ECOLOGY

The following addendum to the original ecological assessment was completed on the 19th May 2015.

FloraFauna Consulting

Addendum to Ecological Assessment Report

Project Number: EA-2013-2204

Proposed Extraction Industry

Lot 1324 DP 785574 & Lot 323 DP 855616
McGuires Crossing

May 2015

Prepared for: Grandia Investments Pty Ltd

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Title:	Addendum to Ecological Assessment Report
Project:	Lot 1324 DP 785574 & Lot 323 DP 855616 McGuires Crossing
Client:	Grandia Investments Pty Ltd
Report No.:	EA-2013-2204 Addendum
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The preparation of this addendum to the ecological report has been undertaken in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

All information contained within this addendum are prepared for the exclusive use of the client and with respect to the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes other than those stated herein.

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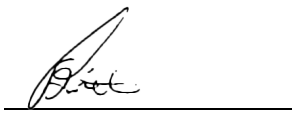
Signed: 

Date: 19 May 2015

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1. Glossary of Terms and Acronyms

AABR: Australian Association of Bush Regenerators

Abundance: Means a quantification of the population of the species or community

Affected species: Means subject species likely to be affected by the proposal

AHD: Australian height datum

APZ: Asset protection zone (for bushfire protection purposes)

Assessment guidelines: Means assessment guidelines issued and in force under Section 94A of the *Threatened Species Conservation Act 1995* or, subject to Section 5C of the *Fisheries Management Act 1994*

CAVS: Census of Australian Vertebrates

CKPoM: Comprehensive Koala Plan of Management for the Eastern Portion of Kempsey LGA

Conservation status: Is regarded as the degree of representation of a species or community in formal conservation reserves

Critical habitat: The area declared to be critical habitat under Part 3 of the *Threatened Species Conservation Act 1995*

DCP: Kempsey Development Control Plan 2013

DECC: Department of Environment, Conservation and Climate Change

Development: The erection of a building on that land, the carrying out of work in, on, over or under that land, the use of that land or of a building or work on that land, and the subdivision of that land

Endangered ecological community: An ecological community specified in Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995*

Endangered population: A population specified under Part 1 of Schedule 1 of the *Threatened Species Conservation Act 1995*

Endangered species: a species listed under Schedule 1 of the *Threatened Species Conservation Act 1995*

EP&A Act: *Environmental Planning and Assessment Act, 1979*

EPBC Act: *Environment Protection and Biodiversity Conservation Act 1999*

Field survey: Means on the ground flora and fauna assessment

Habitat: An area or areas occupied, or periodically or occasionally occupied by a species, population or ecological community and includes any abiotic component

HBT: Hollow-bearing tree

Key Threatening Process: Is a threatening process listed under the *Threatened Species Conservation Act 1995*

KFT: Koala food tree

LEP: Kempsey Local Environmental Plan 2013

Locality: the area within a 5 km radius of the study area

NPW Act: *National Parks and Wildlife Act 1974*

OEH: NSW Office of Environment and Heritage

PBP: *Planning for Bushfire Protection 2006*

PCT: NSW Plant Community Type classification

PMST: Protected matters search tool

Recovery and threat abatement plan: A plan to promote the recovery of threatened species, population or an ecological community with the aim of returning the species, population, or ecological community to a position of viability in nature

ROTAP: Rare or threatened Australian plant

SAT Survey: The Spot Assessment Technique: determining the importance of habitat utilisation by Koalas (*Phascolarctos cinereus*), Phillips and Callaghan 1995

SEPP: State Environmental and Planning Policy

Subject Site: The identified land (Lot(s) and DP(s)

Study area: The geographic extent of the ecological assessment (may be the subject site or a portion of it or incorporate adjacent land)

Threatened species: A species specified in Part 1 or 4 of Schedule 1 or in Schedule 2 of the *Threatened Species Conservation Act 1995*

Threatening process: Means a threatening process that threatens, or could potentially threaten, the survival or evolutionary development of a species, population or ecological community

TSC Act: *Threatened Species Conservation Act 1995*

VIS: NSW Vegetation Information System (classification database)

VMP: Vegetation Management Plan

Vulnerable species: A species listed under Schedule 2 of the *Threatened Species Conservation Act 1995* or when a fish, listed under the *Fisheries Management Act 1994*.

2. Introduction

2.1 Addendum Context

This document is an addendum to the ecological assessment report (reference number EA-2013-2204) prepared by FloraFauna Consulting dated 4 June 2013 in relation to a proposed extraction industry (sand quarry) on land identified as Lot 1324 DP 785574 & Lot 323 DP 855616, McGuires Crossing (the study area). This addendum was prepared to describe the methodologies and to detail the findings of a fauna survey undertaken within the study area during April 2015. It should be noted that changes will not be made to the original report and that this addendum forms part of the documentation of the ongoing Development Application.

2.2 Background

During the original ecological assessment it was determined that the study area occurred across a dunal sand ridge and adjacent slopes as well as the margins of an adjacent coastal floodplain wetland. The dunal sand ridge and slopes within the study area were occupied by a Pink Bloodwood open forest community (VIS classification: *Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion*). The principal species recorded in the canopy included *Eucalyptus pilularis* (Blackbutt), *Eucalyptus planchoniana* (Bastard Tallowwood) and *Corymbia intermedia* (Pink Bloodwood), which were all common throughout the survey area. Another species; *Eucalyptus signata* (Scribbly Gum) was also recorded, but was generally confined to the lower slopes of the dunal ridge adjacent to the wetland. In the mid-stratum the more common species included *Banksia serrata* (Old-man Banksia), *Persoonia lanceolata* (Lance Leaf Geebung), *Persoonia linearis* (Narrow-leaved Geebung), *Brachyloma daphnoides* (Daphne Heath), *Callitris rhomboidea* (Port Jackson Pine), *Ochrosperma lineare* (Straggly Baeckea), *Leucopogon ericoides* (Pink Beard-heath), *Dillwynia retorta*, *Monotoca elliptica* (Tree Broom-heath) and *Leptospermum trinervium* (Flaky-barked Tea-tree). The more common species in the groundcover included *Themeda australis* (Kangaroo Grass), *Pteridium esculentum* (Common Bracken), *Lomandra longifolia* (Spiny-headed Mat-rush), *Imperata cylindrica* var. *major* (Blady Grass) and *Baloskion tetraphyllum* subsp. *meiostachyum* (Plume Rush), *Cymbopogon refractus* (Barbed Wire Grass), *Isolepis inundata* and *Actinotus helianthi* (Flannel Flower). In the disturbed parts of the survey area where the canopy and understorey had either been removed or reduced weed species including *Andropogon virginicus* (Whisky Grass), Chrysanthemoides *monilifera* subsp*. rotundata* (Bitou Bush) and *Sporobolus africanis* (Parramatta Grass) were established.

During the initial field survey it was noted that the Pink Bloodwood open forest community contained a significant number of trees in the late-mature growth stages that contained hollows. There were also quantities of fallen dead timber on the forest floor, providing important refuges for a variety of terrestrial species of fauna and the formation of microhabitats. Consequently it was recognised that the habitat within the study area was likely to be of high ecological value with potential foraging and nesting/denning habitat for a number of threatened species.

Kempsey Shire Council have received advice from the NSW Office of Environment and Heritage that the original ecological assessment undertaken by FloraFauna Consulting was deficient in the following areas:

- *Only visual Daytime surveys were conducted. No trapping, spotlighting, call playback or other survey techniques were used;*
- *The Office of Environment and Heritage (OEH) online Bionet Atlas showed the following records;*
  - *Squirrel Glider on the site in 2010; and*
  - *Brush-tailed phascogale either on, or very close to the site, in 2009.*

  These are both nocturnal listed threated species in NSW and would not be detected on the site by a visual daytime survey. Neither of these records are mentioned in the Ecological Assessment (Flora and Fauna Consulting, 2013).
- *The Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (DEC NSW, 2OO4) is the standard guidelines for suggested survey methods and efforts for ecological surveys. This was also the suggested guideline in the Director Generals Requirements for the preparation of the EIS. However the ecological assessment survey effort was significantly less than set out in the guidelines and therefore unable to conduct an accurate Assessment of Significance and determine if an SIS is required; and*
- *The Director Generals Requirements (DGR's) for the proposed development requested consideration of a Biodiversity Offset Strategy. The EIS (pages 32 and 33) lists reasons claiming a biodiversity offsets are not required for the development. However it is Councils Opinion these reasons do not negate the need for a biodiversity offset strategy.*

The purpose of this addendum to the ecological report is to address the aforementioned deficiencies of the original ecological assessment report.

2.3 Study Area

The study area comprised the land within the subject site identified as Lot 1324 in DP 785874 and Lot 323 in DP 855616, McGuires Crossing, which has area of approximately 24.32 hectares. The site is situated approximately 5 km southwest from the village of Hat Head and approximately 1.8 km from the coastline. There are two existing dwellings erected on the land within the study area, which are unoccupied and derelict. Access to these dwellings is via Tea Tree Lane and Loftus Road.

The study area is located on a sand ridge derived from sedimentary deposits laid down during the cold periods of the Quaternary when the sea level was more than 100 metres lower than at present. In the past 18,000 years the sea level has risen to its present position, sweeping sand from the continental shelf before it. This sand has accumulated in the coastal barrier systems forming high foredunes, low inner barrier ridges, wide lake basins and high parabolic (crescent-shaped) dunes blown onto bedrock hills (NPWS, 2003).

The study area adjoins Hat Head National Park to the north and east and rural holdings to the south and west. With the exception of the dunal sand ridge bisecting the subject site the land within the surrounding landscape is generally low-lying with significant areas containing wetlands. Several wetlands mapped under *State Environment Protection Policy No. 14 – Coastal Wetlands* (SEPP 14) are situated within the immediate vicinity of the study area, including SEPP 14 Wetland No. 469 situated immediately to the west, SEPP 14 Wetland No. 471 situated immediately to the north and SEPP 14 Wetland No. 472 situated immediately to the east.

Figure 3.1: Aerial image of the study area

3. Methodology

3.1 Nomenclature

The names of plants used in this document follow the *Flora of New South Wales* (Harden, 2000) with updates from the PlantNet website (Royal Botanic Gardens Sydney, 2012).

The description of plant communities used in this document follow the NSW Plant Community Type (PCT) classification from the NSW Vegetation Information System (VIS) classification database (NSW Department of Environment and Heritage). For clarity a description based on observations recorded during the field survey has also been provided.

The names of vertebrate animals used in this document follow the Census of Australian Vertebrates (CAVS) database maintained by the Department of the Environment and Heritage (2004).

3.2 Licencing

All work in relation to this fauna survey was undertaken with appropriate licences and authorisations including:

- A Scientific Licence for the purpose of ecological survey and consulting issued subject to the provisions of Section 132C of the NPW Act and regulations; and
- An Animal Research Authority issued by the Department of Industries and Investment (formerly the Department of Primary Industries) Director-General's Animal Care and Ethics Committee for the purpose of biodiversity survey and habitat assessment.

3.3 Survey Timing and Weather Conditions

The survey was conducted between 15 and 19 April 2015. Weather conditions at the time were relatively mild. Generally, the weather was fine and sunny with very slight wind from the northeast, except for the final day after completion of field work when light rain was recorded. The maximum day time temperature was in the range of 28-29^{o} C and the minimum overnight temperature was in the range of 14-16^{o} C.

3.4 Other Site Information

It was noted that two tree species; *Corymbia intermedia* (Pink Bloodwood) and *Eucalyptus pilularis* (Blackbutt) were flowering at the time of the fauna survey.

3.5 Threatened Fauna Records

The Atlas of NSW Wildlife database indicates several threatened species of fauna have been recorded in the vicinity of the study area (development site) as indicated in Table 3.1. Suitable habitat was considered to be available to these species within the study area.

Species	Common Name
Phascogale tapoatafa	Brush-tailed Phascogale
Phascolarctos cinereus	Koala
Petaurus norfolcensis	Squirrel Glider
Pteropus poliocephalus	Grey-headed Flying-fox
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat
Chalinolobus nigrogriseus	Hoary Wattled Bat
Miniopterus australis	Little Bentwing-bat
Myotis macropus	Southern Myotis
Scoteanax rueppellii	Greater Broad-nosed Bat

Table 3.1: Threatened species recorded in proximity to the study area (Source: Atlas of NSW Wildlife)

In addition to the above, *Petaurus norfolcensis* (Squirrel Glider) was recorded in a recent survey undertaken by FloraFauna Consulting at a site situated at Loftus Road Crescent Head approximately 6 km to the south of the study area. Note, this record has yet to be entered into the Atlas of NSW Wildlife database.

3.6 Fauna Survey Methodology

3.6.1 Legislative Context

For the purposes of the Koala survey undertaken in this study the methodology prescribed under the *Comprehensive Koala Plan of Management for the Eastern Portion of Kempsey Shire LGA* (CKPoM) and the principles of the *EPBC Act Referral Guidelines for the Vulnerable Koala* Department of the Environment) were adopted.

For survey of other species, as a minimum the methodology, survey design and survey effort detailed under the *Threatened Biodiversity Survey and Assessment Guidelines for Development and Activities Working Draft* (DEC, 2004) were followed. The following fauna surveys were undertaken.

3.6.2 Koala Habitat Assessment and Survey

- For the purposes of the *Comprehensive Koala Plan of Management for the Eastern Portion of Kempsey Shire LGA* (CKPoM) a habitat assessment was undertaken utilising the Spot Assessment Technique (SAT) as detailed in Appendix 1 of the CKPoM Volume II. The survey effort proposed was an initial sampling intensity (every 150 metres). However, given the difficulty in accessing all parts of the site due in part to the dense understorey and swampy margins 150 metre grid spacing could not be uniformly applied across the whole of the site. To compensate for this a higher sampling intensity of approximately 120 metre grid spacing was applied; and
- For the purposes of the EPBC Act a Koala assessment and survey was undertaken in accordance with the survey principles set out in the *EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)*. This involved utilising the results of the aforementioned SAT survey, which was

supplemented by diurnal searches for sightings and signs of the species and nocturnal spotlighting surveys.

The position of SAT survey sites is indicated on the SAT grid plan at Figure 3.1.

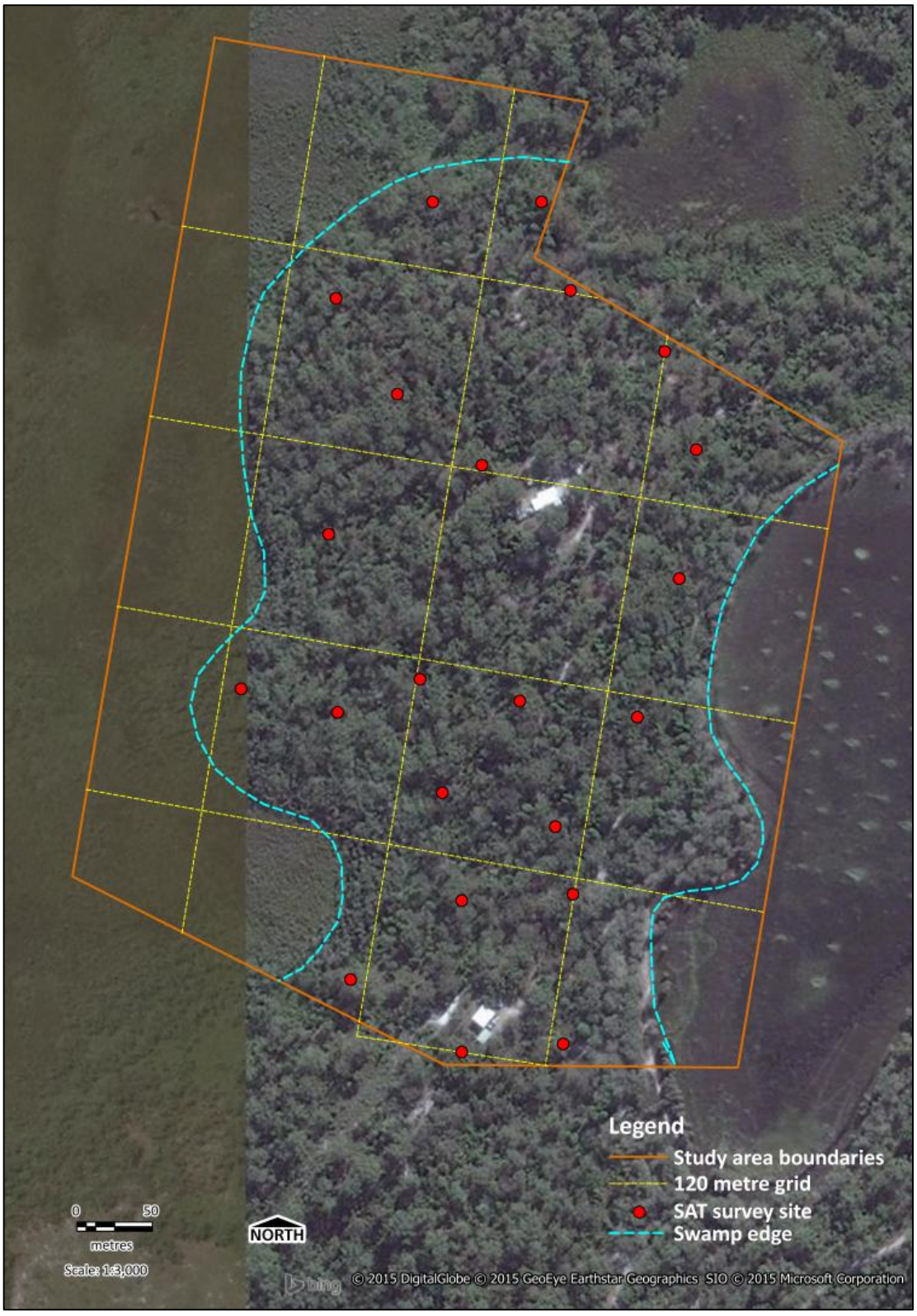

Figure 3.1: SAT survey grid plan

3.6.3 Search for Scats, Tacks and Other Signs

A search for scats, tracks and other signs was conducted the whole of the study area. The minimum search effort prescribed is 30 minutes per suitable habitat.

3.6.4 Trapping

Trapping was conducted within suitable habitat along existing vehicular tracks to facilitate ready access to the trap lines.

a. Elliott Trapping

Arboreal Elliott trapping utilising six (6) Type A (8 cm x 10 cm x 33 cm) traps over four (4) nights (equivalent to 24 trap nights) targeting *Phascogale tapoatafa* (Brush-tailed Phascogale) was conducted. Traps were mounted on timber platforms with a metal brackets screwed to the trunk of selected trees. All traps were mounted so as to allow for drainage of water out of trap.

In addition, terrestrial Elliott trapping utilising thirty (30) Type A traps over four (4) nights (equivalent to 120 trap nights) was conducted along a line transect adjacent to an existing disused vehicular track. Targeted species considered to have potential to utilise the habitat within the study area included *Pseudomys gracilicaudatus* (Eastern Chestnut Mouse), *Planigale maculata* (Common Planigale) and *Pseudomys novaehollandiae* (New Holland Mouse).

Elliott traps were alternately baited with a rolled oats/peanut butter/honey mixture or a rolled oats/peanut butter/tin mackerel mixture and were provided with loose dry leaf litter for insulation of trapped animals.

b. Cage Trapping

Arboreal cage trapping utilising six (6) cage traps measuring 66 cm x 23 cm x 26 cm set over four (4) nights (equivalent to 24 trap nights) targeting *Petaurus norfolcensis* (Squirrel Glider) was conducted. Traps were mounted on timber platforms with a metal brackets screwed to the trunk of selected trees. All cage traps were wrapped in shade cloth to provide shelter to captured animals and baited with a rolled oats/peanut butter/honey mixture.

c. Pitfall Trapping

Pitfall traps with drift nets comprising six (6) 20 litre plastic buckets buried in the ground each with a five (5) metre long by 30 cm high black plastic drift fence installed either side.

The location of all traps sites is indicated in Figure 3.2.

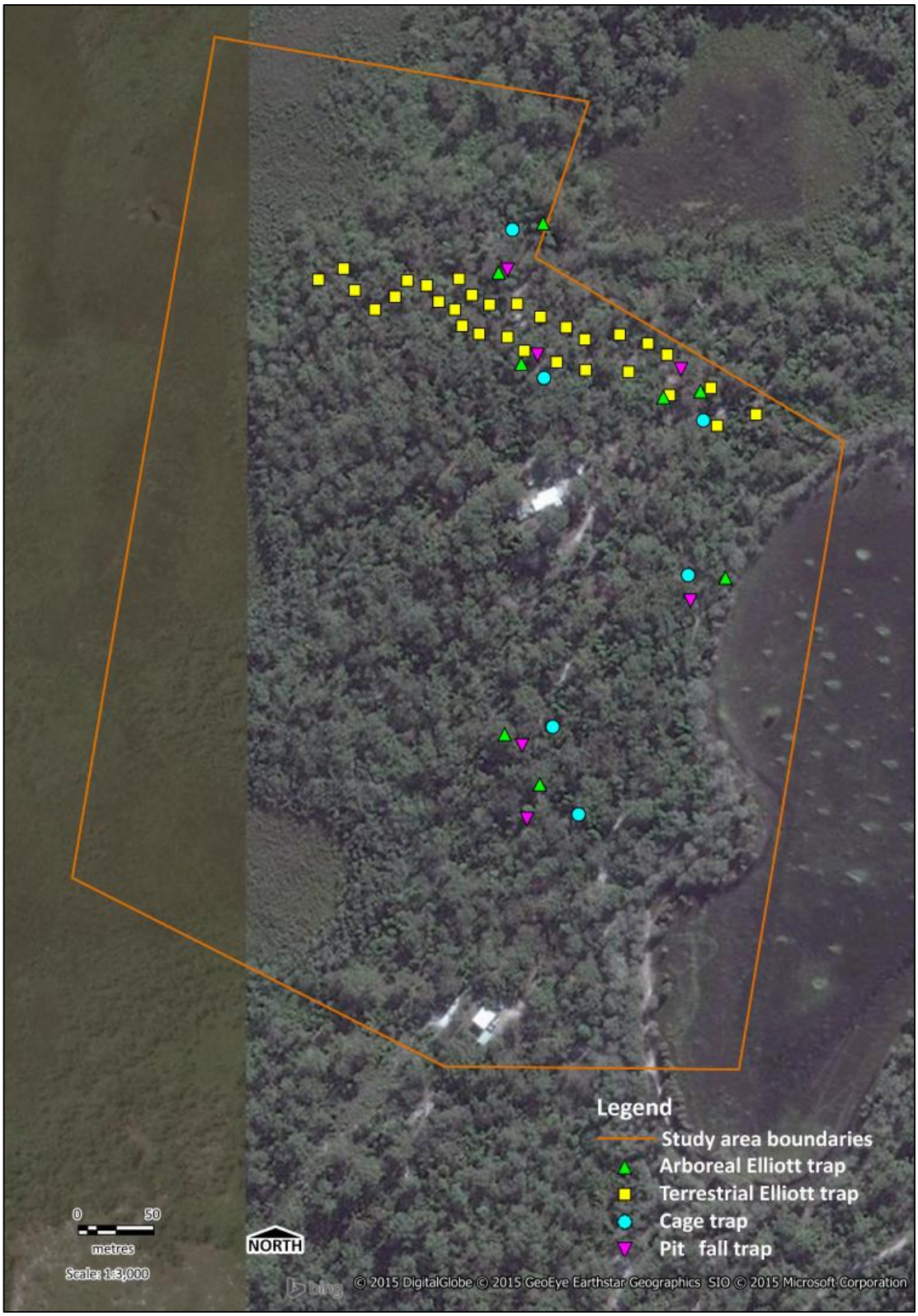

Figure 3.2: Location of traps within the study area during the fauna survey

3.6.5 Spotlighting

Spotlighting utilising a VariSpot variable 5~100 watt quartz halogen handheld spotlight primarily to target *Petaurus norfolcensis* (Squirrel Glider) and *Phascolarctos cinereus* (Koala) but other species that may have been present was undertaken on three (3) separate nights for approximately 1.5 hours on each night. The line transect generally

followed existing vehicular tracks and avoided the trap sites. The spotlighting line transect is indicated in Figure 3.3.

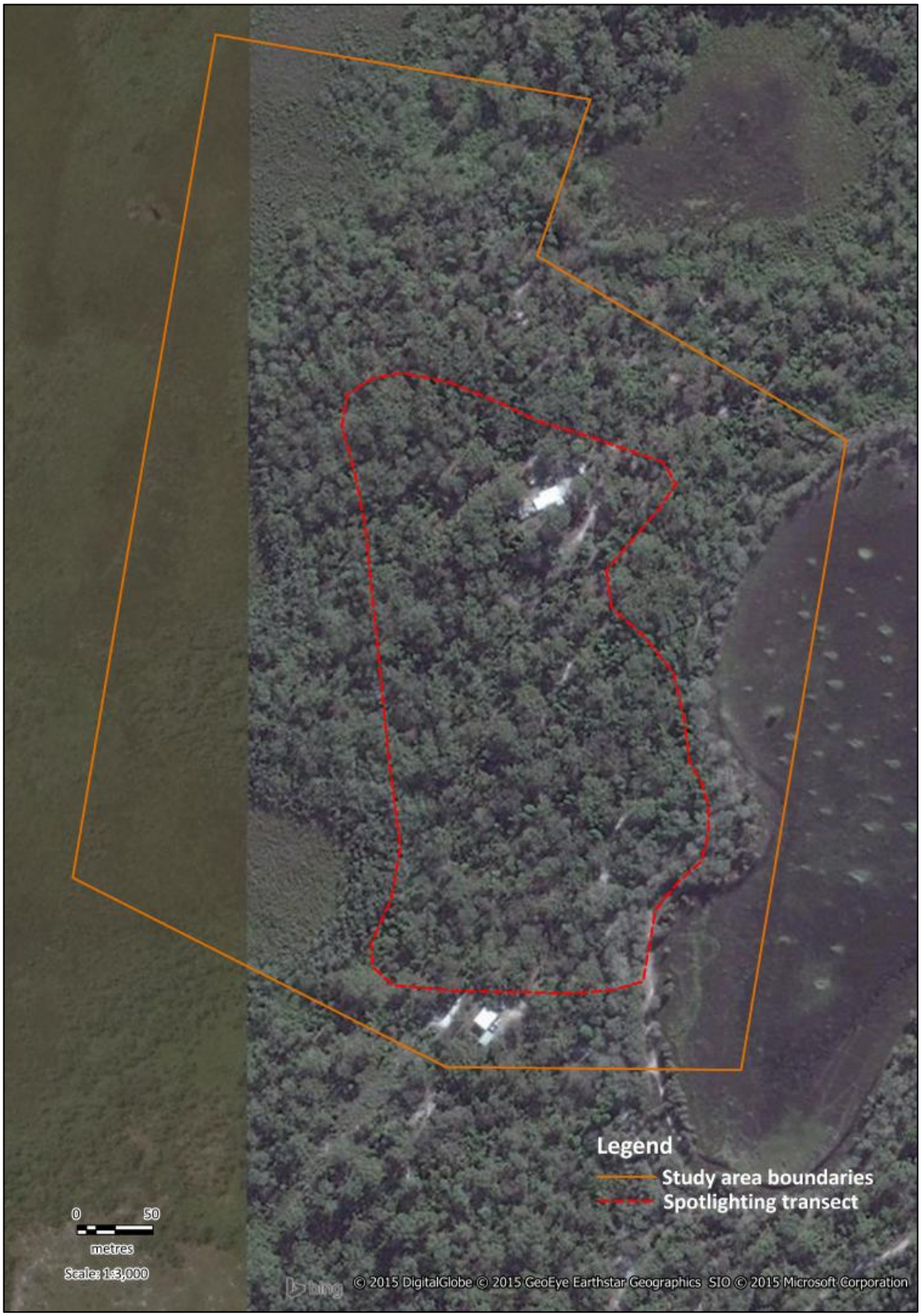

Figure 3.3: Spotlighting line transect

3.6.6 Ultrasonic Echolocation Detection

The ultrasonic echolocation detection survey was conducted utilising a single Wildlife Acoustics EM3+ Echo Meter over four (4) separate nights in the position indicated in Figure 3.4.

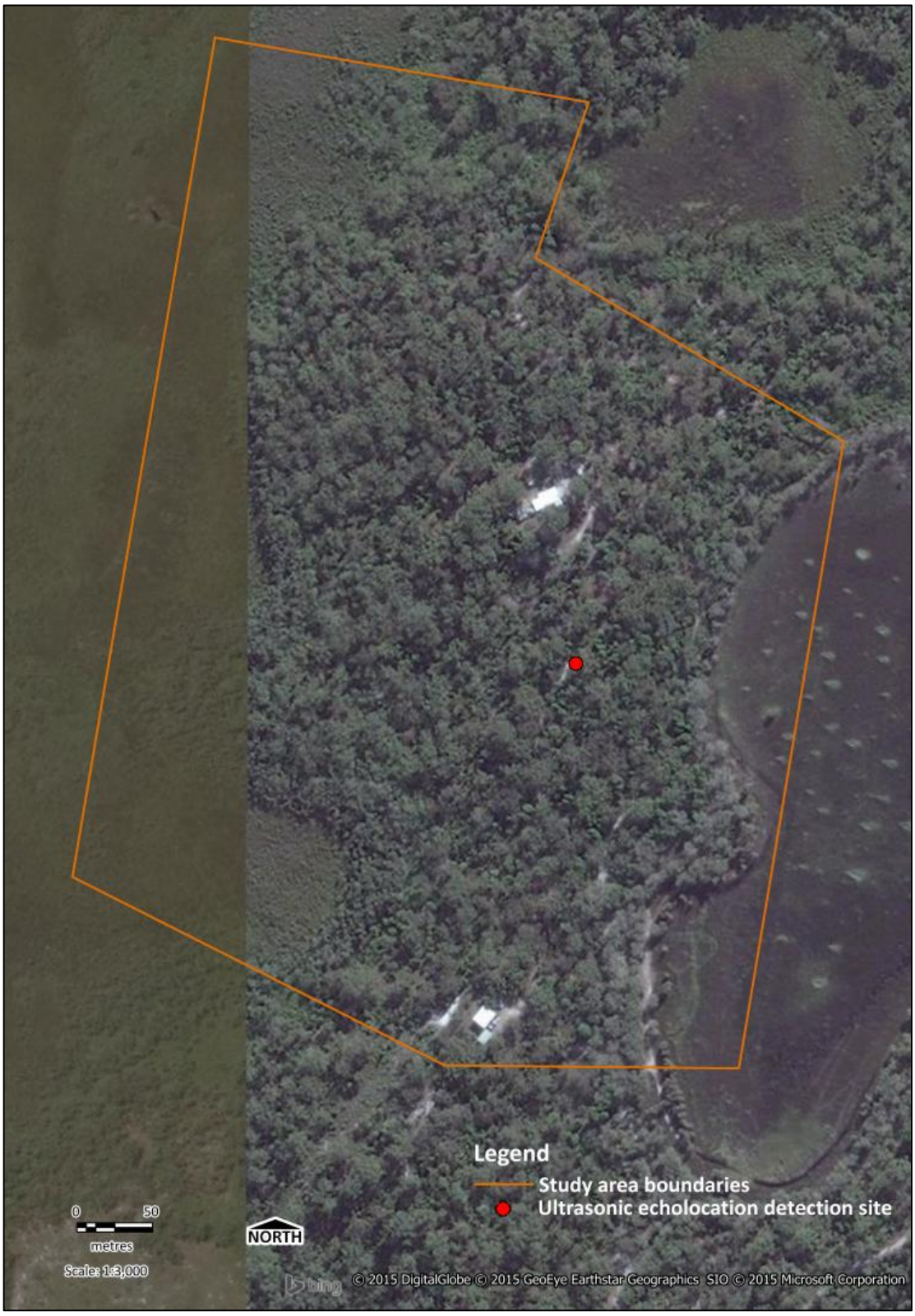

Figure 3.3: Ultrasonic echolocation detection sit

The most suitable time to conduct bat surveys is between October and March when bats are active. However, the mild conditions with relatively warm nights and moderate humidity experienced on site during the survey provided suitable conditions to conduct an ultrasonic echolocation detection survey during the current study.

The region-based guide to the echolocation calls of Microchiropteran Bats; *Bat Calls of New South Wales* (Pennay et al 2001) was used for the initial analysis of call identification. Records obtained from the Atlas of NSW Wildlife (OEH, 2015) as well as distributional information provided in relevant literature including *Australian Bats* (Churchill, 2008), *A Field Guide to the Mammals of Australia* (Menkhorst and Knight, 2004) and *The Mammals of Australia* (Strahan, 1998) were used to determine the potential for the occurrence of species within the study area.

The Microchiropteran Bat calls recorded during the survey were forwarded to Anna McConville of Echo Ecology, a specialist fauna call identification consultancy for identification. The Echo Ecology analysis is assessment is provided in the results.

3.7 Survey Limitations

Ecological surveys are limited in their capacity to document all of the species of flora and fauna likely or actually occurring at a given site. There are numerous factors that will influence whether a species is detected or not, including climatic and seasonal conditions, the issue of migratory species movements, availability of shelter and food resources, and how readily a species is observed or otherwise recorded given the cryptic nature of some species making them difficult to detect. The absence of a species from survey results does not necessarily indicate that the species is not present. Similarly, there are limitations applicable to the interpretation of records held in databases for the presence or absence of a species at a site. For instance, the Atlas of NSW Wildlife is a database of limited available information and it should not be assumed that the absence of records indicates that a species is not present. Therefore, in order to offset these limitations the habitat components of the study area have been assessed to help predict those species likely to occur within the study area based on habitat preferences.

4. Results

4.1 Koala SAT Survey

Twenty two (22) SAT sites were surveyed across the study area as indicated in Figure 3.1. No koala faecal pellets were found.

4.2 Scats, Tracks and Other Signs Search

Due to the sandy soil within the study area numerous tracks were observed across the site during the fauna survey. These appeared to have been made mostly by invertebrates but several tracks appeared to be those of vertebrates including amphibians, small reptiles, *Varanus varius* (Lace Monitor), which was observed within the study area during diurnal survey activities and a species of macropod.

There were several foraging signs observed across the site, which were attributed to an unidentified species of Bandicoot. Based on Atlas records the most likely species is *Isoodon macrourus* (Northern Brown Bandicoot). There were also digging signs recorded in termitaria, which was attributed to *Tachyglossus aculeatus* (Short-beaked Echidna).

There were several rough-barked trees, in particular *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus planchoniana* (Bastard Tallowwood) showing evidence of disturbance to the trunk that was attributed to arboreal fauna. However, the species responsible could not be determined based solely on these signs. It was noted that there was a lack of disturbance observed to the trunks of smooth-barked eucalypts such as *Eucalyptus signata* (Scribbly Gum).

There were no obvious feeding incisions observed on preferred sap tree species during the survey. Some old occluded wounds were noted on the trunks of some individuals of *Eucalyptus signata* (Scribbly Gum).

4.3 Trapping

4.3.1 Elliott Trapping

a. Terrestrial

There were no captures of any species recorded from the terrestrial Elliott trapping.

b. Arboreal

Arboreal Elliott trapping resulted in the capture of one (1) adult male *Phascogale tapoatafa* (Brush-tailed Phascogale) in an arboreal Elliott trap. An image of the captured Brush-tailed Phascogale is provided at Figure 4.1.

Figure 4.1: Brush-tailed Phascogale captured during the fauna survey

The Brush-tailed Phascogale was captured in a tree-mounted Elliott trap identified as Trap A6 located in the south-eastern part of the study area as indicated in Figure 4.2.

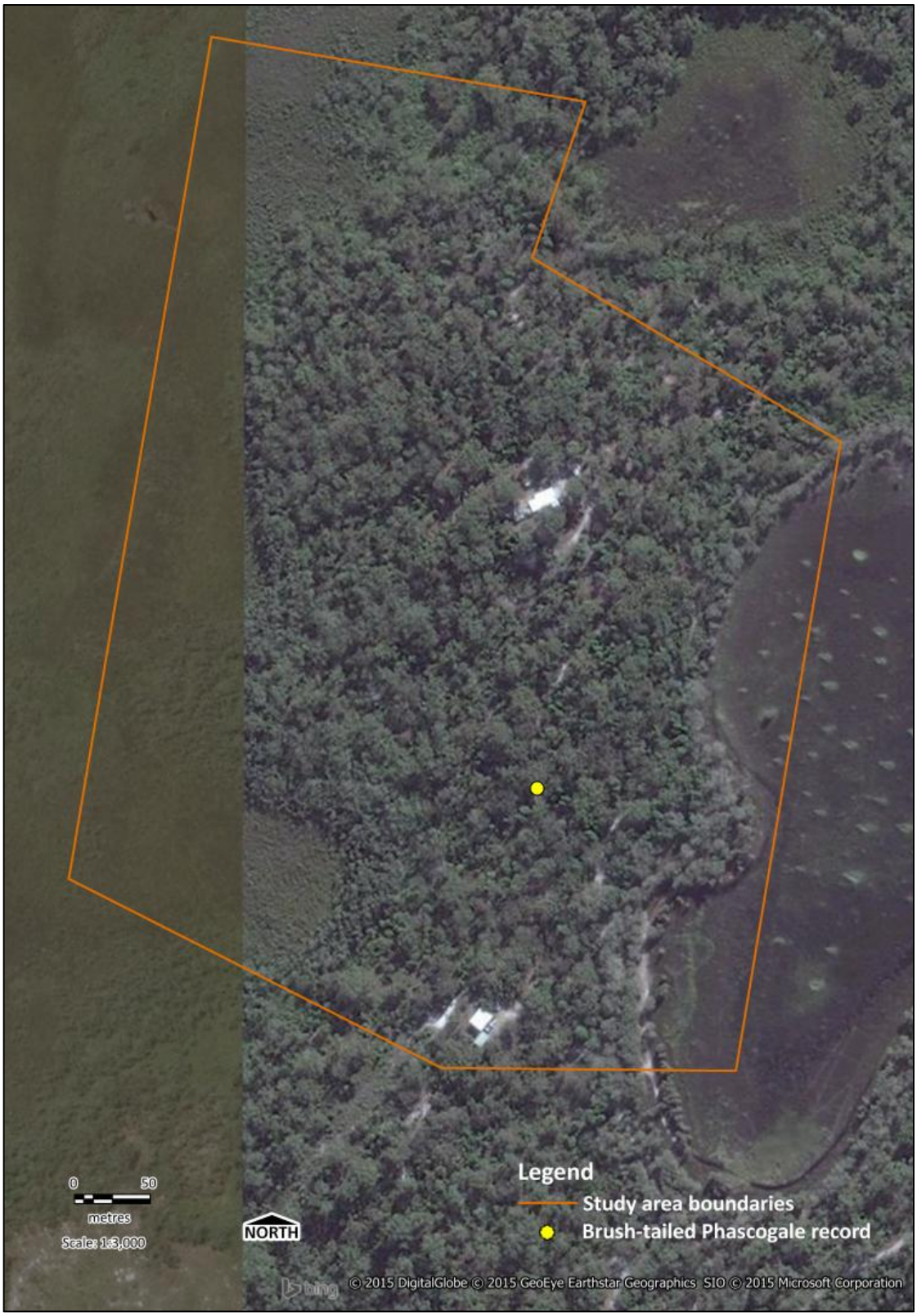

Figure 4.2: Location of Brush-tailed Phascogale capture

4.3.2 Cage Trapping

Three individuals of *Trichosurus vulpecula* (Common Brushtail Possum) were captured in tree-mounted cage traps during the fauna survey. Two of these captures were an

adult male captured on two consecutive nights in the same trap and it is suspected that this may have been the same individual.

4.3.3 Pitfall Trapping

Pitfall trapping resulted in the capture of a relatively large number of two species of frog; *Limnodynastes dumerilii* (Eastern Banjo Frog) and *Limnodynastes peronii* (Striped Marsh Frog). There was a total of ten (10) Eastern Banjo Frogs captured including both adult and juveniles. Seventy nine (79) Striped Marsh Frogs were captured, all of which were juveniles.

Two species of reptile were captured in pitfall traps including *Lampropholis delicata* (Dark-flecked Garden Skinks) and (*Demansia psammophis*) (Yellow-faced Whipsnake). In the case of the Dark-flecked Garden Skink, three (3) individuals were captured. In the case of the Yellow-faced Whipsnake one (1) juvenile of approximately 30 cm in length was captured.

There was also a significant number of invertebrate species captured in pitfall traps, however no details were recorded for the purposes of this study.

4.4 Spotlighting

Several species of fauna were recorded during the spotlighting survey including the *Limnodynastes dumerilii* (Eastern Banjo Frog), *Limnodynastes peronii* (Striped Marsh Frog), *Tachyglossus aculeatus* (Short-beaked Echidna), *Trichosurus vulpecula* (Common Brushtail Possum), *Wallabia bicolor* (Swamp Wallaby), *Pteropus poliocephalus* (Grey-headed Flying-fox) and several unidentified Microchiropteran bats.

4.5 Ultrasonic Echolocation Detection Survey

The Microchiropteran Bat species recorded with confidence in the Echo Ecology analysis included:

- *Chalinolobus gouldii* (Gould's Wattled Bat)
- *Miniopterus australis* (Little Bentwing-bat)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Tadarida australis* (White-striped Free-tail Bat)
- *Vespadelus darlingtoni* (Large Forest Bat)
- *Vespadelus pumilus* (Eastern Forest Bat)

The detailed bat call identification report prepared by Echo Ecology is appended to this report as Appendix C.

4.6 Opportunistic Observations

There were a number of additional observations of fauna recorded opportunistically during the survey including four amphibians, four reptiles, 28 avian species and 13 mammals, most of which are common species. The complete list of species recorded during the fauna survey including the six threatened species is appended to this report as Appendix A.

Two additional threatened species were also recorded opportunistically during the survey. These included *Crinia tinnula* (Wallum Froglet) was heard calling from various locations in the areas of wetland within the study area and adjacent allotments. There was an observation of an individual of the threatened species of raptor species; *Lophoictinia isura* (Square-tailed Kite), which was observed flying above the canopy of the study area.

5. Discussion

5.1 Threatened Species

Based on Atlas of NSW Wildlife records and habitat preferences the main target species of this fauna survey were *Phascogale tapoatafa* (Brush-tailed Phascogale), *Phascolarctos cinereus* (Koala), *Petaurus norfolcensis* (Squirrel Glider) and five species of Microchiropteran bats including *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat), *Chalinolobus nigrogriseus* (Hoary Wattled Bat), *Miniopterus australis* (Little Bentwing-bat), *Myotis macropus* (Southern Myotis) and *Scoteanax rueppellii* (Greater Broad-nosed Bat).

One Brush-tailed Phascogale was captured during the survey, confirming that the species is present within the study area. The threatened species profile for the Brush-tailed Phascogale (OEH, 2015) indicates that the species is known to be associated with Pink Bloodwood open forest (described under the VIS classification as *Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion*), which was recorded across the study area. The threatened species profile also indicates that the species nests and shelters in tree hollows with entrances of 2.5 to 4 cm in width. As the study area contains an abundance of suitable hollow-bearing trees within a plant community that the Brush-tailed Phascogale is known to be associated with and in which the species has been recorded there seems little doubt that the habitat within the study area is important to the survival of the species.

The field survey indicated that the habitat within the study area contains two preferred Koala food tree species for the purposes of SEPP 44, including *Eucalyptus signata* (Scribbly Gum), which was a common component of the Pink Bloodwood open forest (particularly on the lower slopes) and *Eucalyptus robusta* (Swamp Mahogany), which was only present as uncommon isolated individuals at the margins of the site. For the purposes of the CKPoM and the EPBC Act Koala Referral Guidelines only *Eucalyptus robusta* (Swamp Mahogany) is listed as a preferred Koala food tree species. Therefore, the habitat within the study area appears to be marginal in terms of food resources for the Koala. The records contained within the Atlas of NSW Wildlife tend to support this conclusion as there are just four records of the species within the 10 km x 10 km default search area around the site and none of these were in close proximity. The general lack of records in the vicinity is interesting, given the site's proximity to a National Park estate and the Koala being an iconic species that is frequently targeted in surveys (particularly since the species listing under the EPBC Act and introduction of the CKPoM).

No Koala faecal pellets were found during the SAT survey and there were no sightings of the species during diurnal searches or spotlighting. There were also no other obvious signs such as scratch marks on trees to suggest that the Koala was present within the study area at the time of the fauna survey. In addition Koala movements to and from the site are likely to be impeded by the wetlands, which are largely comprised of treeless sedgelands located adjacent to the site in the northern, eastern and western directions. Therefore, the habitat within the study area is unlikely to be useful to the species.

There were no Squirrel Gliders captured during the current survey. However, this does not in any way suggest that the species is absent from the habitat within the study area. As previously discussed, the absence of a species from survey results does not necessarily indicate that the species is not present and other factors such as historical records and habitat assessment need to be considered. The Atlas of NSW Wildlife contains four records of the species within one kilometre of the study area and an additional record within the default 10 km x 10 km search area around the site. Furthermore, FloraFauna Consulting recorded the species at a site approximately 6 km south of the study area.

The Squirrel Glider requires a mix of eucalypt, Acacia and Banksia species and within a suitable vegetation community, at least one flora species should flower prolifically in winter and there should be at least one smooth-barked eucalypt species (Menkhorst et al, 1988; Quinn, 1995). The Squirrel Glider also requires an abundance of tree hollows for refuge and nest sites. The Pink Bloodwood open forest community to which the species is known to be associated with in conjunction with the adjacent Paperbark swamp forest community satisfy these habitat preferences. For instance, a common species in the understorey of the Pink Bloodwood open forest community; *Banksia serrata* (Old Man Banksia) flowers from late summer to early winter. The dominant species in the canopy of the adjacent Paperbark swamp forest was *Melaleuca quinquenervia* (Broad-leaved Paperbark), which flowers during autumn and winter. Both species are regarded as nectar food trees. *Eucalyptus saligna* (Scribbly Gum), which is a common component of the canopy of the Pink Bloodwood open forest within the study area is a smooth-barked eucalypt species. The other principal species' in the canopy of the Pink Bloodwood open forest flower at various time during the year, providing a continuum of food resources for the species throughout the year. The study area also contained an abundance of suitable hollow-bearing trees.

As the habitat preferences of the Squirrel Glider are generally satisfied and the records contained in the Atlas of NSW Wildlife indicate a history of the species in the immediate vicinity of the site it is considered that the species is likely to occupy or at the very least utilise the habitat within the study area. There are various possible reasons why the species was not captured during the current study. It could simply be that the species was not utilising the habitat within the study area at the time of the survey. During the survey it was noted that some individuals of two species of trees; *Corymbia intermedia* (Pink Bloodwood) and *Eucalyptus pilularis* (Blackbutt) were flowering. Generally, the flowering period for Pink Bloodwood is from January to March and for Blackbutt, flowering generally occurs from September to March. This means the survey was undertaken at the end of flowering period for the two species and that some individuals were flowering slightly later than normal. It was also noted that *Banksia serrata* (Old Man Banksia) was flowering. Therefore, the failure to capture the Squirrel Glider may have been associated with an abundance of available food resources at the time of the survey, which resulted in the species being less inclined to search for other sources of food such as the bait used in the traps.

Six species of Microchiropteran bats were recorded with confidence during the ultrasonic echolocation detection survey, including two of the target threatened

species; *Miniopterus australis* (Little Bentwing-bat) and *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat).
In addition to the species targeted in the survey three other threatened species were recorded including the *Pteropus poliocephalus* (Grey-headed Flying-fox), *Lophoictinia isura* (Square-tailed Kite) and *Crinia tinnula* (Wallum Froglet). In the cases of the Grey-headed Flying-fox and the Square-tailed Kite the habitat was being utilised for foraging purposes. In the case of the Wallum Froglet, the species is a permanent resident of the wetland habitats at the margins of the study area and surrounding area. The species inhabits acidic wetlands, *Melaleuca* swamps and sedgelands, wet and dry heath, and woodland areas on the sandy coastal lowlands. The Wallum Froglet is a nocturnal, terrestrial and cryptic species. Males call from secluded positions at the water's edge or from among sedge tussocks near the water level. During the day individuals shelter in crayfish burrows or under leaf litter and may be found well away from water.

Based on the desktop/database analysis, survey results and habitat assessment the threatened species known or considered likely to occur within the study area are listed in Table 5.1 below

Species	Common Name	Recorded/Predicted
Crinia tinnula	Wallum Froglet	Recorded
Lophoictinia isura	Square-tailed Kite	Recorded
Dasyurus maculatus	Spotted-tailed Quoll	Predicted
Phascogale tapoatafa	Brush-tailed Phascogale	Recorded
Petaurus norfolcensis	Squirrel Glider	Predicted
Pteropus poliocephalus	Grey-headed Flying-fox	Recorded
Syconycteris australis	Common Blossom-bat	Predicted
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Recorded
Chalinolobus nigrogriseus	Hoary Wattled Bat	Predicted
Miniopterus australis	Little Bentwing-bat	Recorded
Myotis macropus	Southern Myotis	Predicted
Scoteanax rueppellii	Greater Broad-nosed Bat	Predicted

Table 5.1: Threatened fauna species known or predicted to occur in the study area

Several of the threatened species listed in Table 5.1 are dependent on tree-hollows for shelter and/or reproduction. Therefore, these species are considered most at risk of being significantly impacted by the proposed development. The threatened species regarded as being hollow-dependent include:

- *Phascogale tapoatafa* (Brush-tailed Phascogale)
- *Petaurus norfolcensis* (Squirrel Glider)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Myotis macropus* (Southern Myotis)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

The threatened species of fauna listed in Table 5.1 have been considered under the Assessment of Significance (7 Part Test) appended to this report as Appendix B.

5.2 Development Considerations

The proposed development involves establishing an extractive industry for the purpose of extracting sand from the dunal ridge within the study area. The land within the study area is zoned RU1 – Primary Production in the central parts of the site and E2 – Environmental Conservation at the northern, eastern and western margins under the *Kempsey Local Environment Plan 2013*.

The proposed development would be confined to the RU1 zoned land comprising the central part of the ridge within the study area, which has an area of approximately 6.4 hectares. Vehicular access associated with the proposed sand extraction is expected to be from Belmore River Road via an existing haulage route along a right of carriageway from Belmore River Road, through the approved sand extraction quarry situated at Lot 5 in DP 1018266 and a right of carriageway that enters the proposed development site at the southern boundary.

The proposed development will have significant impact on biodiversity as it involves the complete removal of the habitat within the proposed development footprint, albeit in stages and gradually over a period of several years. One approach to protecting biodiversity within the study area would be by simply not proceeding with the proposed development. However, the sand is a valuable resource that is in demand. Furthermore, the land that forms the footprint of the proposed development is zoned for primary production and as such it could be lawfully used for various agricultural pursuits that would also have significant potential impacts on biodiversity. For instance, notwithstanding protection of the vegetation afforded under the *Native Vegetation Act 2003*, there are several routine agricultural management actions (RAMAS) that allow for removal of vegetation without further approval under the Act. Such actions are already evident within the study area including clearing along the power line running through the central part of the site and adjacent to fence lines.

The NSW Office of Environment and Heritage (OEH) have raised a number of legitimate concerns regarding the proposed development including:

1. *Further consideration should be given to the cumulative effects of biodiversity impacts associated with this and similar operations in the vicinity of the subject site;*
2. *A more realistic assessment of rehabilitation capacity should be prepared along with a suitably detailed rehabilitation plan that includes monitoring of revegetation more frequently that the annual timeframe that is currently proposed in the EIS, and which considers the need for pest control to ensure that the proposal does not contribute to the Key Threatening Process Predation by the European Red Fox;*
3. *It is necessary for the EIS to address the need for pest species and weed control programs, ensuring that efforts to control pests will be effectively co-ordinated with programs operating on adjoining lands, particularly within Hat Head National Park;*
4. *Clarification should be provided regarding whether additional clearing is proposed to erect fencing around buffer zones, the type of fencing to be erected and the potential barrier to fauna movement arising from fencing;*

5. *Further consideration of likely impacts to Hat Head National Park Is provided in the EIS and direct engagement between NPWS, the proponent and the consent authority is undertaken, as requested by NPWS, to ensure appropriate protections for NPWS estate are included in the EIS prior to its finalisation. These should include the adequacy of proposed impact mitigation such as buffer distances between park boundaries and the proposed operational area, weed and pest control programs, restrictions on park access, and bushfire management needs;*
6. *Additional and appropriate biodiversity assessment should be undertaken an accordance with the OEH threatened species survey and assessment guidelines to inform the ElS. Biodiversity assessment must include impacts through all stages of the proposal. It would be appropriate for the EIS to commit to implementation of a suitable biodiversity monitoring and adaptive management program for the life of the proposal;*
7. *All unavoidable direct and indirect irnpacts on biodiversity should be offset in accordance with the OEH offset principle;*
8. *The BioBanking Assessment Methodology should be used as a suitable metric to determine the quantum of offsets required to compensate for the impacts of the proposal; and*
9. *The recommendations of the Aboriginal cultural heritage assessment report, all of which are supported by OEH, should be reflected in the ElS.*

In relation to the aforementioned comments from OEH, this addendum to the ecological report directly addresses point 6. It also provides recommendations that are relevant to points 2, 3 and 4.

5.3 Vegetation/Habitat Removal Strategy

Should the consent authority in its determination approve the proposed development, the impacts on threatened biodiversity and the measures to mitigate those impacts requires careful consideration. As a minimum the following mitigation measures are recommended in relation to any approval issued for the proposed extraction industry on land identified as Lot 1324 in DP 785874 and Lot 323 in DP 855616, McGuires Crossing:

5.3.1 General Requirements

1. All activities associated with the sand extraction shall be restricted to the land within the 'active' cell and approved access corridor;
2. Fencing shall be provided around the 'active' cell and approved access corridor within the development site and shall be constructed to the following minimum standard:
    - A height of 1.2 metres;
    - Steel star picket posts at maximum spacing between posts of 2 metres;
    - Three (3) strands of steel wire;
    - Orange barrier mesh or similar shall be attached to the fence and extend along or around the entire perimeter; and

3. All fencing shall be wholly contained within the development footprint and shall not encroach into the E2 zoned land.

5.3.2 Pre-clearing Survey – Habitat Features and Trees

Habitat is that part of the environment occupied by plants or animals. In relation to fauna, habitat features are the physical components within the habitat that are utilised for food, shelter and for reproduction. Habitat features that may be present within the proposed development site include tree hollows, stags (standing dead trees), fallen timber and other plant debris, bark, caves and cliffs, rocks (small rocks, large boulders, rock outcrops) dense understorey and groundcover vegetation, and leaf litter.

Prior to commencement of any land clearing operations within the proposed development site a pre-clearing survey of the land shall be undertaken by an Ecologist. During the pre-clearing survey the Ecologist shall undertake the following tasks:

1. The site is to be surveyed to locate all habitat features that may provide shelter for species of fauna. This shall include (but not be limited to) hollow-bearing trees, rock outcrops, fallen timber (hollow logs, tree limbs etc.), stags (standing dead trees), areas containing dense understorey and areas of dense ground cover;
2. All habitat features detected shall be thoroughly searched for the presence of fauna;
3. Those habitat features in which species of fauna are either detected or are considered to have a high likelihood of harbouring fauna are to be clearly marked and the position recorded by GPS;
4. A 10 metre exclusion zone shall be established around all marked habitat features;
5. The site is to be surveyed to identify any trees to be retained;
6. All trees selected for retention shall be clearly marked; and
7. Arrangements are to be made for local FAWNA NSW Inc. representatives to take into care any injured animals, abandoned offspring or eggs.

5.3.3 Vegetation Removal (Canopy and Understorey)

Prior to the commencement of any land clearing operations the Ecologist shall undertake the following tasks:

1. Survey the area to determine if species of fauna are present;
2. If any species of fauna is found, then clearing operations must not occur within 25 metres of the fauna until it moves away of its own volition;
3. Marked habitat features (as determined under Section 5.3.2) shall not be removed until the specifications detailed in Section 5.3.4 and Section 5.3.5 have been satisfied; and
4. A 10 metre exclusion zone in which no vegetation is to be removed shall be provided around all marked habitat features (as determined under Section 5.3.2).

5.3.4 Removal of Habitat Feature (Excluding Hollow-bearing Trees)

This section applies to all habitat features except hollow-bearing trees, which are dealt with separately under Section 5.3.5. Prior to the removal of marked habitat features the Ecologist shall undertake the following tasks:

1. Shall be present on site during removal of all marked habitat features (as determined under Section 5.3.2);
2. Once the trees (excluding hollow-bearing trees) and other vegetation have been removed from around a habitat feature, the habitat feature shall be thoroughly searched immediately prior to its removal;
3. When the Ecologist is satisfied the habitat feature is free of fauna, the habitat feature and associated exclusion zone can be removed;
4. Where fauna is found within a habitat feature all work within 25 metres of the fauna shall cease until it has moved away of its own volition; and
5. In cases where the Ecologist deems that it is in the best interest of the fauna to capture it for later release, the captured fauna shall be held according to the specifications detailed in Section 5.3.6.

5.3.5 Hollow-bearing Tree Removal

Hollow-bearing trees are those trees that contain hollows or other features that potentially provide nesting or refuge sites for fauna species. Removal of hollow-bearing trees shall be undertaken as follows:

1. Shall be present on site during removal of all hollow-bearing trees;
2. All hollow-bearing trees are to be left in place until at least 48 hours after all other trees and vegetation located within 25 metres of the hollow-bearing tree has been removed;
3. Once the other trees and vegetation have been removed from around a hollow-bearing tree, the hollow-bearing tree is to be bumped on the side at least twice per day, using the on-site clearing equipment or other appropriate means, to encourage any resident fauna to depart the tree;
4. The bumping is to be repeated at one minute intervals over a period of at least 5 minutes immediately prior to the felling of the tree;
5. During the bumping the Contractor is to take precautions to ensure that there is no risk of personal injury or equipment damage from falling limbs.
6. Hollow-bearing trees are to be felled on to stockpiles of previously felled timber to soften the impact of felling;
7. Immediately following the felling of a hollow-bearing tree the Ecologist is to properly inspect the tree for signs of fauna occupation. If hollows cannot be viewed over their full length, then they are to be sectioned carefully to enable a full inspection of the hollow. When the Ecologist is satisfied the tree is free of fauna, the tree can be removed;
8. An inventory of the number and size of all tree hollows shall be maintained in order to determine the number and type of nest boxes to be provided in the nest box strategy;
9. Where fauna is found within a hollow of the felled hollow-bearing tree all work within 25 metres of the fauna shall cease until it has moved away of its own volition or is captured for later release;

10. Felled trees and other timber from the clearing area shall be suitably stored on site within the development area for reuse in rehabilitation works; and
11. The Ecologist will need to make a judgement call in some instances as to whether fauna found within a hollow of a felled hollow-bearing tree should be left to move away of its own volition or should be captured for later release or placed into care with a member of FAWNA NSW Inc.

5.3.6 Captured Fauna

Where tree hollows or other habitat features are found to contain species of fauna that did not leave the area prior to removal of the vegetation and are subsequently captured for their welfare and protection, the following specifications shall apply:

- Fauna captured shall be kept in a dark environment prior to release in retained vegetation at dusk on the day of capture;
- In the event that fauna are injured during the process, the animals are to be taken to the nearest veterinarian for treatment prior to release; and
- Any injured fauna should be immediately taken to veterinarian for treatment prior to release.

5.3.7 Retention of Topsoil and Seed Bank

Following removal of the vegetation within an extraction cell the sandy topsoil (containing soil nutrients and seed bank) to a depth of approximately 100 mm to 300 mm shall be removed and stored on site for use in site rehabilitation and vegetation regeneration after completion of sand extraction activities. The topsoil shall not be stored on the adjacent buffer areas.

5.3.8 Retention of Felled Trees and other Timber

All trees felled within an extraction cell shall be suitably stored on site within the development footprint. At the completion of sand extraction activities and during the site rehabilitation the felled trees and other timber shall be placed randomly within the rehabilitation area to provide shelter habitat for fauna.

5.3.9 Fox Control

At the commencement of the development, a fox control strategy shall be implemented. To be effective Fox control should be undertaken at high frequency over a broad area and across all land tenures. Therefore, it is recommended that the proponents liaise with OEH as the Hat Head National Park occupies the larger area of land adjoining the site as well as other neighbouring landholders.

5.4 Nest Box Strategy

The nest box strategy should be targeted at the hollow-dependent threatened species known or likely to occur in the area as detailed in Section 5.1. Details of the tree hollow-dependent species and type of nest box required are provided in Table 5.2 below.

Species	Common Name	Nest Box Type
Phascogale tapoatafa	Brush-tailed Phascogale	Phascogale
Petaurus norfolcensis	Squirrel Glider	Small Glider
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Micro Bat
Chalinolobus nigrogriseus	Hoary Wattled Bat	Micro Bat
Myotis macropus	Southern Myotis	Micro Bat
Scoteanax rueppellii	Greater Broad-nosed Bat	Micro Bat

Table 5.2: Target hollow-bearing dependent threatened species

The nest box strategy shall incorporate the following measures:

- Nest boxes shall be provided at a ratio of 2 nestboxes for each tree hollow to be removed as determined by the tree hollow inventory;
- The type of nest boxes shall be in accordance with Table 5.3;
- Nest boxes shall be installed within the E2 Environmental Conservation zone adjacent to the 'active cell' in which hollow-bearing trees have been removed;
- Nest boxes will be manufactured to reduce the likelihood of occupation by feral animals such as the Common Myna and Honey Bee according to industry standards;
- Nest boxes are to be installed in trees (both rough-barked and smooth-barked eucalypts) that do not already have hollows;
- A 40 mm to 50 mm thick layer of wood shavings is to be placed in the base of nest boxes to simulate decaying hollows and provide extra insulation;
- All nest boxes will be attached to the tree using the *Habisure* system, which involves:
    - A length of 3.15 mm plastic-coated soft fencing wire passed through the nest box and around the tree trunk;
    - The wire must be folded into at least four folds about 60 mm tall and 15 mm apart at the sides of the box to allow for tree growth;
    - Where the wire is in contact with the tree trunk or branch it must be threaded through a length of garden hose to protect the tree;
    - Where possible the wire around the tree should pass over a branch behind the trunk, although nest boxes can be installed directly on a straight-stemmed tree; and
    - Nest boxes will be positioned on the north-west to east sector of tree trunks to avoid hot afternoon sun and the predominant aspect of severe storms

Fauna	Dimensions H x W x D (mm)	Entrance Diameter (mm)	Height Range (m)
Phascogale	400 x 180 x 180	40	3 – 5
Small Glider	450 x 250 x 250	45	4 – 8
Micro Bats	500 x 360 x150	20 hole/15 slit	2 – 5

Table 5.3: Recommended nest boxes to be installed

5.5 Site Rehabilitation

5.5.1 General

During the rehabilitation and regeneration stage of each extraction cell the exposed area of land will be vulnerable to colonisation by invasive weed species. This is evident in the disturbed/cleared areas of land within the site, which has been colonised by weed species including *Sporobolus africanis* (Parramatta Grass), *Andropogon virginicus* (Whisky Grass), *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush) and *Lantana camara* (Lantana). Weed management shall be initiated at the commencement of works and shall be ongoing for the duration of the extractive industry operation until such time that the regeneration/revegetation of native vegetation is sufficiently advanced to inhibit the establishment of weeds.

Site rehabilitation will involve a number of specialised activities including weed management and other bush regeneration activities such as collection of seeds, propagation of collected seeds and other propagules, regeneration of the native plant community and replanting of native vegetation. Therefore, it is likely that such work will require the services of a professional bush regeneration contractor.

5.5.2 Weed Control Method Descriptions

The method of weed control should be appropriate for the target weed and may include any of the methods detailed below.

i. Herbicide spraying

Targeted herbicide spraying using Biactive Glyphosate where appropriate is the recommended method of weed control for the riparian buffer. Sprayed plants should remain on site for some time even after they are dead as the dead plant roots will still help to stabilise the soil and will continue to provide refuge for fauna. However it is essential that there is no off target spraying of native species. In areas where native species are present hand weeding should be undertaken. In sensitive areas where herbicide spraying is not possible, a number of alternative options are available depending on the weed species as described below.

ii. Cut & paint

Cut and paint involves cutting off the main bulk of the stem just above ground level. Herbicide is then applied straight away to the freshly cut surface of the stem. This method removes the bulk of the weed material but leaves the roots stabilising the soil for a period of time until they rot.

iii. Scrape & paint

Scrape and paint involves making a long scrape along the stem of the plant from the base of the plant upwards using a knife. Concentrated herbicide can then be applied to the scrape. The exposed surface area increases the effectiveness of the herbicide. In addition, the dead plant will remain on site providing soil stabilisation and refuge for fauna.

iv. Manual removal

This method involves removal of the whole plant. This is often the best option for grasses or for plants that have bulbs or corms. It is essential that the main part of the plant is removed as many will reshoot from broken stems or bulbs. However, this method has the greatest potential for disturbing and destabilising the soil. Therefore, care should be taken when using this method.

v. Removal of seed and vegetative propagules

This method involves removal of all seed propagules from the plant, which should be bagged and removed from site for proper disposal. This will minimise weed reinfestation of the site. Vegetative propagules from plants should also be removed and bagged with care as each section of vegetative material has the ability to regrow.

5.5.3 Weed Control Regime

i. Primary Weeding

Primary weeding is the initial weeding. It is recommended that primary weeding should be carried out to remove the majority of dominant weeds. This involves removal of weeds through herbicide use and hand removal. It is important to note primary weeding usually initiates new growth of both weeds and native species.

ii. Secondary or Follow-up Weeding

Secondary or follow-up weeding involves intensive weeding in areas that have already received primary work to remove weed regrowth or overlooked weeds. It is recommended that secondary weeding be conducted in the following 3-6 months after primary weeding.

iii. Maintenance Weeding

Left unmanaged, weeds will re-establish on the disturbed/cleared parts of the site from bird, wind, water transport and other seed or propagule dispersal mechanisms. Maintenance weeding should be undertaken 6-12 times per year until the resistance of the re-established plant community to weeds increases. Maintenance weeding is to be conducted until such time that the regeneration of native vegetation is sufficiently advanced to inhibit the establishment of weeds.

5.5.4 Reinstatement of Topsoil and Seed Bank

At the completion of sand extraction from within each extraction cell the area shall be levelled with any edges and changes in ground levels appropriately battered and stabilised. Once the area is deemed to be at an appropriate level and stable the stored topsoil shall be evenly spread across the whole of the area of the extraction cell to allow the stored seed to germinate.

5.5.5 Regeneration of Native Vegetation

Regeneration of native vegetation within cells where sand extraction has been completed may require additional actions to weed management and reinstatement of the topsoil with associated seed bank. It may be necessary for other bush regeneration

actions such propagation of seeds and other propagules and replanting of native plants. All of these actions may need to be coordinated under a vegetation management plan (VMP).

5.6 Offset Land within the Study Area

It is proposed to provide a biodiversity offset within the study area comprising the land identified as Cell 11 and Cell 12 as indicated on the 'Sand Quarry EIS' plan prepared by Dennis Partners and the adjacent land to the south within the study area that is currently occupied by a derelict dwelling and associated outbuildings. The approximate footprint of the amended extraction area and proposed offset is shown in Figure 5.1.

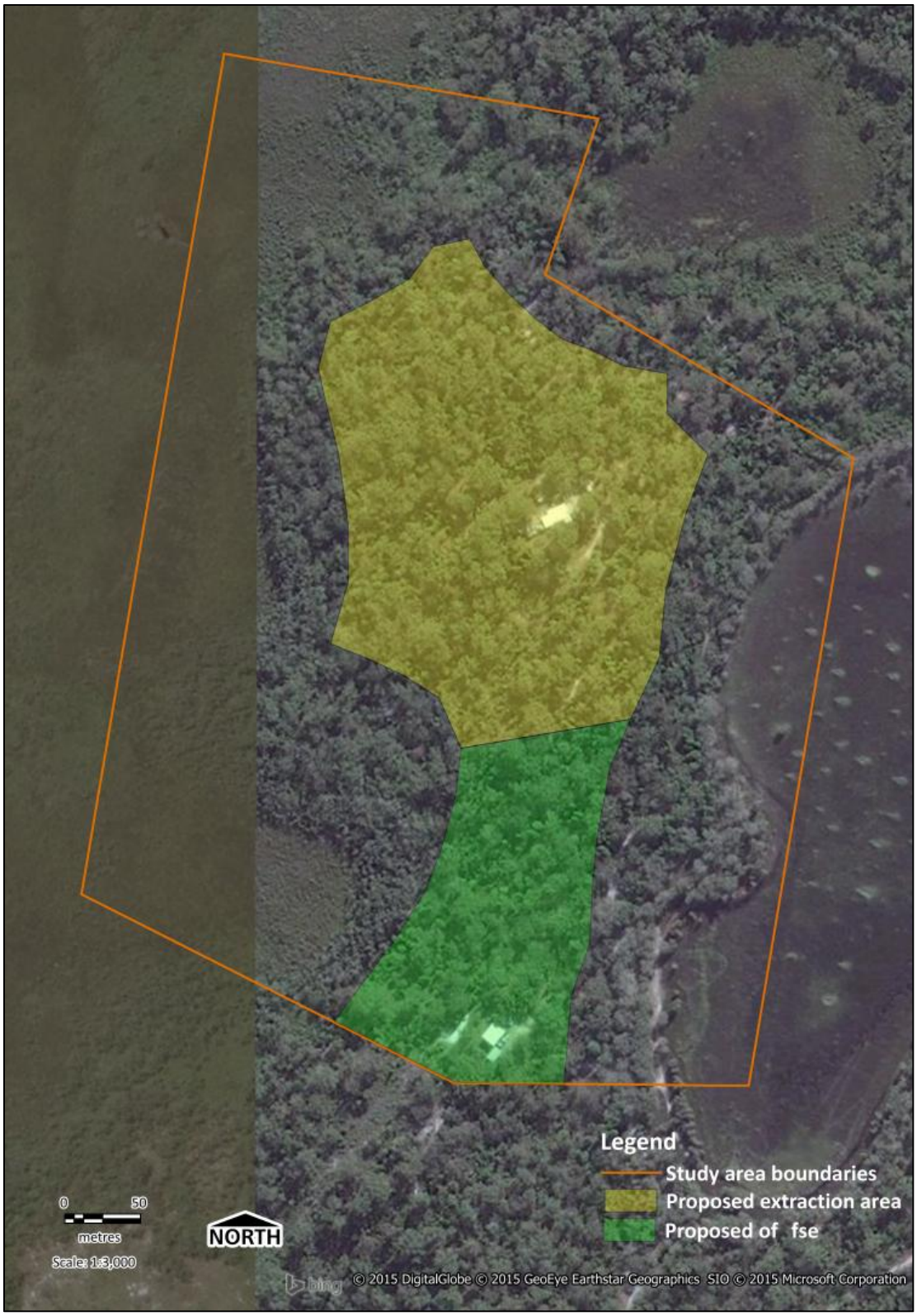

Figure 5.1: Proposed amended extraction area and proposed offset

The biodiversity offset shall be subject to the same weed control and rehabilitation regime as that proposed within the extraction area and generally satisfies the OEH principles for the use of biodiversity offsets in NSW. In this regard the 13 points of consideration under the OEH offset principles have been considered as detailed below:

1. *Impacts must be avoided first by using prevention and mitigation measures*: This has been addressed through confining the proposed sand extraction activities to the central ridge area of the site and the suite mitigation measures outlined above;

2. *All regulatory requirements must be met*:

   This has been addressed through the current development application process;

3. *Offsets must never reward ongoing poor performance*:

   The proposed mitigation measures and management actions are aimed at ensuring that the ongoing performance will not be poor;

4. *Offsets will complement other government programs*:

   The offset will complement the objectives of the adjacent National Park reserve and OEH objectives generally;

5. *Offsets must be underpinned by sound ecological principles*:

   The proposed offset is underpinned by the current biodiversity assessment, which has been undertaken in accordance with the *'Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft'* (DEC, 2004);

6. *Offsets should aim to result in a net improvement in biodiversity over time*:

   The proposed offset area incorporates land with native vegetation comprising a Pink Bloodwood open forest community (VIS classification: *Pink Bloodwood open forest of the coastal lowlands of the NSW North Coast Bioregion*) as well as a disturbed area in the vicinity of the derelict dwelling and associated outbuildings. The proposed offset would result in the demolition and removal of the structures, rehabilitation of the land and regeneration of the of the native vegetation as per the site rehabilitation regime proposed for the extraction area;

7. *Offsets must be enduring – they must offset the impact of the development for the period that the impact occurs*:

   It is the proposed that the offset shall be in perpetuity;

8. *Offsets should be agreed prior to the impact occurring*:

   It is anticipated that this will be addressed at the issue of development consent;

9. *Offsets must be quantifiable – the impacts and benefits must be reliably estimated*:

   - The amended extraction area (exclusion of Cell 11 and Cell 12) is approximately 5.8 hectares;
   - The proposed offset incorporating Cell 11, Cell 12 and the adjacent land to the south in the vicinity of the derelict dwelling is approximately 2.6 hectares;

- The offset serves to conserve the same plant community (with localised variations) as those within the proposed extraction area;
- The offset maintains existing connectivity between the ridge and lower slopes to the east and west , and wetland habitats beyond;
- The habitat within the offset is a combination of good quality forest habitat and disturbed habitat (in the vicinity of the derelict dwelling), which will be improved under the rehabilitation regime;
- The development consent will ensure an appropriate level of security is afforded to the offset; and
- The offset area is not isolated or fragmented.

10. *Offsets must be targeted*:

    The offset ensures connectivity between the eastern and western conserved areas of habitat in addition to the connectivity maintained in the northern part of the site. It also ensures that areas of land on the central sand ridge dominated by rough-barked Eucalypt species, which are preferred habitat of the Brush-tailed Phascogale are retained;

11. *Offsets must be located appropriately*:

    The offset is located in an area with the same ecological characteristics as the proposed extraction area;

12. *Offsets must be supplementary*:

    The proposed offset is beyond existing requirements and is not already funded under another scheme. The proposed offset is also supplementary to the other land within the study area located outside the proposed extraction area, which is to be protected from impacts associated with the proposed development. It is noted that a large proportion of this land is zoned E2 – Environmental Conservation under the LEP;

13. *Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or contracts*:

    The proposed offset can be enforced through the development consent conditions.

6. Conclusion

This document is an addendum to the ecological assessment report (reference number EA-2013-2204) prepared by FloraFauna Consulting dated 4 June 2013 in relation to a proposed sand extractive industry on land identified Lot 1324 DP 785574 & Lot 323 DP 855616, McGuires Crossing. The addendum was prepared to describe the methodologies and to detail the findings of additional fauna surveys undertaken for threatened species. It should be noted that changes will not be made to the original report and that this addendum forms part of the documentation of the ongoing Development Application.

Six (6) threatened species were recorded during the additional fauna surveys, including:

- *Crinia tinnula* (Wallum Froglet)
- *Lophoictinia isura* (Square-tailed Kite
- *Phascogale tapoatafa* (Brush-tailed Phascogale)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Miniopterus australis* (Little Bentwing Bat)

In addition, six (6) threatened species that were not recorded during the current survey are considered likely to occur within the study area. These include:

- *Dasyurus maculatus* (Spotted-tailed Quoll)
- *Petaurus norfolcensis* (Squirrel Glider)
- *Syconycteris australis* (Common Blossom-bat)
- *Chalinolobus nigrogriseus* (Hoary Wattled Bat)
- *Myotis macropus* (Southern Myotis)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

All of the above threatened species have been considered in the assessment of significance appended to this report as Appendix B.

As the entire habitat will be removed from the extraction area, albeit gradually over a period of several years it is likely that the development will impact biodiversity. However, it is noted that there are limited sand resources located on private land in relatively stable environments available within the Kempsey Shire local government area. Alternative sources include more fragile ecosystems such as coastal sand dunes and beach ecosystems.

The proponents have acknowledged that biodiversity will be impacted by the proposed development. They have also agreed to the implementation of a range of mitigation measures including:

- A suite of measures aimed at minimising impact on fauna and rehabilitating the habitat within the site as detailed In Section 5;
- A reduction in the size of the development footprint;

- Maintaining connectivity between the eastern and western sides of the sand ridge through the retention of the habitat within cell 11 and 12; and
- Sand extraction being undertaken gradually in conjunction with ongoing rehabilitation works in accordance with the recommendations of this report;

Should the consent authority in its determination approve the proposed development, it is recommended that the suite of mitigation measures detailed in Section 5 of this report be applied.

7. References

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8. Appendix A: Fauna Species List

Family	Scientific Name	Common Name
Amphibia		
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet
	Crinia tinnula	Wallum Froglet
	Limnodynastes dumerilii	Eastern Banjo Frog
	Limnodynastes peronii	Striped Marsh Frog
	Litoria caerulea	Green Tree Frog
Reptilia		
Scincidae	*Eulamprus quoyii*	Eastern Water Skink
	Lampropholis delicata	Garden Skink
Varanidae	*Varanus varius*	Lace Monitor
Elapidae	*Demansia psammophis*	Yellow-faced Whipsnake
Aves		
Acanthizidae	*Acanthiza pusilla*	Brown Thornbill
	Gerygone olivacaea	White-throated Gerygone
Accipitridae	*Lophoictinia isura*	Square-tailed Kite
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra
Artamidae	*Cracticus tibicen*	Australian Magpie
	Cracticus torquatus	Grey Butcherbird
	Strepera graculina	Pied Currawong
Corvidae	*Corvus tasmanicus*	Forest Raven
Cuculidae	*Chalcites lucidus*	Shining Bronze Cuckoo
Dicruridae	*Dicrurus bracteatus*	Spangled Drongo
Maluridae	*Malurus cyaneus*	Superb Fairy Wren
Meliphagidae	*Acanthorhynchus tenuiostris*	Eastern Spinebill
	Anthochaera chrysoptera	Little Wattlebird
	Caligavis chrysops	Yellow-faced Honeyeater
	Meliphaga lewinii	Lewin's Honeyeater
	Philemon corniculatus	Noisy Friarbird
	Phylidonyris niger	White-cheeked Honeyeater
	Plectorhyncha lanceolata	Striped Honeyeater
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush
	Pachycephala pectoralis	Golden Whistler
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote
	Pardalotus striatus	Striated Pardalote
Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet
	Trichoglossus haematodus	Rainbow Lorikeet
Rhipiduridae	*Rhipidura fuliginosa*	Grey Fantail
	Rhipidura leucophrys	Willie Wagtail
Strigidae	*Ninox novaeseelandiae*	Southern Boobook

Mammalia		
Dasyuridae	*Phascogale tapoatafa*	Brush-tailed Phascogale
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo
	Wallabia bicolor	Swamp Wallaby
Peramelidae	*Isoodon/Perameles sp.*	Unidentified Bandicoot
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat
Molossidae	*Tadarida australis*	White-striped Freetail-bat
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat
	Miniopterus australis	Little Bentwing Bat
	Vespadelus darlingtoni	Large Forest Bat
	Vespadelus pumilus	Eastern Forest Bat

Fauna species recorded during the field survey

9. Appendix B: Assessment of Significance

The following Assessment of Significance (Seven-Part Test) relies on the habitat assessment as detailed in Section 2.2, the fauna survey results as detailed in Section 4 and the conclusions drawn as described in Section 5 and Section 6 of this report. Based on the plant community, habitat assessment and survey results it is considered that the land within the study area constitutes potential habitat for the thirteen (12) threatened species of fauna listed in Table B.1.

Family	Scientific Name	Common Name
Amphibia		
Myobatrachidae	*Crinia tinnula*	Wallum Froglet
Aves		
Accipitridae	*Lophoictinia isura*	Square-tailed Kite
Mammalia		
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll
	Phascogale tapoatafa	Brush-tailed Phascogale
	Petaurus norfolcensis	Squirrel Glider
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox
	Syconycteris australis	Common Blossom-bat
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat
Vespertilionidae	*Chalinolobus nigrogriseus*	Hoary Wattled Bat
	Miniopterus australis	Little Bentwing Bat
	Myotis macropus	Southern Myotis
	Scoteanax rueppellii	Greater Broad-nosed Bat

Table B.1: Subject species for Assessment of Significance

Assessment of Significance

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

Amphibia

Wallum Froglet (*Crinia tinnula*)

The Wallum Froglet is a small frog up to 30 mm long and is similar in appearance to other species of *Crinia*. The species is extremely variable in colour and pattern, ranging for light grey or brown to dark grey above and cream to dark grey below. One distinguishing character of the Wallum Froglet is a fine white line on the underside from the tip of the snout to the base of the abdomen.

The species breeds in swamps with permanent water as well as shallow ephemeral pools and drainage lines. As with other members of the genus, breeding occurs mostly in the colder months, but can occur throughout the year following rain. Eggs are deposited in water with a pH of < 6 and tadpoles take two to six months to develop into frogs. Individuals shelter under leaf litter, vegetation and other debris or in burrows of other species such as crayfish that are wet or very damp and often located near the water's edge, but may also be found well away from water. Males may call throughout the year and at any time of day, peaking following rain.

The Wallum Froglet is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. The Atlas of NSW Wildlife database search indicated 30 records of the species within 10 km of the study area. The species was also recorded (calls of several frogs) at the margins of the study area during the fauna survey.

The adjacent coastal swamp at the margins of the study area and beyond is suitable habitat for the species. The relatively large number of records of the species in the Atlas of NSW Wildlife database and the number of calls of male Wallum Froglets recorded during the current fauna survey indicates that there is a sizable population of the species in the swamp habitat adjacent to the proposed development site. Given the proposed development will be confined to the central dune within the study area and will not impact directly on the swamp habitat, it is unlikely that the action proposed will have an adverse effect on the life cycle of the species such that a viable population of the species is likely to be placed at risk of extinction.

Aves

Square-tailed Kite (*Lophoictinia isura*)

The Square-tailed Kite is a medium sized long-winged raptor with a square tail and upturned wings when in flight. Adults have a white face with thick black streaks on the crown and finer streaks elsewhere. The saddle, rump and central upper tail-coverts are blackish with grey-brown barring. The underparts are predominately grey-brown with black tips on the grey tail and wings. There is an obscure bullseye on the wings and when sitting the legs are barely visible. The species is usually silent; however it may utter a hoarse or plaintiff yelp and a weak twitter near its nest.

The species is found in a variety of habitats including open forest, and shows a particular preference for timbered watercourses. The species is a specialist hunter of passerine birds, especially honeyeaters and appears to occupy large hunting ranges of more than 100km^2. Nesting occurs between July and October, with birds constructing a large stick nest lined with eucalypt leaves generally located on a large horizontal branch of a eucalypt 12-26m above the ground.

The Square-tailed Kite is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. The Atlas of NSW Wildlife database search indicated one (1) record of the species within 10 km of the study area. In addition, a single individual of the species was recorded flying above the canopy of the study area during the fauna survey.

There is foraging and potential nesting habitat available to the Square-tailed Kite within the study area and as well as within the habitat on adjacent land. Some loss of habitat will occur within the proposed extraction area. It is proposed to remove sand gradually over a period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be rehabilitated and allowed to regenerate over time to a natural condition thereby restoring potential foraging habitat. In the meantime, the majority of the land within the site that lies outside the extraction area will remain undisturbed and available to the species in the future. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Mammalia

Spotted-tailed Quoll (*Dasyurus maculatus*)

The Spotted-tailed Quoll is the largest marsupial carnivore on the Australian mainland. Males are 38-76 cm long with a tail length up to 55 cm, while females are 35-45 cm long with a tail measuring up to 42 cm. The species is a rich rufous brown to dark brown above, with white spots of varying size and pale below.

The Spotted-tailed Quoll is recorded from a wide range of habitats, including rainforest, open forest, woodland, coastal heath and inland riparian forest. It occurs from the coast to the snowline and inland to the western plains. The species usually nocturnal and is an efficient predator taking prey ranging from small wallabies to insects. Den sites include hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. The species was formerly widespread on either side of the Great Dividing Range, but its distribution is disjunct over much of its former range. Loss of habitat through land clearing, poisoning and trapping is implicated in its decline.

The Spotted-tailed Quoll is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995* and as endangered nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. The Atlas of NSW Wildlife database search indicated one (1) record of the species within 10 km of the study area.

This species forages across a wide range of habitats. Some loss of habitat will occur within the proposed extraction area. It is proposed to remove sand gradually over a period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be rehabilitated and allowed to regenerate over time to a natural condition thereby restoring potential foraging habitat. Logs and felled trees (particularly those containing hollows) will be stored and reinstated in rehabilitation areas to provide habitat that could be utilised by this species in future. In the meantime, the majority of the land within the site that lies outside the extraction area will remain undisturbed and available to the species in the future. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Brush-tailed Phascogale (*Phascogale tapoatafa*)

The Brush-tailed Phascogale is an arboreal marsupial carnivore with a characteristic black, bushy tail. The species has a patchy distribution around the coast of Australia with the highest frequency occurring in forest on the Great Dividing Range in the north-east and south-east of the State.

The Brush-tailed Phascogale has a preference for dry sclerophyll open forest with sparse ground cover of herbs, grasses, shrubs or leaf litter and also rough-barked trees of 25cm DBH or greater. However, it is known to inhabit heath, swamps, rainforest and wet sclerophyll forest as well. The species uses tree hollows with entrances between 2.5 cm and 4 cm for nesting and shelter, and feed mostly on arthropods as well as other invertebrates and nectar. Females occupy exclusive territories of approximately 20-60 hectares and males have overlapping territories of up to 100 hectares.

The Brush-tailed Phascogale is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. The Atlas of NSW Wildlife database search indicated three (3) records of the species within 10 km of the study area. In addition an individual of the species was captured within the study area during the current fauna survey.

There is suitable shelter/nesting and foraging habitat available to the Brush-tailed Phascogale within the study area. The species requires tree hollows of adequate size for shelter and nesting. There were numerous trees recorded within the study area containing hollows that could potentially be utilised by the species. Many of these trees are located outside the proposed extraction area where they will not be impacted by the development and therefore remain available to the species. There are also numerous hollow-bearing trees located within the proposed extraction area that would need to be removed to facilitate the development. Consequently, there will be some loss of both shelter/nesting habitat and foraging habitat. However, it is proposed to remove sand gradually over a period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be rehabilitated and allowed to regenerate over time to a natural condition thereby restoring foraging habitat. In addition, a nestbox strategy is proposed as detailed in Section 5.4 of this report to offset the loss of tree hollows. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Squirrel Glider (*Petaurus norfolcensis*)

The Squirrel Glider is widely, though sparsely, distributed in eastern Australia from northern Queensland to western Victoria. West of the Great Dividing Range, the Squirrel Glider inhabits mature or old growth Box, Box-Ironbark and River Red Gum forest, while in coastal areas the species inhabits Blackbutt-Bloodwood forest with heath understorey, with a preference for mixed species stands having a shrub or Acacia mid-storey. Squirrel gliders live in family groups of a single male, one or more adult females and their offspring. The diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein. Abundant tree hollows are required for refuge and nest sites.

The Squirrel Glider is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. The Atlas of NSW Wildlife database search indicated seven (7) records of the species within 10 km of the study area. Furthermore, FloraFauna Consulting recorded the species at a site approximately 6 km south of the study area.

There is suitable shelter/nesting and foraging habitat available to the Squirrel Glider within the study area. The species requires tree hollows of adequate size for shelter and nesting. There were numerous trees recorded within the study area containing hollows that could potentially be utilised by the species. Many of these trees are located outside the proposed extraction area where they will not be impacted by the development and therefore remain available to the species. Similarly, there is foraging habitat within the study area located outside of the proposed extraction area that will continue to be available to the species. There are also numerous hollow-bearing trees located within the proposed extraction area that would need to be removed to facilitate the proposed development. Consequently, there will be some loss of both shelter/nesting habitat and foraging habitat. However, it is proposed to remove sand gradually over a period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be rehabilitated and allowed to regenerate over time to a natural condition. This will restore the lost foraging habitat but not the loss of shelter/nesting habitat. To mitigate this loss of shelter/nesting habitat the installation of nestboxes as outlined in the nestbox strategy in Section 5.4 is proposed. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox is the largest Australian bat species and is found within 200km of the eastern coast of Australia from Bundaberg in Queensland to Melbourne, Victoria. The species occurs in subtropical and temperate rainforest, tall sclerophyll forest and woodland and individuals travel up to 50km to feed on the nectar and pollen of native trees, particularly eucalypts, Melaleuca spp. and Banksia spp. and the fruits of rainforest trees and vines.

The Grey-headed Flying-fox is listed as endangered in NSW under the *Threatened Species Conservation Act 1995* and as vulnerable nationally under the *Environment Protection and Biodiversity Conservation Act 1999*. The Atlas of NSW Wildlife database search indicated five (5) records of the species within 10 km of the study area.

The Grey-headed Flying-fox was recorded flying above the canopy of the study area during the current fauna survey and the species potentially could use the habitat for foraging. Grey-headed Flying-foxes congregate in large numbers at roosting sites (camps) that may be found in rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas. No camp was observed within or adjacent to the study area during the current survey. Therefore, the species does not appear to be utilising the habitat for roosting. There is foraging habitat within the study area located outside of the proposed extraction area that will continue to be available to the species. In addition, it is proposed to remove sand gradually over a

period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be rehabilitated and allowed to regenerate over time to a natural condition thereby restoring foraging habitat. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Common Blossom-bat (*Syconycteris australis*)

The Common Blossom-bat is a small nectar-eating bat with large eyes. The species is approximately 6 cm long and has very soft fawn to reddish fur. It is highly specialised for a diet of nectar and pollen, having a very pointed muzzle and a long, thin brush-like tongue. The species occurs in coastal areas of eastern Australia from Hawks Nest in NSW to Cape York Peninsula in Queensland. In areas, the distribution extends inland to coastal foothills. The common blossom-bat often roosts in littoral rainforest and feeds on nectar and pollen from flowers in adjacent heathland and paperbark swamps. They have also been recorded in a range of other plant communities, such as subtropical rainforest, wet sclerophyll forest and other coastal forests.

The species generally roosts individually in dense foliage and vine thickets of the sub-canopy, staying in the same general area for a season. It changes roost sites daily, but each roost site is generally only 50 metres or so away from other recent roosts. Favoured feeding sites are repeatedly visited on consecutive nights within a flowering season and revisited over several years. The species requires a year round supply of nectar and pollen which is gathered from a mosaic of coastal complex vegetation types. The common blossom-bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. The Atlas of NSW Wildlife database search indicated one record of the species within 10 km of the study area.

There is foraging habitat available to the Common Blossom-bat within the study area, however the species is unlikely to use the habitat for roosting. Suitable potential foraging habitat is located outside of the proposed extraction area that will continue to be available to the species. In addition, it is proposed to remove sand gradually over a period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be rehabilitated and allowed to regenerate over time to a natural condition thereby restoring foraging habitat. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)

The Yellow-bellied Sheathtail-bat is a very distinctive, large insectivorous bat up to 87 mm long. It has long, narrow wings, a glossy jet-black back, and a white to yellow belly extending to the shoulders and just behind the ear. Characteristically, it has a flattened head and a sharply-pointed muzzle. The tail is covered with an extremely elastic sheath that allows variation in the tail-membrane area. Males have a prominent throat pouch, while females have a patch of bare skin in the same place.

The species is widely distributed across northern and eastern Australia. In the most southerly part of its range most of Victoria, south-western NSW and South Australia) it is a rare visitor in late summer and autumn. It roosts singly or in groups up to six, in tree hollows and buildings. In treeless areas the species is known to utilise mammal burrows. The species forages in most habitats for insects flying high and fast over the forest canopy.

The Yellow-bellied Sheathtail-bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. There was one (1) record of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the study area. In addition, the species was recorded within the study area during the current survey by echolocation detection.

There is suitable roosting and foraging habitat available to the Yellow-bellied Sheathtail-bat within the study area. There were numerous trees recorded within the study area containing hollows that could potentially be utilised by the species. Many of these trees are located outside the proposed extraction area where they will not be impacted by the development and therefore will remain available to the species. There are also numerous hollow-bearing trees located within the proposed extraction area that would need to be removed to facilitate the development. Consequently, there will be some loss of both roosting habitat and foraging habitat. However, it is proposed to remove sand gradually over a period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be rehabilitated and allowed to regenerate over time to a natural condition thereby restoring foraging habitat. In addition, a nestbox strategy is proposed as detailed in Section 5.4 of this report to offset the loss of tree hollows. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Hoary Wattled Bat (*Chalinolobus nigrogriseus*)

The Hoary Wattled Bat is a small sooty-coloured bat with a light silvery-white frosting or hoary appearance that is visible at close range. Also, there are small lobes of skin or wattles between the ears and mouth. This species is typically observed flying about at dusk, leaving its roost site before other bat species have emerged.

The Hoary Wattled Bat is widely distributed across northern Australia but is absent from the arid centre. In northeast NSW it reaches the lower Clarence and Richmond River areas, extending from near Murwillumbah in the north, south to between Grafton and Coffs Harbour. In NSW the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum as well as box and ironbark species, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat. The species is known to roost in rock crevices but in the absence of these it is likely to roost in tree hollows or similar sites.

The Hoary Wattled Bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. There was one (1) record of the species listed under the Atlas of NSW Wildlife within a 10 km x 10 km search area around the study area.

There is suitable roosting and foraging habitat available to the Hoary Wattled Bat within the study area. The species requires tree hollows of adequate size for roosting. There were numerous trees recorded within the study area containing hollows that could potentially be utilised by the species. Many of these trees are located outside the proposed extraction area where they will not be impacted by the development and therefore will remain available to the species. There are also numerous hollow-bearing trees located within the proposed extraction area that would need to be removed to facilitate the development. Consequently, there will be some loss of both roosting habitat and foraging habitat. However, it is proposed to remove sand gradually over a period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be rehabilitated and allowed to regenerate over time to a natural condition thereby restoring foraging habitat. In addition, a nestbox strategy is proposed as detailed in Section 5.4 of this report to offset the loss of tree hollows. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Little Bentwing-bat (*Minopterus Australia*)

The Little Bentwing-bat occurs along the east coast of Australia from north-eastern Queensland to the central coast of New South Wales. The species mainly forages for insects between the canopy and understorey of well-timbered habitats including wet and dry sclerophyll forest, woodland, rainforest and coastal swamp forest. The Little Bentwing-bat is regarded as a cave-obligate species that roosts by day in caves, tunnels and mine shafts. Maternity colonies are formed during summer in roost sites with high humidity, which are often shared with the Eastern Bentwing-bat.

The Little Bentwing-bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. In the Atlas of NSW Wildlife there are 5 records of the species within 10 km of the study area.

This species forages across a wide range of habitats but requires caves, tunnels and mine shafts for roosting. There is foraging habitat available to the Little Bentwing-bat in the canopy of the study area, however, it is unlikely to use the habitat within the study area for roosting. Foraging habitat is located outside of the proposed extraction area that will continue to be available to the species. In addition, it is proposed to remove sand gradually over a period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be rehabilitated and allowed to regenerate over time to a natural condition thereby restoring foraging habitat. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Southern Myotis (*Myotis macropus*)

The Southern Myotis has disproportionately large feet with widely-spaced toes, which are distinctly hairy and with long, curved claws. The species has dark-grey to reddish-brown fur above and is paler below. It weighs up to 15 grams and has a wingspan of approximately 28 cm.
The Southern Myotis is found along the coastal strip from the northwest of Australia, across northern Australia and south to western Victoria. The species is rarely found more than 100 km inland, except along major rivers. It is always found close to water, from small creeks to large lakes and mangrove-lined estuaries. The species utilises a range of roost sites including caves, mineshafts, culverts, dense foliage and tree hollows in which it roosts in groups of 10-15 individuals. It forages low over water taking flying insects as well as aquatic insects and small fish, which it captures by raking the claws across the water surface.

The Southern Myotis is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. The Atlas of NSW Wildlife database search indicated one (1) record of the species within 10 km of the study area.

The adjacent wetlands provide potential foraging habitat for the Southern Myotis. Suitable roosting opportunities for the species are available within the study area. There were numerous trees recorded within the study area containing hollows that could potentially be utilised by the species for roosting. Many of these trees are located outside the proposed extraction area where they will not be impacted by the development and therefore will remain available to the species. There are also numerous hollow-bearing trees located within the proposed extraction area that would need to be removed to facilitate the development. Consequently, there will be some loss of potential roosting habitat. However, a nestbox strategy is proposed as detailed in Section 5.4 of this report to offset the loss of tree hollows. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Greater Broad-nosed Bat (*Scoteanax rueppellii*)

The Greater Broad-nosed Bat is a large robust bat with a broad head and short, squarish muzzle. The ears are widely spaced, short and have a rounded apex with a concave rear edge immediately below the apex. The upper parts vary from mid-brown to dark cinnamon-brown and the underparts are tawny-olive in colour.

The species occurs in a range of habitats including cleared grazing land, heathland, coastal swamp forest, woodland, rainforest as well as wet sclerophyll forest and dry sclerophyll forest. The species usually roosts in tree hollows and forages after sunset, flying slowly along watercourses at an altitude of 3 metres to 6 metres.

The Greater Broad-nosed Bat is listed as vulnerable in NSW under the *Threatened Species Conservation Act 1995*. In the Atlas of NSW Wildlife there was one record of the species within 10 km of the study area.

The adjacent wetlands provide potential foraging habitat for the Greater Broad-nosed Bat. Suitable roosting habitat for the species is also available within the study area. There were numerous trees recorded within the study area containing hollows that could potentially be utilised by the species for roosting. Many of these trees are located outside the proposed extraction area where they will not be impacted by the development and therefore will remain available to the species. There are also numerous hollow-bearing trees located within the proposed extraction area that would need to be removed to facilitate the development. Consequently, there will be some loss of potential roosting habitat. However, a nestbox strategy is proposed as detailed in Section 5.4 of this report to offset the loss of tree hollows. Therefore, the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

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

The Koala (Combined populations of Queensland, New South Wales and the Australian Capital Territory)

This population has been listed as vulnerable under the EPBC Act as it has undergone a substantial decline over three generations due to a combination of a number of factors including loss and fragmentation of habitat, vehicle strike, disease and predation by dogs.

The field survey indicated that the habitat within the study area contains two preferred Koala food tree species for the purposes of SEPP 44, including *Eucalyptus signata* (Scribbly Gum), which was a common component of the Pink Bloodwood open forest (particularly on the lower slopes) and *Eucalyptus robusta* (Swamp Mahogany), which was only present as uncommon isolated individuals at the margins of the site. For the purposes of the CKPoM and the EPBC Act Koala Referral Guidelines only *Eucalyptus robusta* (Swamp Mahogany) is listed as a preferred Koala food tree species. Therefore, the habitat within the study area appears to be marginal in terms of food resources for the Koala. The records contained within the Atlas of NSW Wildlife tend to support this conclusion as there are just four records of the species within the 10 km x 10 km default search area around the site and none of these were in close proximity. The general lack of records in the vicinity is interesting, given the site's proximity to a National Park estate and the Koala being an iconic species that is frequently targeted in surveys (particularly since the species listing under the EPBC Act and introduction of the CKPoM).

No Koala faecal pellets were found during the SAT survey and there were no sightings of the species during diurnal searches or spotlighting. There were also no other obvious signs such as scratch marks on trees to suggest that the Koala was present within the study area at the time of the fauna survey. In addition Koala movements to and from the site are likely to be impeded by the wetlands, which are largely comprised of treeless sedgelands located adjacent to the site in the northern, eastern and western

directions. Therefore, the habitat within the study area is unlikely to be useful to the species. On this basis it is considered that the action proposed is unlikely to have an adverse effect on the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

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

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

The Paperbark swamp forest community situated at the margins of the study area is listed as the endangered ecological community (EEC) – *Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*. However, as this part of the site lies well outside the proposed extraction area the action proposed is unlikely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

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

The Paperbark swamp forest community situated at the margins of the study area is listed as the endangered ecological community (EEC) – *Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*. However, as this part of the site lies well outside the proposed extraction area the action proposed is unlikely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

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

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

It is envisaged that the entire habitat within the proposed extraction area, which constitutes approximately 20 % of the study area is likely to be removed or modified as a result of the proposed sand extractive industry. The remaining land containing Pink Bloodwood open forest, and Paperbark swamp forest and wetland at the margins will be conserved. It is also proposed to rehabilitate the site at the completion of sand extraction operations, initiate a nestbox strategy and provide offsets within the study area. Therefore, the habitat to be removed or modified as a result of the proposed action is not considered to be significant.

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

It is considered that the proposed action is unlikely to fragment habitat areas or isolate habitat areas from other areas of habitat.

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

The habitat within the study area to be removed, modified, fragmented or isolated constitutes a relatively small area and the majority of the habitat within the study area will be retained. It is also proposed to rehabilitate and restore the habitat within the proposed extraction area at the completion of each stage of extraction operations. Therefore, the habitat within the study area proposed to be removed and/or modified is not considered to be significant to the long-term survival of the aforementioned threatened species subject to implementation of the raft of recommended mitigation measures.

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

Critical habitat was not recorded within the survey area. Therefore, the action proposed is unlikely to have an adverse effect on critical habitat (either directly or indirectly).

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

There is a recovery plan in place for the Koala. It is considered that the action proposed is consistent with the objectives or actions of this recovery plans.

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

Key threatening processes (KTPs) are listed in Schedule 3 of the TSC Act. Those considered to be applicable to the proposed development are:

Clearing of Native Vegetation
The reduction of native vegetation within the study area associated with the proposed development of the land could be viewed as contributing to the overall incremental decline of native vegetation within the region. However, the native vegetation across the majority of the study area lies outside the proposed extraction area and will be retained. In addition, it is proposed to remove sand gradually over a period of several years in a staged operation by dividing the extraction area up into several 'cells'. As extraction of sand from each active cell is completed the land therein will be

rehabilitated and allowed to regenerate over time to a natural condition. Therefore, it is considered that the proposed action does not contribute significantly to this KTP.

Anthropogenic Climate Change

The use of machinery and power tools during any future earthworks will contribute to anthropogenic climate change through release of stored carbon from vegetation and greenhouse gas emissions associated with use of fossil fuels. However, the overall impact of the action is considered negligible in the context of other human activities in the region.

Invasion of native plant communities by exotic perennial grasses

The proposed action has the potential to introduce plant species with the capacity to impact on the natural environment by destroying habitat or over-running indigenous plant species and altering the local biodiversity. This is particularly significant where disturbance occurs and the native vegetation cover is removed. However, measures, including weed management and site rehabilitation are recommended to mitigate this KTP.

Invasion, Establishment and Spread of Lantana (Lantana camara)

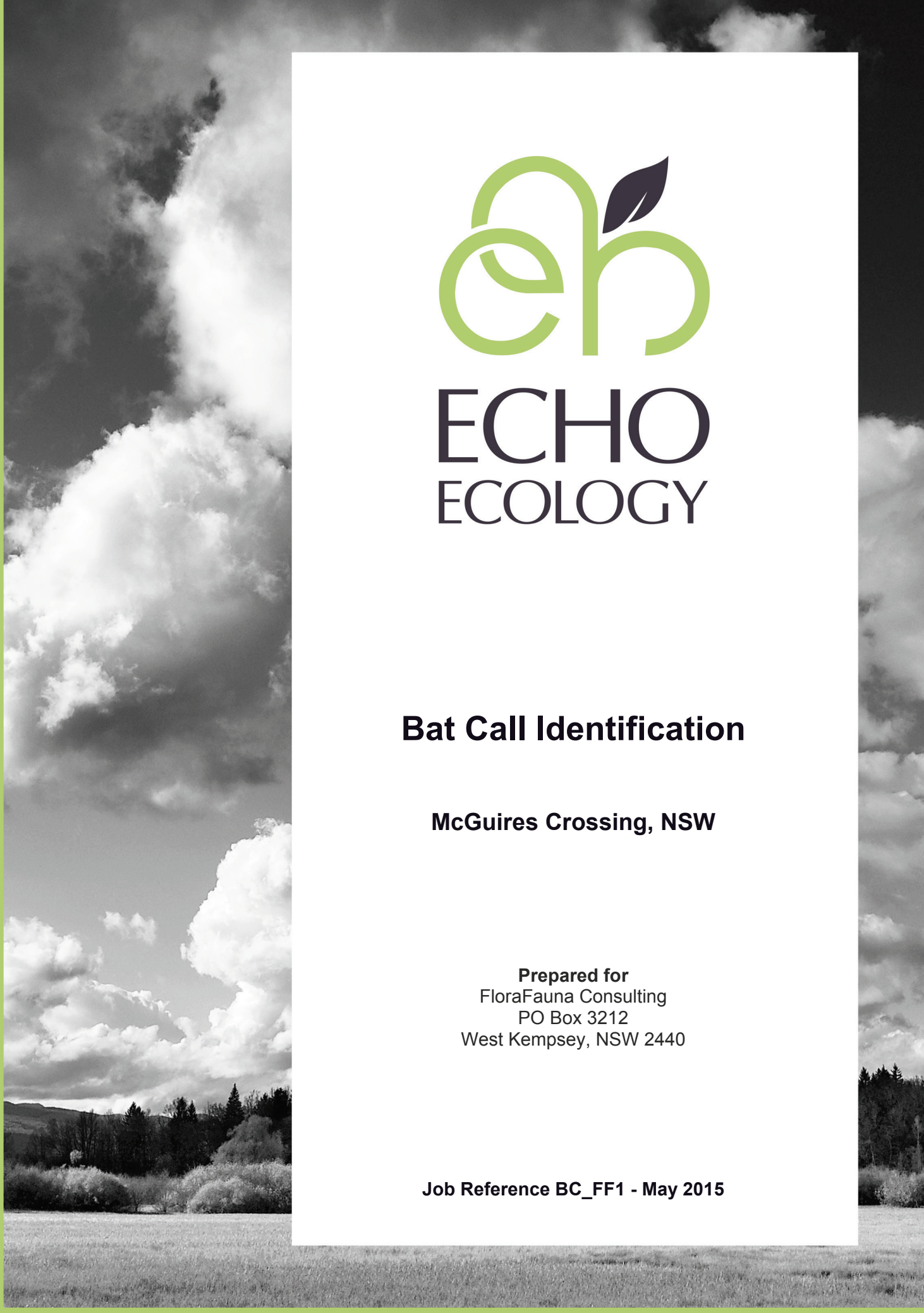
The field survey revealed that Lantana is established within the study area and the proposed action has the potential to significantly contribute to this KTP. However, measures, including weed management and site rehabilitation are recommended to mitigate this KTP.

Predation by the European Fox (Vulpes vulves)

The removal of native vegetation, stockpiling of topsoil and storage of timber for reuse in rehabilitation areas has the potential to provide suitable foraging and denning habitat for the European Fox and thereby contributing to this KTP. To mitigate this potential threat to biodiversity it is recommended that fox control be undertaken during the life of the action. However, it is noted that fox control is only effective if it is undertaken at high frequency over a broad area and across all land tenures. Therefore, it is also recommended that the proponents liaise with OEH as the Hat Head National Park occupies the larger area of land adjoining the site as well as other neighbouring landholders.

10. Appendix C: Bat Call Report

See following pages.



ECHO ECOLOGY

Bat Call Identification

McGuires Crossing, NSW

Prepared for
FloraFauna Consulting
PO Box 3212
West Kempsey, NSW 2440

Job Reference BC_FF1 - May 2015

Echo Ecology Pty Ltd ABN 73 162 118 710 • PO Box 4132 Crescent Head, NSW 2440 Australia • **P:** 0423 801 779 • **E:** info@echoecology.com.au• **W:** echoecology.com.au

This report has been prepared to document the analysis of digital ultrasonic bat echolocation calls received from a third party. The data was not collected by the author and as such no responsibility is taken for the quality of data collection or for the suitability of its subsequent use.

This report was authored by

Dr Anna McConville
PhD, B.Env.Sc.

Contents

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1.0 INTRODUCTION

This report has been commissioned by FloraFauna Consulting to analyse bat echolocation call data (EM3, Wildlife Acoustics) collected from McGuires Crossing, NSW. Data was provided electronically to the author. This report documents the methods involved in analysing bat call data and the results obtained only.

2.0 METHODS

The identification of bat echolocation calls recorded during surveys was undertaken using AnalookW (Chris Corben, Version 4.1t) software after converting .WAV files to zero crossings format using Kaleidoscope (Wildlife Acoustics). The identification of calls was undertaken with reference to Pennay *et al*. (2004) and through the comparison of recorded reference calls from north-eastern NSW. Reference calls were obtained from the NSW database and from the authors personal collection.

Each call sequence ('pass') was assigned to one of five categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species
- Probable - Pass identified to species level and there is a low chance of confusion with another species
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species
- Species group - Pass could not be identified to species level and could belong to one of two or more species. Occurs more frequently when passes are short or of poor quality
- Unknown - Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Call sequences that were less than three pulses in length were not analysed and were assigned to 'Unknown' and only search phase calls were analysed. Furthermore, some species are difficult to differentiate using bat call analysis due to overlapping call frequencies and similar shape of plotted calls and in these cases calls were assigned to species groups.

The total number of passes (call sequences) per unit per night was tallied to give an index of activity.

It should be noted that the activity levels recorded at different sites may not be readily able to be compared. Such comparisons are dependent on many variables which need to be carefully controlled during data collection and statistically analysed. Influential variables include wind, rain, temperature, duration of recording, season, detector and microphone sensitivity, detector placement, weather protection devices etc.

2.1 Characteristics Used to Differentiate Species

Miniopterus australis was differentiated from *Vespadelus pumilus*, by characteristic frequency or the presence of a down-sweeping tail on pulses. Call sequences which had a majority of pulses containing an up-sweeping tail were assigned to *Vespadelus pumilus*.

Chalinolobus gouldii was differentiated from other species by the presence of curved, alternating call pulses.

Scotorepens orion, *Scoteanax rueppellii* and *Falsistrellus tasmaniensis* were unable to be differentiated from one another.

Myotis macropus was unable to be differentiated from *Nyctophilus* sp..

Vespadelus darlingtoni, *Saccolaimus flaviventris* and *Tadarida australis* were differentiated from other bat species on the basis of characteristic frequency.

3.0 RESULTS

A total of 220 call sequences were recorded, of which 114 call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, 31 call sequences (27 %) were able to be confidently identified (those classified as either definite or probable identifications) to species level (Table 3-1). Species recorded confidently within the site include:

- *Chalinolobus gouldii* (Gould's wattled bat)
- *Miniopterus australis* (Little bentwing bat)
- *Saccolaimus flaviventris* (Yellow-bellied sheathtail bat)
- *Tadarida australis* (White-striped free-tailed bat)
- *Vespadelus darlingtoni* (Large forest bat)
- *Vespadelus pumilus* (Eastern forest bat)

Additionally, the following bat species potentially occurred within the site, but could not be confidently identified (those calls classified as possible or as a species group):

- *Chalinolobus morio* (Chocolate wattled bat)
- *Falsistrellus tasmaniensis* (Eastern falsistrelle)
- *Miniopterus schreibersii oceanensis* (Eastern bentwing bat)
- *Mormopterus (Micronomus) norfolkensis* (East coast free-tailed bat)
- *Mormopterus (Ozimops) ridei* (Eastern free-tailed bat)
- *Myotis macropus* (Large-footed myotis)
- *Nyctophilus geoffroyi* (Lesser long-eared bat)
- *Nyctophilus gouldi* (Gould's long-eared bat)
- *Scoteanax rueppellii* (Greater broad-nosed bat)
- *Scotorepens orion* (Eastern broad-nosed bat)
- *Vespadelus regulus* (Southern forest bat)
- *Vespadelus troughtoni* (Eastern cave bat)
- *Vespadelus vulturnus* (Little forest bat)

It should be noted that additional bat species may be present within the site but were not recorded by the detectors and habitat assessment should be used in conjunction with these results to determine the likelihood of occurrence of other bat species.

Table 3-1 below summarises the results of the bat call analysis.

Table 3-1: Results of bat call analysis (number of passes per site per night)

IDENTIFICATION	Night 1	Night 2	Night 3	Night 4
DEFINITE				
Chalinolobus gouldii	-	1	-	-
Miniopterus australis	1	2	-	1
Saccolaimus flaviventris	-	2	2	-
Tadarida australis	-	4	4	-
Vespadelus pumilus	-	1	-	-
PROBABLE				
Chalinolobus gouldii	1	2	1	-
Miniopterus australis	2	1	-	1
Saccolaimus flaviventris	-	2	-	-
Tadarida australis	1	-	1	-
Vespadelus darlingtoni	-	1	-	-
POSSIBLE				
Tadarida australis	-	-	-	2
SPECIES GROUPS				
Chalinolobus gouldii / Mormopterus (Micronomus) norfolkensis / Mormopterus (Ozimops) ridei	2	21	2	5
Chalinolobus gouldii / Mormopterus (Ozimops) ridei	-	1	-	-
Chalinolobus gouldii / Scoteanax rueppellii	-	15	-	-
Chalinolobus morio / Vespadelus pumilus / Vespadelus vulturnus / Vespadelus troughtoni	4	-	2	7
Falsistrellus tasmaniensis / Scotorepens orion / Scoteanax rueppellii	-	6	-	-
Miniopterus australis / Vespadelus pumilus	-	1	1	5

IDENTIFICATION	Night 1	Night 2	Night 3	Night 4
Miniopterus schreibersii oceanensis / Vespadelus darlingtoni / Vespadelus regulus	-	1	-	-
Myotis macropus / Nyctophilus geoffroyi / Nyctophilus gouldi	-	8	-	-
UNKNOWN				
Unknown	47	17	13	29
TOTAL	**58**	**86**	**26**	**50**

4.0 SAMPLE CALLS

A sample of the calls actually identified from the site for each species is given below.

Figure 4-1: *Chalinolobus gouldii* probable call

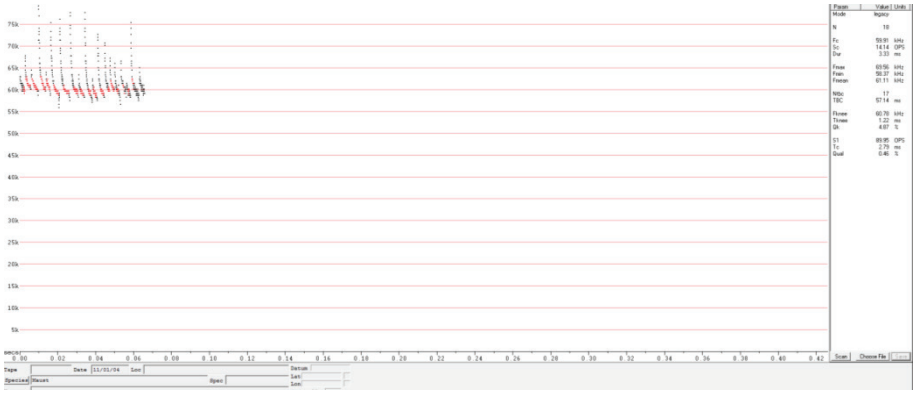

Figure 4-2: *Miniopterus australis* definite call

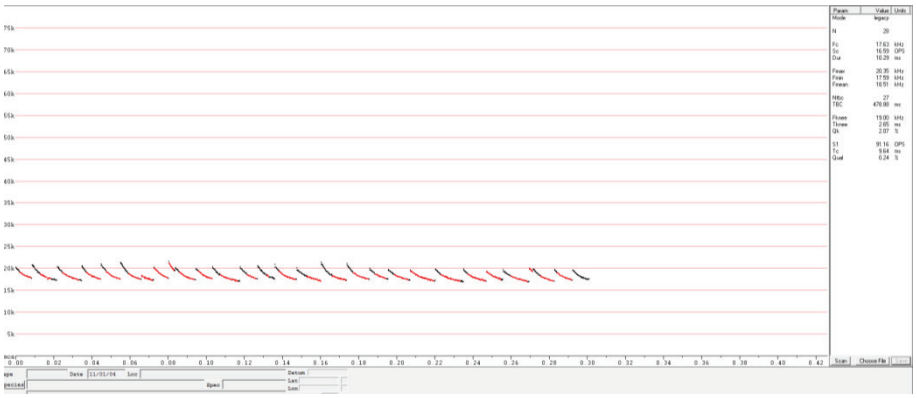

Figure 4-3: *Saccolaimus flaviventris* definite call

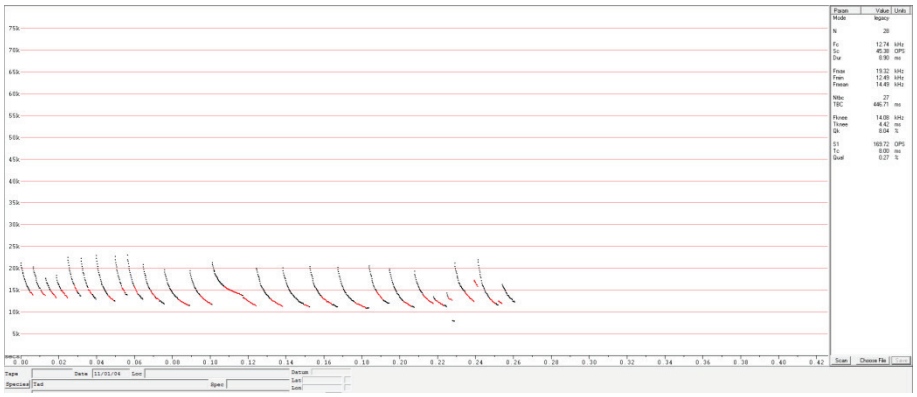

Figure 4-4: *Tadarida australis* definite call

Figure 4-5: *Vespadelus darlingtoni* probable call

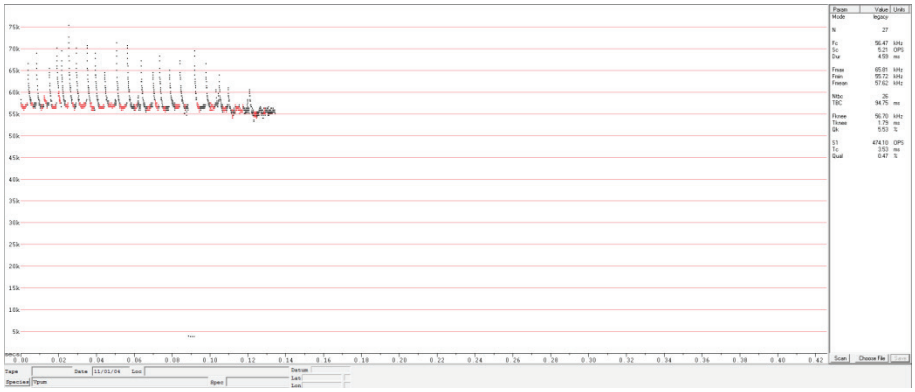

Figure 4-6: *Vespadelus pumilus* definite call

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NOISE

The acoustic barrier issue has been thoroughly reviewed by the original Consultants. ERM's conclusion is as follows: -

> *"ERM completed a review of the 2010 noise model and re-created the noise model based on newly available data. The predicted noise levels at the nearby receptors for the 2015 noise modelling assessment were below the noise criteria for the daytime period. According to the operational scenarios proposed in the EIS completed by Town Planning it was determined that the 3m barrier previously recommended is not required for the proposed sand quarry.*
>
> *To confirm that the results from the 2015 noise model, consideration should be given to the completion of compliance noise monitoring within the first three months of operations at the proposed quarry."*

Please see Report attached.

All correspondence to:
P.O. BOX 464
SANCTUARY COVE QLD 4212

MOBILE (0414) 68 9277
EMAIL townplan66@gmail.com

TOWNPLANNING CONSULTANTS & DRAFTING SERVICES PTY. LTD.

A.C.N. 063 172 476
ABN 88 063 172 476

26th May 2015.

Attention: Rachael Jeffrey.

Kempsey Shire Council,
P.O. Box 3078,
WEST KEMPSEY. N.S.W. 2440.

Dear Rachael,

RE: T6-14-122 - COUNCIL INFORMATION REQUEST
PROPOSED EXTRACTIVE INDUSTRY.

Further to my interim response of the 23rd January 2015, I have just received the outstanding supplementary Consultants Reports required (Council's correspondence of 22nd December 2014).

After reviewing all the correspondence and reports received, it is proposed to amend the scope of the project so as to include a significant biodiversity offset area. The planned last two Extraction Cells 11 and 12 have now been deleted from the proposal so as to preserve a permanent habitat corridor between S.E.P.P. No's 469 and 472.

The Owners could have undertaken significant clearing of the land at the same time as adjoining Lot 322 was cleared; however, their consultations with Council (at that time) resulted in their decision to maintain an ecologically sustainable approach to their operation. It is considered that their incremental clearing and rehabilitation practices will allow the land to revert back to its original level of sustainability in a relative short time period. Future clearing practices will be further monitored in accordance with our recommendations contained in the Addendum Ecological Report.

It should be stressed that the Owners of the land have previously undertaken a responsible attitude to undertaking a sustainable method of extraction and rehabilitation of their nearby sites.

In conclusion, the proposed extractive industry will provide an important sand resource for the future growth of the Shire. There are extremely limited amounts of such resource within such stable, disturbed, rural residential type environments that are distant from coastal foreshore type areas.

I have now incorporated my interim response and comments/advices received at that time within the subject Report so as to provide a single comprehensive reply to Council's original Information Request. Please see attached.

Yours faithfully,

S. W. WINK.

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A.C.N. 063 172 476
ABN 88 063 172 476

RESPONSE TO INFORMATION REQUEST

ON

PROPOSED EXTRACTIVE INDUSTRY

LOT 1324 D.P. 785874 AND
LOT 323 D.P. 855616
BELMORE RIVER ROAD,
BELMORE RIVER

ISSUES ADDRESSED ARE AS FOLLOWS: -

- PROPERTY DESCRIPTION
- ECOLOGY
- ABORIGINAL HERITAGE
- NOISE
- STOCKPILING AND OVERBURDEN
- ROADS AND TRAFFIC
- DRAFT OPERATION MANAGEMENT PLAN
- ACID SULFATE SOILS

ENVIRONMENTAL RESOURCES MANAGEMENT AUSTRALIA PTY LTD

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Technical (Acoustics) Report

Project Number:	0296155	**Date:**	21 May 2015
Project Name:	Belmore Sands Noise	**Subject:**	Noise Modelling – Belmore River Quarry
From:	Andrew Morris	**Reference:**	O296155_Technical Report_Belmore Sands.docx
Copied To:	Nathan Lynch, Murray Curtis	**Client:**	MR Sands

1. OVERVIEW

Crescent Head Sands Pty Ltd & John Phillips Pty Ltd trading as MR Sands' (MR Sands) application to establish and operate the proposed sand quarry at Lot 1324 DP785874 and Lot 323 DP855616 on Belmore River Road (Right Bank), Belmore River of New South Wales (NSW).

Environmental Resources Management Australia Pty Ltd (ERM) was engaged to respond to Kempsey Shire Council (KSC) letter addressed to Town Planning Consultants and Drafting Services Pty Ltd (Town Planning) dated 22 December 2014. The letter from KSC was in reference to the EIS with clarification required on the noise report completed for the sand quarry. KSC had concerns regarding the intended construction of a 3m noise barrier.

Following a review of the previous noise report and model completed by ERM for the report titled *Noise Impact Assessment, Belmore River Road via Gladstone Village, Kempsey Shire* for *Grandia Investments Pty Ltd* (September 2010) it was determined that further refinement of the noise model could be completed following the availability of new data.

The previous noise model was completed using calculation method ENM-link within the noise modelling software Predictor (v6.12) which incorporated all noise sources to be operational concurrently as a conservative model. The ERM 2010 report recommended the use of a 3m barrier (stockpile mound) situated to the west of operational plant and equipment. ERM has recently revised the previous noise model using Predictor software package (v8.14) using the ISO 9613.1/2 as a third octave model with an updated operational scenarios and digital data which was not available at the time of the 2010 report.

The revised noise model re-evaluated the position of the noise sources in relation to the quarry footprint using new detailed elevation data, revision of the operational scenarios based on the number of staff at the quarry able to operate the plant and equipment as detailed in the EIS prepared by Town Planning. According to the change in the proposed operations the revised noise model has identified that the 3m barrier (stockpile mound) is not required. This document has been prepared by ERM to summarise the findings of revised noise model conducted in April 2015 and May 2015.

a. METHODOLOGY

The methodology, inputs and assumptions that have informed the HRPR noise modelling and assessment are outlined below:

- Brüel & Kjær's Predictor 7810 (Version 8.14) noise modelling software package was utilised to calculate noise levels using the International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) - *Acoustics - Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation noise propagation algorithms* (international method for general purpose, 1/1 octaves).

- The Predictor software package allows topographic details to be combined with ground regions, water, foliage, significant building structures etc. and receptor locations, to create a detailed and accurate representation of the site and surrounding area. The noise model allowed for the quantification of noise levels from multiple sources, based on sound power or pressure levels emitted from each source. The model computed the noise propagation in the assessment area of influence to specifically quantify A-weighted decibels, $L_{Aeq,\ 15minute}$ dB(A) at identified receptors.

Sound Power Level L_W, dB(A) data (refer *Table 2*) for the plant was obtained from the client……

- Aerial imagery was utilised to identify receptor locations. Noise levels were calculated at 1.5 and 4.5 m for all receptors, representative of single and double storey buildings. In all cases noise has been assessed at the most-affected point on or within the residential property boundary or, if that is more than 30 m from the residence, at the most-affected point within 30 m of the residence.

- Meteorological conditions for prevailing winds and temperature inversions were included in the model. The model included a temperature of 12°C and humidity of 70%, to represent daytime conditions.

- A ground factor of 0.5 was adopted for the general modelling area (0.0 is hard, 1.0 is soft) with a ground factor of 0.1 (mostly hard) adopted for the site. The adopted ground factor of 0.5 was adopted due to the potential presence of water in the adjacent SEPP14 wetlands surrounding the quarry.

- 3D topographic data was obtained from Dennis Partners Pty Ltd of Kempsey.

Technical Note

Daytime noise criteria apply throughout the period of the quarry day shift (7am to 6pm) on all days. Refer *Section 2* for daytime criteria considered in this document which was adopted from the ERM 2010 report.

All noise levels presented in this document are expressed in dB(A) re: 2×10^{-5} Pa.

b. NOISE SENSITIVE RECEPTORS

The potentially sensitive receptors considered in the noise model are presented below in *Table 1* and identified in *Figure 1*.

Table 1 – Noise Measurement (Receiver) Locations

Receiver ID	Description	MGA (Zone 56) Coordinates		Direction and Distance from Quarry Centre	
		Easting	Northing	Compass point	Distance, m
R1	Belmore River Road (Right Bank)	498780	6560698	West	2095
R2		498780	6560570	West	2080
R3		498671	6560373	West	2175
R4		498575	6560004	West	2310

c. NOISE EMISSION SOURCES

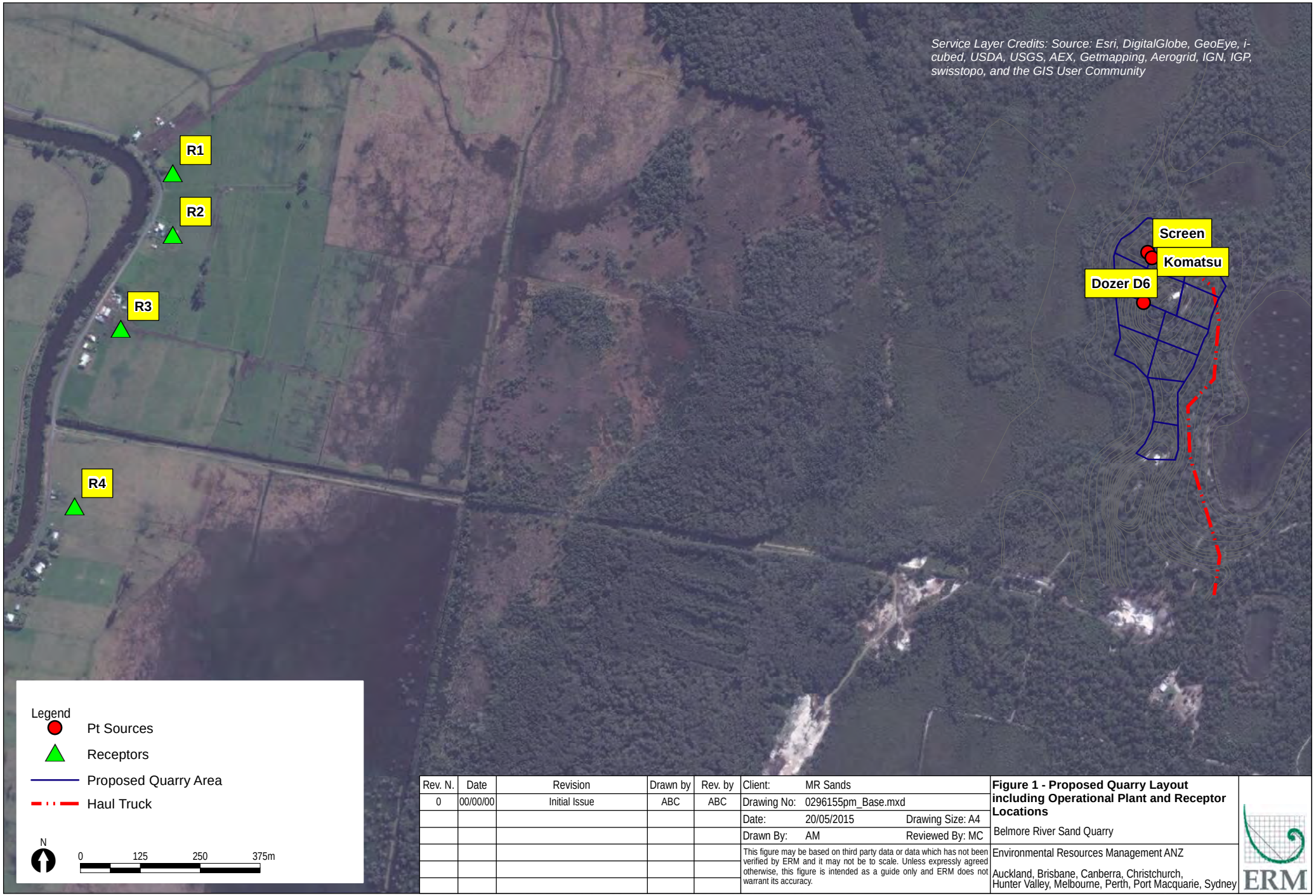
L_W data incorporated into the noise model is presented in *Table 2* with the location of each source (and other key features of the model) identified in *Figure 1*.

Guidance Note

Sound Power Level (L_W) is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment. This differs from a Sound Pressure Level (L_P) which is the level of sound pressure as measured at a distance by a standard sound level meter with a microphone. L_P is the received sound as opposed to L_W which is the sound 'intensity' at the source.

Table 2 – Sound Power Level Data

ID	Description	GPS		Emission Height, m	~Ground Height, m	Frequency (Hz)									
		Easting	Northing			31	63	125	250	500	1k	2k	4k	8k	LW
Screen	Sand Processing Plant	Varies	Varies	2.0	Varies		26	60	65	69	72	74	76	77	**96**
Haul Truck	Quarry Haul Truck	Varies	Varies	1.8	Varies		53	61	66	70	73	76	78	81	**112**
Front End Loader	Komatsu WA420 - 110.5dB(A) Front End Loader	Varies	Varies	2.0	Varies		79	86	90	94	98	99	100	99	**111**
Dozer	Cat. D6 Dozer	Varies	Varies	2.0	Varies		19	49	55	60	64	68	74	79	**110**



Rev. N.	Date	Revision	Drawn by	Rev. by
0	00/00/00	Initial Issue	ABC	ABC

Client:	MR Sands	
Drawing No:	0296155pm_Base.mxd	
Date:	20/05/2015	Drawing Size: A4
Drawn By:	AM	Reviewed By: MC

Figure 1 - Proposed Quarry Layout including Operational Plant and Receptor Locations

Belmore River Sand Quarry

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM

2. RESULTANT NOISE LEVELS

Based on the methodology, inputs and assumptions described above ERM have predicted LAeq, 15minute noise levels for an "unmitigated" noise assessment scenario. The resultant noise levels for each scenario are presented in *Table 3*.

In each case noise levels are predicted for each noise sensitive receptor for quarry works at all assessed receptor locations representative of potential works associated with the quarry as identified in *Figure 1*.

a. COMPARISON TO LEQ, 15 MINUTE CRITERIA

A comparison of resultant site noise level contributions to the daytime ($L_{eq,\ 15\ minute}$) operational noise impact assessment criteria is presented in *Table 3*. The predicted noise levels have been determined by noise modelling previously described in *Section 1*, in the absence of any influential source not associated with the site.

Table 3 – Predicted LAeq, 15 minute Unmitigated Noise Levels

Receiver ID	Description	Assessment Height	Assessment Period	Noise Assessment ($L_{eq,\ 15\ min}$)		
				Operational Noise Impact Assessment Criteria	Predicted Noise Level	Complies
R1		1.5	Daytime (7am to 6pm)	35	32	Yes
		4.5		35	32	Yes
R2		1.5		35	32	Yes
		4.5		35	32	Yes
R3		1.5		35	31	Yes
		4.5		35	31	Yes
R4		1.5		35	30	Yes
		4.5		35	30	Yes

3. DISCUSSION

ERM completed a review of the 2010 noise model and re-created the noise model based on newly available data. The predicted noise levels at the nearby receptors for the 2015 noise modelling assessment were below the noise criteria for the daytime period. According to the operational scenarios proposed in the EIS completed by Town Planning it was determined that the 3m barrier previously recommended is not required for the proposed sand quarry.

To confirm that the results from the 2015 noise model, consideration should be given to the completion of compliance noise monitoring within the first three months of operations at the proposed quarry.

4. CONTACTS

ERM trust this information meets MR Sands requirements. Any questions or queries regarding the data presented in this document please do not hesitate to contact Andrew Morris on +61 434 181 414 or 02 4903 5500 or via email at andrew.morris@erm.com.

for Environmental Resources Management Australia Pty Ltd

Andrew Morris
Project Manager

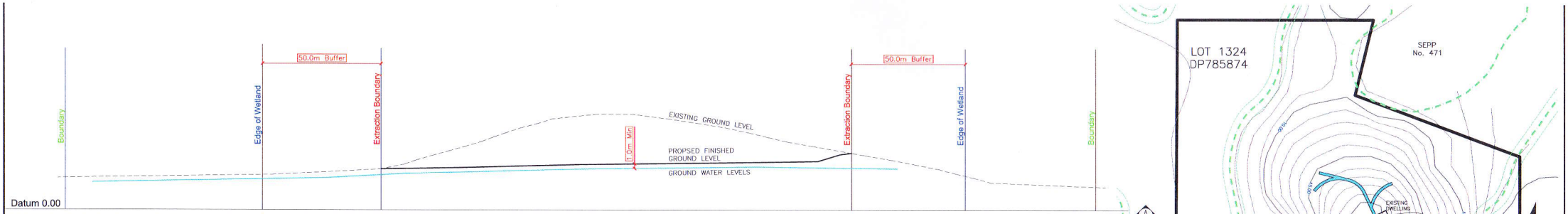
Murray Curtis
Partner

PROPERTY DESCRIPTION

I further consulted with the Engineer about the status of D.P. 1018286 (registration date shown as 18th October 2000 on plans). He has agreed to amend submitted plans in accordance with Council requirements.

New Plans are now attached.

Full scale plans are being sent to Council under separate cover.



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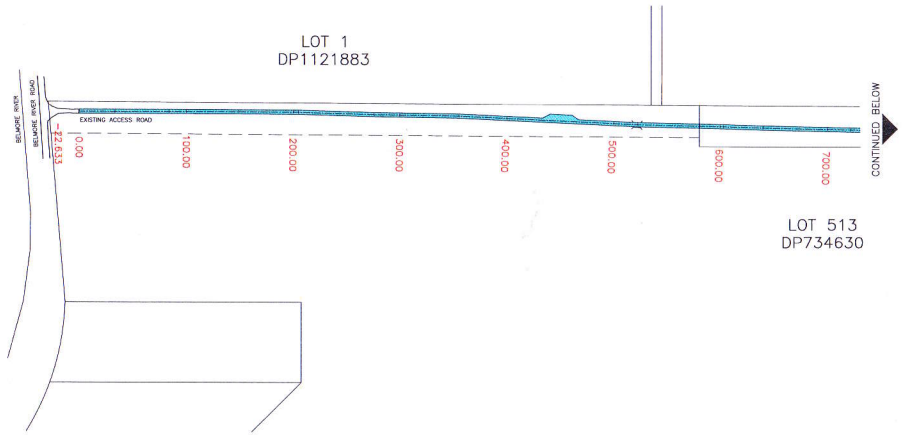
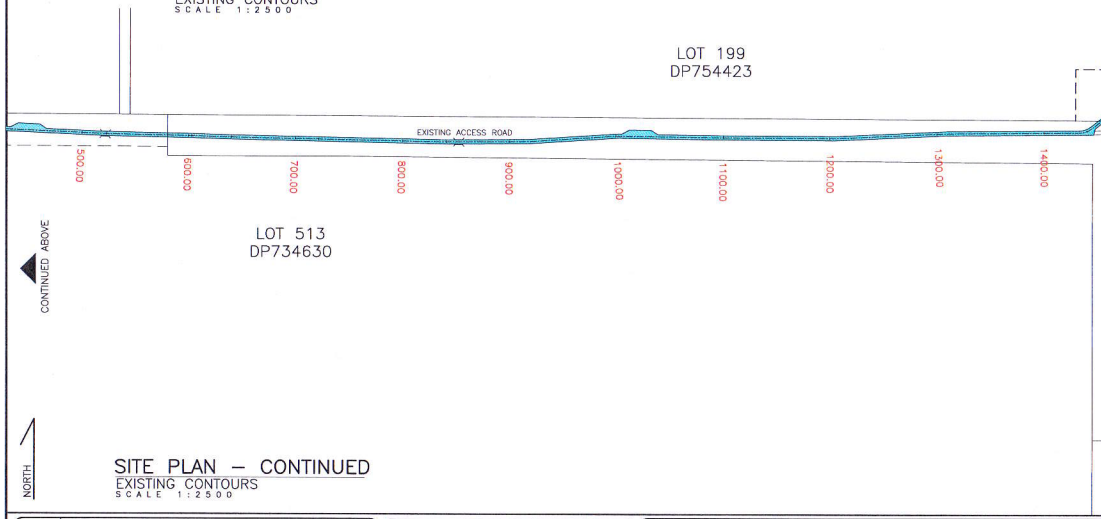
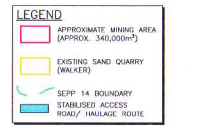
NOT TO SCALE

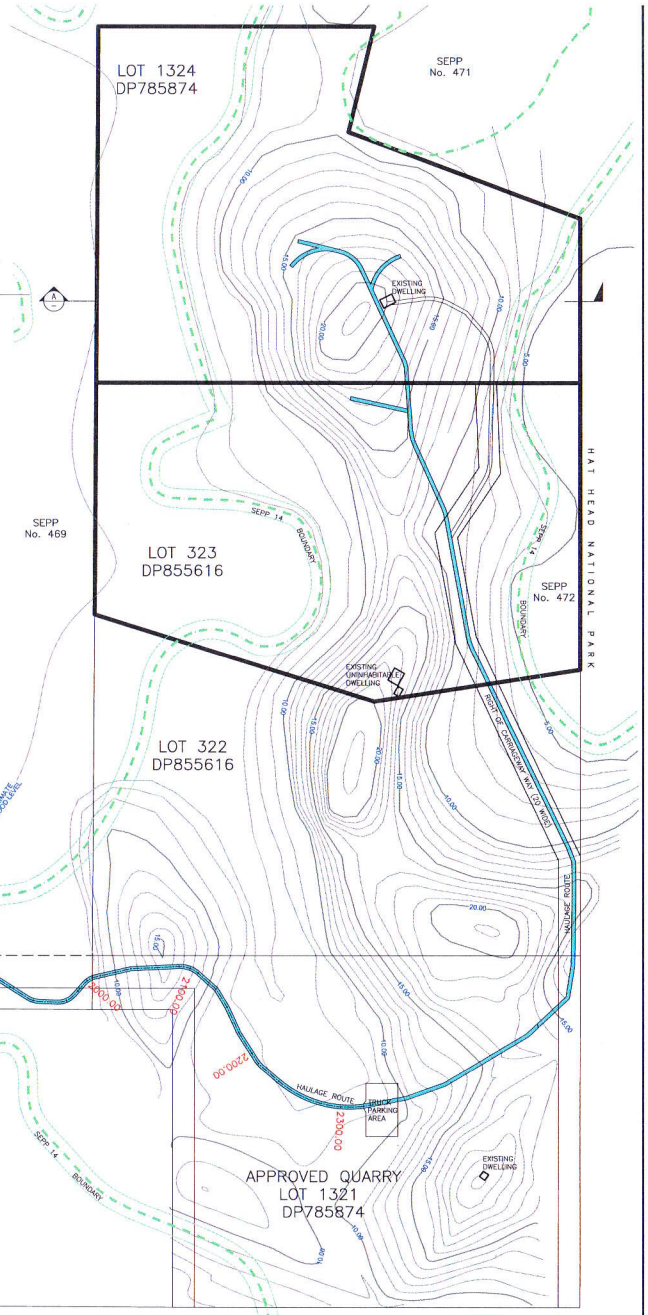


SITE PLAN
EXISTING CONTOURS
SCALE 1:2500





NOTE:
- 50m BUFFER BETWEEN SEPP14 WETLAND BOUNDARY AND MAXIMUM DEPTH OF EXTRACTION
- 1m BUFFER BETWEEN GROUND WATER LEVEL AND MAXIMUM DEPTH OF EXTRACTION
- WORKING FACE/DISTURBED AREA UP TO 5000m²
- PROPOSED EXCAVATION 20000m³/YEAR



NORTH

SITE PLAN – CONTINUED
EXISTING CONTOURS
SCALE 1:2500

REV NO	REVISION DESCRIPTION	APPROV DATE
A	DA Application	21/05/15

Notes
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project: PROPOSED SAND QUARRY
TO LOT 5 DP1018286 (LOT 1321 DP785874)
VIA BELMORE RIVER ROAD
KEMPSEY

client: GRANDIA INVESTMENTS P/L

design consultant:

title: PROPOSED OVERALL PLAN
EXISTING CONTOUR PLAN AND
TYPICAL SECTION

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ABN 62 101 949 937

scale	drawn	checked	approved	revision no.
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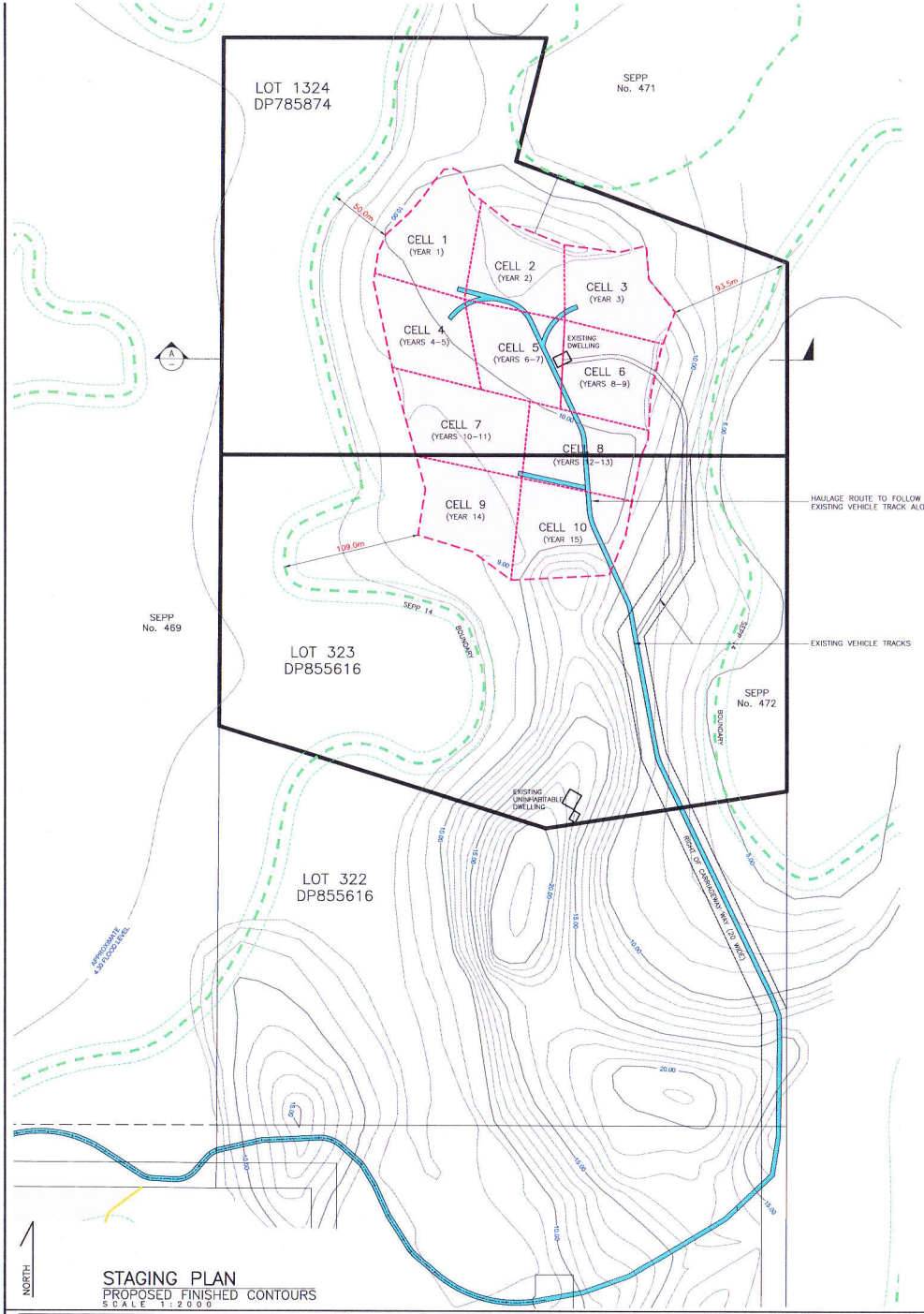
sheet size	datum	origin of levels		
A1	AHD	AMOS & McDONALD SURVEYORS		

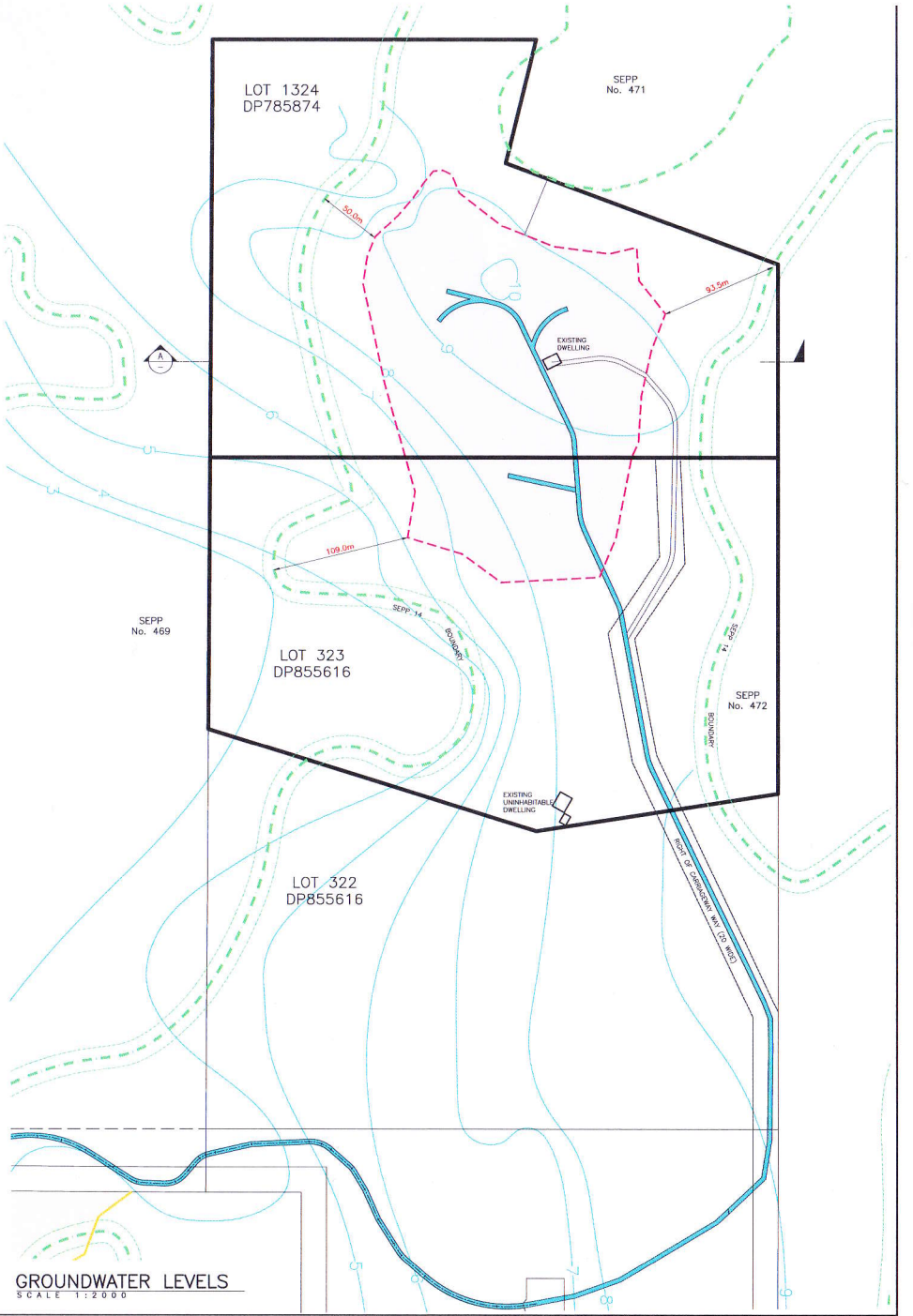
project no.	drawings in set	sheet no.
0749–DP	[04]	01



STAGING PLAN
PROPOSED FINISHED CONTOURS
SCALE 1:2000

NOTE:
- 50m BUFFER BETWEEN SEPP14 WETLAND BOUNDARY AND MAXIMUM DEPTH OF EXTRACTION
- 1m BUFFER BETWEEN GROUND WATER LEVEL AND MAXIMUM DEPTH OF EXTRACTION
- WORKING FACE/DISTURBED AREA UP TO 5000m²
- PROPOSED EXCAVATION 20000m³/YEAR

LEGEND
- APPROXIMATE MINING AREA (APPROX. 340,000m²)
- EXISTING SAND QUARRY (WALKER)
- GROUND WATER LEVEL
- SEPP 14 BOUNDARY
- STABILISED ACCESS ROAD/ HAULAGE ROUTE



GROUNDWATER LEVELS
SCALE 1:2000

REV NO	REVISION DESCRIPTION	APPROV DATE
A	DA Application	21/05/15

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VIA BELMORE RIVER ROAD
KEMPSEY

client: GRANDIA INVESTMENTS P/L

design consultant:

title: PROPOSED STAGING PLAN
WITH FINISHED CONTOURS AND
EXISTING GROUNDWATER LEVELS

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project no.	drawings in set	sheet no.
0749–DP	[04]	03

ABORIGINAL HERITAGE

My interim response of 23rd January 2015 was forwarded to the Office of Environment & Heritage.

The Office responded on the 29th April 2015 with recommendations on appropriate requirements for the development. See attached.

NSW GOVERNMENT | Office of Environment & Heritage

Your reference T6-14-122
Our reference: DOC15/92648
Contact Ms Rosalie Neve (02) 6659 8221

General Manager
Kempsey Shire Council
PO Box 3078
West Kempsey NSW 2440

Attention: Ms Rachael Jeffrey

Dear Mr Rawlings

Re: Belmore River Sand Quarry – Aboriginal Cultural Heritage Considerations

Thank you for your email of 18 March 2015 requesting additional advice from the Office of Environment and Heritage (OEH). I appreciate the opportunity to provide further input.

Your email follows receipt of a response from the planning consultant acting on behalf of the applicant for the Belmore River Sand Quarry Development Application. OEH understands that the additional information provided relates to Aboriginal cultural heritage matters raised in response to OEH concerns outlined in correspondence to Council dated 15 December 2014.

OEH has reviewed the additional information provided in relation to the proposed sand extraction at Belmore River and provides the following comments for consideration.

OEH notes that an Aboriginal cultural heritage assessment was undertaken in consultation with the registered Aboriginal stakeholders with respect to the proposed quarry expansion area. OEH further notes that the archaeologist's recommendation for further archaeological investigations within the area was not supported by the registered Aboriginal stakeholders. OEH acknowledges the Aboriginal knowledge-holders' determination that the shell material identified on the access track is not of a cultural nature.

OEH supports the ongoing working relationship with the community detailed in the *Draft Plan of Management* and the proposed management strategy of ongoing monitoring by representatives of the registered Aboriginal parties for the project to identify any potential Aboriginal objects to be uncovered as part of the proposed works. However, OEH notes the strategies outlined in the draft plan only cover procedures to ensure the identification of any potential Aboriginal objects encountered during the proposed development works, as opposed to their management.

The importance of protecting Aboriginal cultural heritage is reflected in the provisions of the *National Parks and Wildlife Act 1974* (NPW Act). The NPW Act clearly establishes that Aboriginal objects and places are protected and may not be damaged, defaced or disturbed without appropriate authorisation.

Locked Bag 914, Coffs Harbour NSW 2450
Federation House Level 7, 24 Moonee Street,
Coffs Harbour NSW 2450
Tel: (02) 6651 5946 Fax: (02) 6651 6187
ABN 30 841 387 271
www.environment.nsw.gov.au

Importantly, approvals under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) do not absolve the proponent of their obligations under the NPW Act. As such, if Aboriginal objects are identified within the project area during the proposed quarrying works, all work must cease within the area until the registration and management of the Aboriginal objects is finalised.

In this instance, should the proposed quarry receive approval, OEH recommends conditions that clarify the procedure to follow should Aboriginal objects be identified through the proposed works, such as the potential requirement for an Aboriginal Heritage Impact Permit (AHIP) to be obtained. Where it is identified that a permit is required to harm Aboriginal objects, an AHIP application is to accord with the guideline *Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants* (OEH May 2011) available at the link below (http://www.environment.nsw.gov.au/resources/cultureheritage/20110280AHIPguideforapplicants.pdf.

Any Aboriginal objects identified within the project boundary prior to or during any subsequent works approved under the current development proposal must be registered on OEH's Aboriginal Heritage Information Management System (AHIMS). Penalties apply for failing to do this.

If you require further information or clarification, or should Council be in possession of information that suggests that OEH's statutory interests may be affected, please contact Aboriginal Heritage Planning Officer, Ms Rosalie Neve, either by telephone (02) 6659 8221 or email rosalie.neve@environment.nsw.gov.au.

Yours sincerely

Dimitri Young 29 April 2015

DIMITRI YOUNG
Senior Team Leader Planning, North East Region
Regional Operations

ACID SULFATE SOILS

As per the E.I.S. and Draft Management Plan details, the maximum depth of extraction will be one metre above groundwater levels. Based on Engineering Plans provided, it is anticipated that the lowest level of extraction will be 6m A.H.D. This would be well above levels expected to contain potential acidic soils. See Engineering Plan on Sheet 4 in Stockpiling Section.

Pursuant to D.C.P No. 30, the land is identified as Class 5 type land. The proposal will not intercept or lower ground water levels and does not involve excavation that would disturb potential acidic soils. Please see Pages 22 to 24 of the E.I.S.

The development has been designed to leave a large amount of sand resource within the site so as to permit rehabilitation that is consistent with the surrounding environment.

DRAFT OPERATIONAL MANAGEMENT PLAN

The Draft Plan in the E.I.S. was designed as an overview document only. There is no objection to providing a Traffic and Transport Management Section in the Final Plan as per points i to iv shown in your correspondence. It was expected that such amendments to the Draft Management Plan would be a condition of any possible Consent.

ROAD AND TRAFFIC

It should be stressed that both the existing quarry operation and the proposed new site have restricted all truck haulage to north of the land, i.e.: all truck movements are required to turn right on Belmore River Road towards Gladstone.

The Engineers additional advice and plans are attached.

dennis

civil & structural engineers

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62 101 949 937

Ref:0749-DP

21 May 2015

Steve Wink
Town Planning Consultants and Drafting Services Pty Ltd
PO Box 464
SANCTUARY COVE QLD 4212

RE: PROPOSED EXTRACTIVE INDUSTRY – SAND QUARRY, LOT 1324 DP785874 AND LOT 323 DP 855616, BELMORE RIVER RIGHT BANK ROAD, BELMORE RIVER

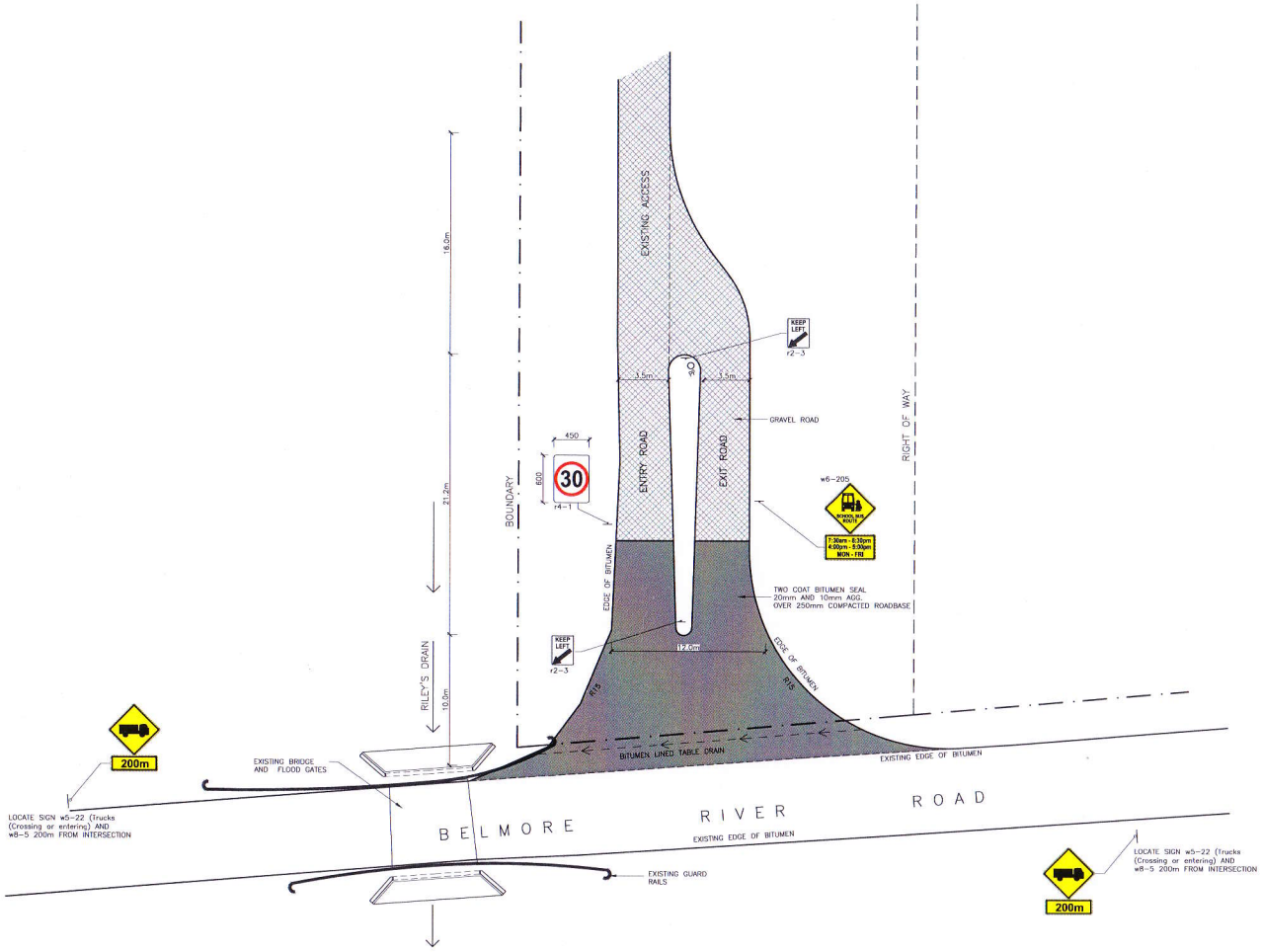
Haul Route Intersection at Belmore River Road

Further to your instructions we have investigated the haulage route intersection and provide the following advice;

- We recommend that the intersection be upgraded as shown on our plan Ref No.:0749-DP Sheet No.2.
- The left turn treatment from Belmore River Rd onto the right of way (ROW) meets the Austroads Standard for a BAL type intersection.
- The right hand turn from the ROW onto Belmore River Rd meets the Austroads Standard for vehicle turning paths.
- A BAR type intersection from Belmore River Rd into the ROW is considered not to be required as this does not form part of the haulage route. There is insufficient space for additional widening of the western side of Belmore River Rd due to the constraints of the adjacent flood control structure. The construction of a passing lane on the western side of the intersection would encourage dangerous traffic movements.

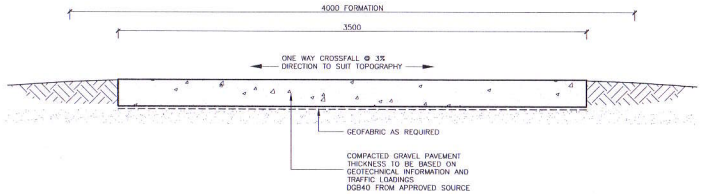
Yours faithfully

Robert Dennis
MIEAust, CPEng



INTERSECTION PLAN
PRIVATE ACCESS ROAD/BELMORE RIVER ROAD
SCALE 1:200

NORTH



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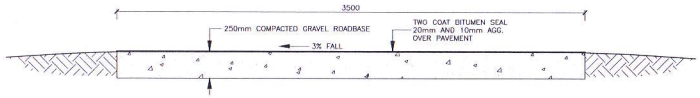
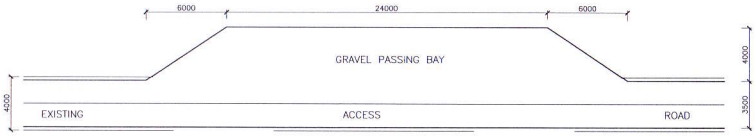


TYPICAL BITUMEN ACCESS ROAD CROSS SECTION AT INTERSECTION
SCALE 1:20



TYPICAL PASSING BAY DETAIL
SCALE 1:200

REV NO	REVISION DESCRIPTION	APPROV DATE
A	DA Application	21/05/15

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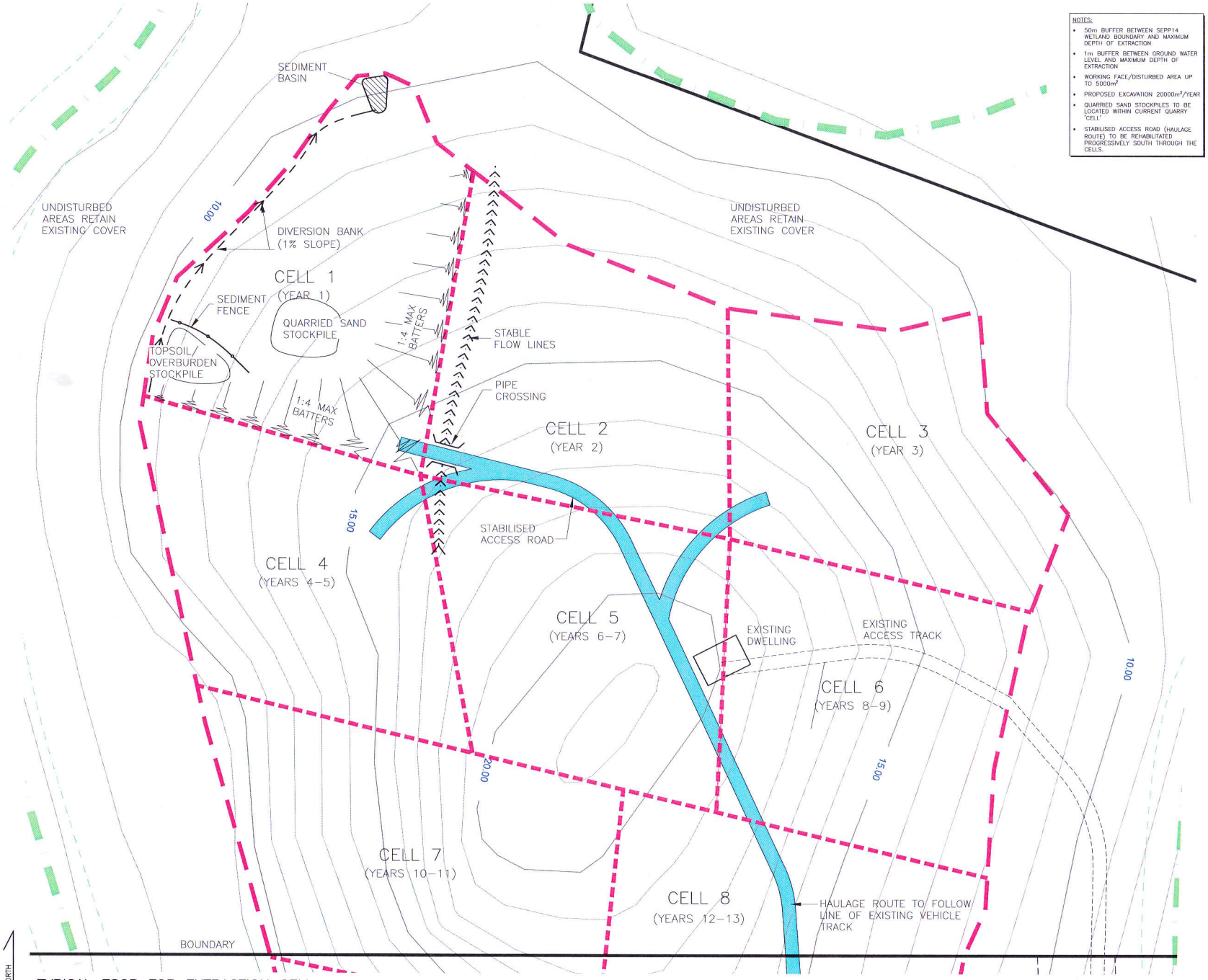
sheet size	datum	origin of levels
A1	AHD	AMOS & McDONALD SURVEYORS

project no.	drawings in set	sheet no.
0749-DP	[04]	02

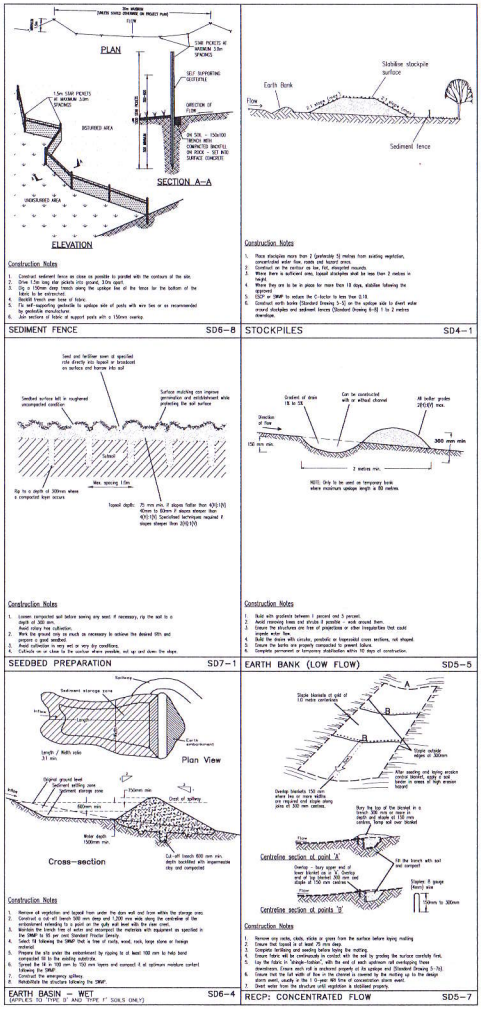
STOCKPILING AND OVERBURDEN

Plans showing indicative location for stockpiles/overburden are now attached. There was an error on "abbreviation" in Section 3.6. The stockpile size was up to 1,000 cubic metres (m^3).



NOTES:

- 50m BUFFER BETWEEN SEPP14 WETLAND BOUNDARY AND MAXIMUM DEPTH OF EXTRACTION
- 1m BUFFER BETWEEN GROUND WATER LEVEL AND MAXIMUM DEPTH OF EXTRACTION
- WORKING FACE/DISTURBED AREA UP TO 5000m²
- PROPOSED EXCAVATION 20000m³/YEAR
- QUARRIED SAND STOCKPILES TO BE LOCATED WITHIN CURRENT QUARRY 'CELL'
- STABILISED ACCESS ROAD (HAULAGE ROUTE) TO BE REHABILITATED PROGRESSIVELY SOUTH THROUGH THE CELLS.



NOTES:

1. STRIP AND STOCKPILE EXISTING TOPSOIL IN DISTURBED AREAS PRIOR TO THE COMMENCEMENT OF EARTHWORKS.
2. REGRADE, RESTORE AND SPREAD TOPSOIL TO ELIMINATE PONDING OF SURFACE WATERS.
3. STOCKPILED TOPSOIL AND IMPORTED TOPSOIL TO BE RE–SPREAD SO AS TO PROVIDE A MINIMUM THICKNESS OF 80mm OVER THE DISTURBED AREAS OF THE ALLOTMENTS, FOOTPATHS AND PUBLIC RESERVES UPON COMPLETION OF DEVELOPMENT CONSTRUCTION WORKS.

LEGEND

- APPROXIMATE MINING AREA
- SEPP 14 BOUNDARY
- HAULAGE ROUTE
- STABLE FLOW LINES
- SEDIMENT FENCE
- DIVERSION BANK (1% SLOPE)
- SEDIMENT BASIN

TYPICAL ESCP FOR EXTRACTION CELL

EXISTING CONTOURS

SCALE 1:500

REV NO	REVISION DESCRIPTION	APPROV DATE
A	DA Application	21/05/15

Notes

THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS

DO NOT OBTAIN MEASUREMENTS BY SCALING OFF DRAWINGS, USE ONLY WRITTEN DIMENSIONS AND VERIFY WITH THE ARCHITECTURAL PLANS

ALL WORK IS TO BE COMPLETED IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARDS

REPORT ANY DISCREPANCIES TO DENNIS PARTNERS BEFORE PROCEEDING

THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNLESS ENDORSED "FOR CONSTRUCTION" IN THE AMENDMENT SCHEDULE

project: PROPOSED SAND QUARRY
TO LOT 5 DP1018286 (LOT 1321 DP785874)
VIA BELMORE RIVER ROAD
KEMPSEY

client: GRANDIA INVESTMENTS P/L

design consultant:

title: TYPICAL ESCP FOR EXTRACTION CELL (EXISTING CONTOURS)

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scale	drawn	checked	approved	revision no.
1:500	TJW			A

sheet size	datum	origin of levels
A1	AHD	AMOS & McDONALD SURVEYORS

project no.	drawings in set	sheet no.
0749–DP	[04]	04