatened under EPBC Act 1999; M = migratory species; * = introduced species.

No.	Scientific Name	Common Name	Habitat					Method
			Sw	DS	H	Ae	Aq	
	Amphibians							
1.	*Crinia tinnula*	# Wallum Froglet	+	+				Trapping, nocturnal amphibian search
2.	*Crinia signifera*	Common Eastern Froglet	+	+				Trapping, nocturnal amphibian search
3.	*Limnodynastes dumerilii grayi*	Banjo Frog			+			Spotlighting, trapping
4.	*Limnodynastes ornatus*	Ornate Burrowing Frog		+	+			Spotlighting, trapping
5.	*Limnodynastes peronii*	Striped Marsh Frog	+	+	+			Nocturnal amphibian survey, trapping
6.	*Litoria jervisiensis*	Jervis Bay Tree Frog	+					Spotlighting
7.	*Pseudophryne bibronii*	Bibron's Toadlet		+				Spotlighting
8.	*Uperoleia sp. nov*			+				Trapping, nocturnal amphibian search
	Reptiles							
1.	*Amphibolurus muricatus*	Jacky Lizard			+			Herpetofauna diurnal search
2.	*Anomalopus swansoni*			+				Herpetofauna diurnal search
3.	*Carlia tetradactyla*	Rainbow Skink			+			Herpetofauna diurnal search
4.	*Ctenotus robustus*	Robust Ctenotus	+		+			Trapping
5.	*Ctenotus taeniolatus*	Copper-Tailed Skink	+					Opportunistic sighting
6.	*Eulamprus quoyii*	Eastern Water Skink	+					Opportunistic sighting
7.	*Hemiaspis signata*	Black-bellied Marsh Snake	+					Opportunistic sighting
8.	*Lampropholis guichenoti*	Grass Skink	+					Trapping
9.	*Morelia spilota spilota*	Diamond Python	+					Opportunistic sighting
10.	*Pogona barbata*	Eastern Bearded Dragon		+				Herpetofauna diurnal search
11.	*Pseudechis porphyriacus*	Red-bellied Black Snake	+					Opportunistic sighting

No.	Scientific Name	Common Name	Habitat					Method
12.	*Pseudonaja textilis*	Eastern Brown Snake		+				Opportunistic sighting
13.	*Ramphotyphlops nigrescens*	Blackish Blind Snake			+			Nocturnal herpetofauna search
14.	*Varanus varius*	Lace Monitor		+				Trapping
	Arboreal Mammals							
1.	*Acrobates pygmaeus*	Feathertail Glider		+				Spotlighting
2.	*Petaurus norfolcensis*	# Squirrel Glider		+				Spotlighting
3.	*Phascolarctos cinereus*	#^ Koala	+					Spotlighting, opportunistic sighting
4.	*Pseudocheirus peregrinus*	Common Ringtail Possum	+					Spotlighting
5.	*Trichosurus vulpecula*	Common Brushtail Possum	+	+				Trapping, spotlighting
	Terrestrial Mammals							
1.	*Macropus giganteus*	Eastern Grey Kangaroo	+	+				Opportunistic sighting
2.	*Mus domesticus*	* House Mouse	+		+			Trapping
3.	*Pseudomys novaehollandiae*	^ New Holland Mouse	+					Trapping
4.	*Rattus fuscipes*	Bush Rat	+	+				Trapping
5.	*Rattus lutreolus*	Swamp Rat	+					Trapping
6.	*Rattus rattus*	* Black Rat		+				Trapping
7.	*Vulpes vulpes*	* Red Fox		+				Spotlighting
8.	*Wallabia bicolor*	Swamp Wallaby	+					Spotlighting
	Bats							
1.	*Chalinolobus morio*	Chocolate Wattled Bat	+	+				Anabat detection
2.	*Chalinolobus gouldii*	Gould's Wattled Bat	+	+	+			Anabat detection
3.	*Miniopterus australis*	# Little Bentwing-bat	+	+	+			Anabat detection
4.	*Miniopterus schreibersii oceanensis*	# Eastern Bentwing-bat	+					Anabat detection
5.	*Mormopterus norfolkensis*	# Eastern Freetail-bat		+				Anabat detection
6.	*Mormopterus sp. 2*	Undescribed Freetail-bat sp.		+				Anabat detection
7.	*Nyctophilus gouldi*	Gould's Long-eared Bat						Trapping
8.	*Nyctophilus sp.*	Unidentified Long-eared Bat	+	+	+			Anabat detection
9.	*Pteropus poliocephalus*	#^ Grey-headed Flying-fox						Spotlighting
10.	*Scoteanax rueppellii*	# Greater Broad-nosed Bat	+					Anabat detection
11.	*Tadarida australis*	White-striped Freetail-bat	+	+				Spotlighting, anabat detection
12.	*Vespadelus pumilis*	Eastern Forest Bat		+	+			Anabat detection
13.	*Vespadelus vulturnus*	Little Forest Bat	+	+	+			Trapping, anabat detection

No.	Scientific Name	Common Name	Habitat					Method
	Birds							
1.	*Gymnorhina tibicen*	Australian Magpie	+	+	+			Bird survey
2.	*Corvus coronoides*	Australian Raven	+	+	+			Bird survey
3.	*Threskiornis molucca*	Australian White Ibis				+		Bird survey
4.	*Geopelia humeralis*	Bar-shouldered Dove	+	+	+			Bird survey
5.	*Cygnus atratus*	Black Swan					+	Bird survey
6.	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	+	+				Bird survey
7.	*Monarcha melanopsis*	[M] Black-faced Monarch			+			Bird survey
8.	*Accipiter fasciatus*	Brown Goshawk		+				Opportunistic sighting
9.	*Coturnix ypsilophora*	Brown Quail	+					Opportunistic sighting
10.	*Acanthiza pusilla*	Brown Thornbill	+	+	+			Bird survey
11.	*Sterna caspia*	[M] Caspian Tern				+	+	Bird survey (fly over)
12.	*Ocyphaps lophotes*	Crested Pigeon		+				Bird survey
13.	*Eurystomus orientalis*	Dollarbird			+			Bird survey
14.	*Eudynamys orientalis*	Eastern Koel		+				Bird survey
15.	*Platycercus eximius*	Eastern Rosella	+	+				Bird survey
16.	*Acanthorhynchus tenuirostris*	Eastern Spinebill	+	+	+			Bird survey
17.	*Psophodes olivaceus*	Eastern Whipbird	+	+	+			Bird survey
18.	*Eopsaltria australis*	Eastern Yellow Robin	+	+	+			Bird survey
19.	*Cacomantis flabelliformis*	Fan-tailed Cuckoo		+				Bird survey
20.	*Cacatua roseicapilla*	Galah				+		Bird survey
21.	*Pachycephala pectoralis*	Golden Whistler		+	+			Bird survey
22.	*Cracticus torquatus*	Grey Butcherbird	+	+	+			Bird survey
23.	*Rhipidura fuliginosa*	Grey Fantail	+	+	+			Bird survey
24.	*Colluricincla harmonica*	Grey Shrike-thrush	+	+				Bird survey
25.	*Dacelo novaeguineae*	Laughing Kookaburra	+	+	+			Bird survey
26.	*Myiagra rubecula*	Leaden Flycatcher		+				Bird survey
27.	*Meliphaga lewinii*	Lewin's Honeyeater		+				Bird survey
28.	*Glossopsitta pusilla*	# Little Lorikeet		+				Bird survey
29.	*Anthochaera chrysoptera*	Little Wattlebird	+	+				Bird survey
30.	*Grallina cyanoleuca*	Magpie-lark	+					Bird survey
31.	*Vanellus miles*	Masked Lapwing	+					Bird survey
32.	*Dicaeum hirundinaceum*	Mistletoebird		+	+			Bird survey
33.	*Glossopsitta concinna*	Musk Lorikeet		+				Bird survey
34.	*Phylidonyris novaehollandiae*	New Holland Honeyeater			+			Bird survey
35.	*Philemon corniculatus*	Noisy Friarbird	+	+	+			Bird survey
36.	*Manorina melanocephala*	Noisy Miner		+				Bird survey

No.	Scientific Name	Common Name	Habitat					Method
37.	*Oriolus sagittatus*	Olive-backed Oriole		+				Bird survey
38.	*Anas superciliosa*	Pacific Black Duck					+	Bird survey
39.	*Centropus phasiananus*	Pheasant Coucal			+			Opportunistic sighting
40.	*Cracticus nigrogularis*	Pied Butcherbird	+	+	+			Bird survey
41.	*Strepera graculina*	Pied Currawong	+	+				Bird survey
42.	*Trichoglossus haematodus*	Rainbow Lorikeet	+	+	+			Bird survey
43.	*Anthochaera carnunculata*	Red Wattlebird	+	+	+			Bird survey
44.	*Neochmia temporalis*	Red-browed Finch	+	+				Bird survey
45.	*Rhipidura rufifrons*	[M] Rufous Fantail	+					Opportunistic sighting
46.	*Pachycephala rufiventris*	Rufous Whistler		+				Bird survey
47.	*Myzomela sanguinolenta*	Scarlet Honeyeater	+	+				Bird survey
48.	*Zosterops lateralis*	Silvereye	+	+	+			Bird survey
49.	*Stipiturus malachurus*	Southern Emu-wren	+					Bird survey
50.	*Pardalotus punctatus*	Spotted Pardalote		+				Bird survey
51.	*Streptopelia chinensis*	* Spotted Dove		+				Bird survey
52.	*Cacatua galerita*	Sulphur-crested Cockatoo				+		Bird survey
53.	*Malurus cyaneus*	Superb Fairy-wren	+	+				Bird survey
54.	*Podargus strigoides*	Tawny Frogmouth		+	+			Opportunistic sighting
55.	*Daphoenositta chrysoptera*	# Varied Sittella		+				Bird survey
56.	*Malurus lamberti*	Variegated Fairy-wren	+	+	+			Bird survey
57.	*Hirundo neoxena*	Welcome Swallow		+				Bird survey
58.	*Haliastur sphenurus*	Whistling Kite	+	+				Bird survey
59.	*Haliaeetus leucogaster*	[M] White-bellied Sea-Eagle				+		Opportunistic sighting
60.	*Sericornis frontalis*	White-browed Scrubwren	+	+	+			Bird survey
61.	*Phylidonyris nigra*	White-cheeked Honeyeater		+	+			Bird survey
62.	*Gerygone olivacea*	White-throated Gerygone	+	+				Bird survey
63.	*Cormobates leucophaeus*	White-throated Treecreeper	+					Bird survey
64.	*Rhipidura leucophrys*	Willie Wagtail	+					Opportunistic sighting
65.	*Acanthiza nana*	Yellow Thornbill						Bird survey
66.	*Lichenostomus chrysops*	Yellow-faced Honeyeater	+	+	+			Bird survey
67.	*Calyptorhynchus funereus*	Yellow-tailed Black-Cocktoo		+	+			Bird survey
	Total No. of Species per Habitat Type		**63**	**74**	**40**	**5**	**3**	

APPENDIX 5. STAFF CONTRIBUTIONS

The following Kleinfelder staffs were involved in the compilation of this report.

Name	Qualification	Title/Experience	Contribution
Chelayne Evens	BSC (Geog) Dip. SIS	Ecologist / Workflow Manager	Report Peer Review
Dan Pedersen	BSC EngTech GIFireE, BPAD-A	Senior Ecologist (Botany) Bushfire Consultant	Report technical review
Gayle Joyce	BSc (Forestry) (Hons)	GIS Specialist	Preparation of maps
Samara Schulz	BEnvSc & Mgt (Hons)	Ecologist	Report preparation