LINDEMAN GREAT BARRIER REEF RESORT PROJECT

ENVIRONMENTAL IMPACT STATEMENT

APPENDIX I - TERRESTRIAL FLORA AND FAUNA TECHNICAL REPORT

Addendum: *This EIS was initially prepared assuming that the safe harbour was to be part of the Lindeman Great Barrier Reef Resort Project. With the commencement of the Great Barrier Reef Marine Park Authority's (GBRMPA) Dredging Coral Reef Habitat Policy (2016), further impacts on Great Barrier Reef coral reef habitats from yet more bleaching, and the recent impacts from Tropical Cyclone Debbie, the proponent no longer seeks assessment and approval to construct a safe harbour at Lindeman Island. Instead the proponent seeks assessment and approval for upgrades to the existing jetty and additional moorings in sheltered locations around the island to enable the resort's marine craft to obtain safe shelter under a range of wind and wave conditions. Accordingly, remaining references to, and images of, a safe harbour on various figures and maps in the EIS are no longer current.*

nrc
northern resource consultants

Lindeman Island Resort

EIS Terrestrial Flora and Fauna Technical Report

February 2017

prepared for

White Horse Australia Lindeman Pty Ltd

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Limitations and Qualifications

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List of Acronyms and Abbreviations

AEC	Animal Ethics Committee
DAF	Department of Agriculture and Fisheries
DoEE	Department of Environment and Energy (Commonwealth)
DNRM	Department of Natural Resources and Mines
EHP	Department of Environment and Heritage Protection (Queensland)
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GBRMP	Great Barrier Reef Marine Park
GBRMP Act	*Great Barrier Reef Marine Park Act 1975* (Commonwealth)
LP Act	*Land Protection (Pest and Stock Route Management) Act 2002*
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NC Act	*Nature Conservation Act 1992* (Queensland)
NC Regulation	*Nature Conservation (Wildlife) Regulation 2006* (Queensland)
NRC	Northern Resource Consultants
PMAV	Property Map of Assessable Vegetation
QEOP	Queensland Environmental Offsets Policy
RE	Regional Ecosystem
SP Act	*Sustainable Planning Act 2009* (Queensland)
TEC	Threatened Ecological Community
VM Act	*Vegetation Management Act 1999* (Queensland)
WHA	World Heritage Area

Introduction

1. Background

White Horse Australia Lindeman Pty Ltd is proposing the redevelopment of the existing resort at Lindeman Island. Northern Resource Consultants Pty Limited (NRC) conducted a detailed desktop and field-based vegetation assessment within the lease areas associated with the resort in July-August 2013. These surveys resolved large areas of heterogeneous polygons on the Queensland regional ecosystem (RE) mapping into single unit polygons. The surveys culminated in amendments to the RE mapping via the production of a property map of assessable vegetation (PMAV).

Since the vegetation surveys conducted in 2013, the development design concept has been modified and consequently NRC conducted further field assessments over multiple seasons in 2015. This report details those assessments and builds on the work conducted in 2013 to deliver the following terrestrial flora and fauna assessments:

- Field-based flora surveys including vegetation community assessments, RE ground-truthing, vegetation community mapping and targeted threatened flora searches conducted in July-August 2013.
- A desktop assessment of terrestrial flora and fauna biodiversity values, with a focus on species and communities of conservation significance.
- Two field-based terrestrial vertebrate fauna surveys in different habitat types within the proposed development area and surrounding National Park land conducted over multiple seasons in 2015, including a variety of systematic and targeted survey techniques.
- Two field-based flora surveys conducted over multiple seasons in 2015 to build on the data obtained during the 2013 surveys and incorporate a broader study area including the surrounding National Park land.

2. Purpose

This report details the following aspects of the terrestrial flora and fauna assessments described above within the Lindeman Island proposed lease area:

- Methodologies employed for assessing the terrestrial flora and fauna within the study area over multiple survey periods.
- The presence and status of species and communities within the study area.
- Potential ecological impacts of the project and recommendations for mitigating impacts, with a focus on species and communities of conservation concern, such as those listed under Queensland and Commonwealth legislation.

3. Study Area

The study area for this report includes the current term lease and perpetual lease areas associated with the existing resort, as well as some of the National Park land surrounding these leases. The extent of the study area for this report is shown on the maps provided in Appendix A.

The current term leases and perpetual leases associated with the existing resort development cover a total area of approximately 139ha. These areas were the subject of the vegetation surveys conducted in July-August 2013. Fauna surveys and additional vegetation community and botanical surveys were conducted in these areas during the 2015 studies. The 2015 studies also incorporated various parts of the Lindeman Islands National Park land surrounding the lease areas.

The total study area contains a variety of remnant, mature regrowth (non-remnant), and disturbed habitats. Remnant vegetation within the study area mainly consists of mixed eucalypt woodland with a grassy understory, with some rocky slopes along the coastline containing coastal vine thicket. The east and west margins of the runway strip contain Broad-leaved Tea Tree woodland and the existing resort, golf course and runway strip areas contain non-remnant vegetation.

4. Statutory Framework

4.1 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Australian Government Department of Environment and Energy (DoEE). The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance (MNES). The MNES listed in the EPBC Act that are relevant to this report are:

- nationally threatened species and ecological communities,
- migratory species.

Database searches and field assessments should be conducted as part of any flora and fauna impact assessment. The results of these assessments can be used to determine the presence or likelihood of the occurrence of any MNES within a proposed project area. If any species or communities listed under the EPBC Act are present or likely to be present, an assessment of significance is required. If the proposed action may have a significant impact on MNES, it must be referred to DoEE for assessment. If DoEE determines the proposed action is likely to have significant impacts, the project will be considered as a controlled action and will require formal assessment and approval. If the proposed action is not likely to be significant, approval is not required if the action is taken in accordance with the referral. Consequently, the action can proceed, subject to any state or local government approvals.

Great Barrier Reef Marine Park Act 1975

The *Great Barrier Reef Marine Park Act 1975* (GBRMP Act) is the primary act relating to the Great Barrier Reef Marine Park (GBRMP). The objective of the GBRMP Act is to provide for the long term protection and conservation of the environment, biodiversity and heritage values of the Great Barrier Reef Region. The GBRMP Act provides the framework for planning and management of the Marine Park and implements a cooperative approach to management agreed between the Australian and Queensland governments.

The EPBC Act provides the overarching basis for environmental impact assessment and approval for actions within the GBRMP. Where the proposed action is within the Marine Park, responsibility for assessment under the EPBC Act generally remains with the Great Barrier Reef Marine Park Authority (the Authority). The Authority is responsible for performing its normal regulatory permitting functions and the assessment is generally performed as a single integrated assessment across both Commonwealth Acts.

4.2 State Legislation

Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) is administered by the Queensland Department of Natural Resources and Mines (DNRM) and protects Queensland's biodiversity by conserving native vegetation and addressing land degradation issues.

Queensland's vegetation management framework regulates the clearing of certain native vegetation. The VM Act incorporates the regional ecosystem (RE) classification scheme to regulate the clearing of native vegetation. REs are remnant vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. Remnant vegetation is defined under the VM Act as vegetation where the dominant canopy layer has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.

The Queensland Herbarium has mapped the remnant extent of regional ecosystems for much of the state using a combination of satellite imagery, aerial photography and on-ground studies (ground-truthing). Regional ecosystem maps published by DNRM describe the extent and conservation status of remnant vegetation as REs. REs are classified in the following vegetation management class and biodiversity status categories:

- Endangered
- Of Concern
- Least Concern/Not of Concern

The clearing of native vegetation is regulated under Module 8 of the State Development Assessment Provisions. The classification of REs is relevant to identifying vegetation communities of conservation significance in a regional context and potential environmental offset requirements under the Queensland Environmental Offsets Framework.

Sustainable Planning Act 2009

The *Sustainable Planning Act 2009* (SP Act) is the overarching framework for Queensland's planning and development system. The process for assessing development applications required under the SP Act is known as the Integrated Development Assessment System (IDAS). IDAS sets out a development application process by which councils and other agencies assess and make decisions on the various types of land use and development proposals.

Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NC Act) is administered by EHP and provides the framework for the declaration and management of protected areas, and protection of wildlife listed under the *Nature Conservation (Wildlife) Regulation 2006* (NC Regulation).

Protected Areas

Protected areas are declared under the NC Act for the conservation of Queensland's natural and cultural resources. Classes of protected areas under the NC Act include national parks, regional parks and nature refuges. An environmental offset may be required for actions resulting in significant residual impacts within a protected area.

Under the Queensland Environmental Offsets Framework, an impact on a protected area is significant if a prescribed activity results, or is likely to result, in one or more of the following:

- The authorised clearing or inundation of all or part of the protected area for the construction of private or publicly owned infrastructure on the area,
- The exclusion of, or reduction in, the public use or enjoyment of all or part of the protected area,
- A reduction in the natural or cultural values of all or part of the protected area.

Protected Wildlife

The purpose of the NC Regulation is to class wildlife as one of the following:

- Extinct in the wild
- Endangered
- Vulnerable
- Near threatened
- Least concern

Threatened wildlife under the NC Act is wildlife that is prescribed under the Act as extinct in the wild, endangered or vulnerable. All native flora and fauna species are protected under the Act and 'permits to take' protected wildlife are required from EHP.

EHP hosts the Wildlife Online database, which can be searched to generate a list of all species recorded within a specified area. This tool is useful for determining the presence or likelihood of occurrence of threatened species in an area.

A Protected Plants Flora Survey Trigger Map is now also available, which shows high risk areas for protected plants (those considered as EVNT species – endangered, vulnerable and near threatened) and is used to help determine flora survey and clearing permit requirements for a

specified area. If the study area is located within a high risk area, a comprehensive flora survey is required to be undertaken before any clearing of protected plants can occur. This survey will need to comply with the *Queensland Flora Survey Guidelines – Protected Plants* (EHP 2014).

If threatened plants are found to occur within the high risk area during the field survey and these are likely to be cleared or impacted by the proposed project, an application for a clearing permit from EHP will be required. This application will need to be accompanied by the flora survey results and potential impact management options for the protected plants that include appropriate avoidance, mitigation or offsetting measures.

In addition to this, if threatened plants are found outside a high risk area during the field survey, and these plants are likely to be cleared or impacted by the proposed project, a clearing permit will also be required. Where a flora survey identifies there are no protected plants present or impacts can be avoided, clearing will be exempt from requiring a permit under the NC Act.

Biosecurity Act 2014

The *Biosecurity Act 2014* commenced on 1 July 2016, with the aim to ensure a consistent, modern, risk-based and less prescriptive approach to biosecurity in Queensland. The *Biosecurity Act 2014* replaced the many separate pieces of legislation that were previously used to manage biosecurity. Under this Act, the Biosecurity Regulation 2016 sets out how the Act is implemented and applied.

Under *Biosecurity Act 2014*, there are three types of invasive plant species:

- Prohibited invasive plants
- Restricted Invasive plants
- Invasive plants

Prohibited invasive plants are not present in Queensland and would seriously threaten Queensland's primary industries, natural environment, livestock, human health and people's livelihoods. If a prohibited invasive plant is found in Queensland, it must be reported to Biosecurity Queensland within 24 hours of the sighting.

Restricted invasive plants also seriously threaten Queensland's primary industries, natural environment, livestock, human health and people's livelihoods, but are already established in Queensland. Under the *Biosecurity Act 2014*, restricted invasive plants may fall into one or more categories, with different restrictions relevant to each category.

Restricted invasive plant categories and restrictions:

- Category 2: the invasive plant must be reported within 24 hours Biosecurity Queensland.
- Category 3: the invasive plant must not be distributed or released into the environment.
- Category 4: the invasive plant must not be moved.
- Category 5: the invasive plant must not be kept.

Invasive plants include species that are not listed as prohibited or restricted invasive plants, but the species has, or is likely to have, an adverse impact on a biosecurity consideration because of the introduction, spread or increase in population size of the species in an area. Everyone is obligated to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. Local governments and Biosecurity Queensland provide weed control support services but may also enforce landowner responsibilities if necessary.

Invasive animals are classified in a similar manner to plants and include prohibited and restricted classifications. Landholder responsibilities and restrictions pertaining to these classifications are specific for each category and an invasive animal may be listed under multiple categories. Category actions that must, or must not, be carried out are defined under the *Biosecurity Act 2014.*

Queensland Environmental Offsets Framework

On 1 July 2014, a new environmental offsets framework was introduced in Queensland. The framework includes an Act, a regulation and a single policy, which replaces the five previous single-issue policies.

The *Environmental Offsets Regulation 2014* provides detail of the prescribed activities regulated under legislation and the prescribed environmental matters (known as Matters of State Environmental Significance or MSES) to which the framework applies. Examples of MSES include:

- wetlands and watercourses,
- endangered and 'of concern' regional ecosystems,
- connectivity areas,
- protected wildlife habitat.

For any new development, all impacts to MSES must be avoided or minimised where possible. Where there is a *significant residual impact* to MSES, an environmental offset may be required in accordance with the Queensland Environmental Offsets Policy (QEOP).

Flora and Fauna Assessment Methodology

1. Overall Assessment Methodology

NRC employed a joint approach of desktop analysis and field surveys in this study using best practice recommendations from sources such as:

- *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (Eyre *et al*. 2014)
- *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al*. 2012)
- *Flora Survey Guidelines – Protected Plants* (EHP 2014)

The methodology encompassed two phases: scoping and field survey. The scoping phase encompassed:

- Project planning and definition of objectives,
- Assignment of qualified ecologists,
- Detailed desktop studies,
- Review of previous studies,
- Collation of existing records,
- Literature review of species and potential threats and impacts.

The field survey phase encompassed:

- Systematic and targeted flora surveys and incidental observations,
- Vegetation community mapping and assessments,
- Systematic and targeted fauna surveys and incidental observations.

NRC is a registered scientific user with ethics approval to conduct fauna studies from the Department of Agriculture and Fisheries (DAF) and Animal Ethics Committee (AEC). The survey work involved in this report was conducted under Scientific Purposes Permit number WISP14046014. Survey work performed within the Lindeman Islands National Park estate areas was conducted under Scientific Purposes Permit number WITK16263815.

A vegetation survey incorporating the lease areas associated with the existing resort was conducted by NRC in July-August 2013. Knowledge of the site gained during this study was used in conjunction with current desktop assessments to inform the design of the 2015 field survey program. A site familiarisation process was also conducted prior to each of the 2015 surveys to ensure systematic fauna trapping sites covered an appropriate variety of habitat types within the study area. For vegetation surveys, focus was given to areas where vegetation clearing may occur as part of the proposed development. Focus was also given to areas not

covered in the previous survey conducted in 2013, as well as describing environmental values for flora in the surrounding national park areas.

2. Desktop Analysis

2.1 Literature review and previous studies

A previous flora study conducted by NRC for the proposed Lindeman Island resort development area in July 2013 was the only known recent terrestrial ecology study in the local area. The outcomes of this study were used in conjunction with field guides and scientific publications, which were reviewed prior to field surveys, to determine species likely to be present within the study area and preferred habitat. Focus was given to threatened species identified as having the potential to occur within the study area. The desktop assessment relied primarily on database searches and the previous report to determine species, communities and species habitat relevant to the study area.

2.2 Database Searches

The DoEE protected matters search tool and the Queensland Government Wildlife Online database were utilised to determine species, communities and areas of conservation significance of potential relevance to the proposed development. Both searches included a 50km buffer around a central co-ordinate within the study area (-20.4469° S, 149.0430° E), which includes the entire study area as well as a large buffer incorporating similar habitats in the surrounding landscape.

The results of the database searches and their relevance to the proposed development are discussed in the results section of this report. NRC has developed an approach for ranking threatened species and communities recorded from the desktop searches in terms of their likelihood of occurring within the study area. The approach is based on the presence of local records and the habitat requirements for each species, which are recommended criteria for desktop impact assessment in State published survey guideline documents, such as *Eyre et al*. (2014). Details of the criteria used to assess the likelihood of occurrence for threatened and near threatened species are provided in Table 1. The potential impacts to threatened species that may occur within the study area are discussed in the Impacts Assessment section of this report.

It is possible some locally occurring, near threatened or threatened species, may not be recorded in the State and Commonwealth databases. The comprehensive field survey component of this assessment is therefore an important aspect of the impact assessment process, in order to determine the presence of any threatened species that have not been previously recorded in the local area.

As part of the desktop assessment, the key diagnostic characteristics and condition thresholds specified in the Commonwealth listing advice for threatened ecological communities (TECs) listed under the EPBC Act were reviewed. The application of these criteria is discussed in the Flora Survey Methodology Section.

Table 1: Key assessment criteria for likelihood of occurrence of threatened and near threatened species

LIKELIHOOD OF OCCURRING	KEY CRITERIA	DEFINITION
Present	Present during survey or historical records in the study area	Species was recorded during field surveys or a historical record of the species was located in the study area
High	Known records (<50km) AND Known to occur on islands or access islands in the region* AND Suitable habitat of high quality is present	Historical records of the species occur within a 50km radius of the study area The species is known to occur on islands or can access islands in the region* Suitable habitat of high quality exists with the study area
Moderate	Known records (<50km) AND Known to occur on islands or access islands in the region* AND Suitable habitat is present, but degraded	Historical records of the species occur within a 50km radius of the study area The species is known to occur on islands or can access islands in the region* Suitable habitat is present but is significantly degraded or fragmented
Low	No records (<50km) OR Not known to occur on islands or access islands in the region* OR Habitat present is unsuitable, absent, or highly degraded	No historical records of this species occur within a 50km radius of the study area OR The species is not known to occur on islands or access islands in the region* OR The habitat within the study area is not suitable and/or is in extremely poor condition, or is absent for the species

*Criterion relates to fauna species only

2.3 Mapping

The following mapping sources were reviewed as part of the desktop analysis:

- Regulated Vegetation Management Map (DNRM 2015)
- Geoscience Australia Proserpine SF 55-4 1:250000 Mapsheet (1971)
- Environmentally Sensitive Areas Map (EHP 2015b)
- Flora Survey Trigger Map
- Essential Habitat mapping as shown on a Regulated Vegetation Management Map
- Referrable Wetlands
- Environment and heritage layers on the State Planning Policy interactive mapping.

3. Nomenclature and Taxonomy

With the exception of technical descriptions and tables, all flora and fauna species are referred to by their common names throughout this report, with their scientific names given in brackets after the first reference. Scientific names for flora species within this report follow Bostock and Holland (2013). Where no common name is provided in reference texts, a search was conducted for other accepted common names, and if none were found then the scientific name only was used. An asterisk is used to denote species that are not native to Australia.

The use of scientific and common names for fauna species is in accordance with the following:

- Birds: Pizzey and Knight (2012)
- Amphibians: Vanderduys (2012)
- Reptiles: Wilson (2015)
- Mammals (except microbats): Van Dyck and Strahan (2008)
- Microbats: Reardon *et al*. (2015).

4. Flora Survey Methodology

4.1 Overall methodology

Techniques described in the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al*. 2012) were used to collect sufficient data during the field vegetation assessments to verify the RE codes of the remnant vegetation in the assessment area. The key features recorded in the field relevant to this report are:

- Vegetation structure including height of each stratum and cover density,
- Key species within each stratum,
- Geology, landform and other landzone characteristics.

The species composition and structure for each community were compared to the technical descriptions provided in the Regional Ecosystem Description Database (Queensland Herbarium 2015). The landzone characteristics of each site were compared to the descriptions provided in Wilson and Taylor (2012). This information provided the basis for determining the appropriate RE code for each community. The information in these documents was also used in conjunction with site observations to determine appropriate values for the factors relating to remnant status.

Vegetation surveys were conducted over three survey periods: July 2013, May 2015 and December 2015.

The purpose of these vegetation surveys was to:

- Determine the appropriate RE code, extent, and remnant status of vegetation communities throughout the study area,
- Perform targeted searches for threatened flora species identified during desktop analyses, including ‘meander’ searches in accordance with the Flora Survey Guidelines – Protected Plants (EHP 2014),
- Compile a flora species inventory for the study area.

4.2 Vegetation Assessment Sites

Site Selection

Ground-truthing of the remnant and regulated regrowth vegetation mapping involved detailed assessments of vegetation characteristics at multiple transect locations within the study area. Assessment sites were selected where they would provide representative data for the vegetation type that was the subject of the assessment.

The location of the assessment sites and the survey techniques employed were selected to achieve the following:

- Validate the state published RE and regrowth mapping,
- Accurately determine the extent of each vegetation type,
- Resolve heterogeneous polygons,
- Determine the remnant status of vegetation,
- Compile a species inventory for each vegetation community and the entire study area.

A total of five secondary, 14 tertiary, 14 quaternary, and 25 ground cover assessments were conducted over the two survey periods (Table 2), with sites distributed over the study area to encompass any potential changes in community composition or structure (Appendix A).

Table 2: Vegetation assessments conducted during the survey periods

VEGETATION ASSESSMENT TYPE	JULY 2013	MAY 2015	DECEMBER 2015	TOTAL
Secondary	-	4	1	5
Tertiary	9	2	3	14
Quaternary	-	6	8	14
Grassland	22	3	-	25

Survey Techniques

Secondary and Tertiary Assessments

A 50m x 10m vegetation assessment transect was established at each of the secondary and tertiary assessment sites within the study area. Within these transects a combination of quantitative and qualitative techniques was employed. The vegetation survey techniques employed and attributes recorded during the assessments are detailed in Table 3.

Quantitative measurements such as basal area (using the Bitterlich stick methodology, Grosenbaugh 1952) and canopy height and cover were used to describe the structural form of each community and determine the remnant status of the vegetation. Species composition and structure were used to determine the relevant RE code for each community.

Quaternary Assessment Sites

Quaternary assessment sites were conducted to validate the vegetation community mapping and to capture any variability in the structure and composition of the community. Data collected at Quaternary sites include all location, environmental and structural information for the dominant and conspicuous species in each layer. In general, focus was given to the dominant species, crown cover and median height of the ecologically dominant layer, which is used to define each community and determine the appropriate RE code.

Table 3: Vegetation attributes measured in vegetation survey transects

SURVEY METHOD	ATTRIBUTES MEASURED
Survey Plot 50m x 10m	Key species of each stratum Median height of each stratum Weed species and cover Complete species list Central coordinate
Transect 50m	Percentage cover of each stratum
Quadrats (x5) 1m x 1m	Ground cover species and percentage of cover
Greater area encompassing the present vegetation community	Tree basal area Incidental species observed Additional relevant notes

Grassland Assessment Sites

The species composition and structure of grassland areas was assessed using a 25m transect. Five 1m^2 quadrats were placed at five metre intervals along each transect and the relative cover of each ground cover species was recorded. The height and cover of emergent trees and shrubs were also recorded.

The *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al*. 2012) identifies the following criteria for determining remnant status of grassland communities:

- The community contains native species normally found in the RE.
- The community is not dominated by non-native perennial species.

The species composition of grassland communities was therefore assessed to determine the remnant RE status. Remnant status was assigned to grassland areas where the relative cover of native perennial species (normally occurring in the relevant RE) was greater than 50 per cent. Areas where non-native species comprised more than 50% of the ground cover were classified as non-remnant vegetation.

4.3 Vegetation Mapping

General Approach

Mapping of vegetation communities was performed using a combination of vegetation traverses and aerial imagery. Using the information gained at each of the vegetation assessment sites, and observations made when traversing the study area, the boundaries of vegetation communities were recorded using a handheld GPS device. Some vegetation mapping was also refined using current, high-resolution aerial images.

Key Diagnostic Characteristics and Condition Thresholds for Communities Listed Under the EPBC Act.

The 2015 surveys focussed on accurately mapping the current spatial extent of TECs listed under the EPBC Act within the study area. Vegetation surveys and mapping techniques for TECs followed the previously described methodology. However, the key diagnostic characteristics and condition thresholds described in the Commonwealth listing advice for each TEC were considered when mapping the extent of these communities. These criteria differ to the remnant vegetation criteria under the VM Act (Qld) for regional ecosystem mapping. The ground-truthed and mapped spatial extent to which a remnant vegetation community equates to a RE under the VM Act (Qld) may not wholly equate to the same spatial extent to which that community is protected under the EPBC Act.

The 2015 surveys focussed on obtaining species composition and structure data from various locations within communities listed under the EPBC Act to facilitate assessment against key diagnostic characteristics and condition thresholds. Separate vegetation community mapping was produced where vegetation communities did not meet the condition thresholds for protection under the EPBC Act. This was completed using the general approach methodology described previously to delineate and exclude areas that did not meet condition thresholds.

The following criteria are taken from the relevant Commonwealth listing advice for each TEC listed under the EPBC Act present within the study area (TSSC 2008, 2012):

Broad Leaf Tea-tree (Melaleuca viridiflora) Woodlands in High Rainfall Coastal North Queensland

The listed ecological community is limited to patches that meet the following key diagnostic characteristics and condition thresholds.

Key Diagnostic Characteristics

- It occurs in the Wet Tropics and Central Mackay Coast bioregions in landscapes characterised by high rainfall and near coastal or floodplain locations.
- Sites are seasonally inundated during the wet season but are not permanently waterlogged.
- The tree canopy is clearly dominated (i.e. more than 50% of canopy cover) by *Melaleuca viridiflora*.
- A shrub layer is typically absent or sparse (juvenile canopy species and/or a conspicuous layer of *Xanthorrhoea* (grass tree) may sometimes be present).
- There is a diverse ground-layer of grasses, sedges and forbs (which includes species listed under the description section in the listing advice).

Condition thresholds

- Patch size must be greater than or equal to one hectare.
- A tree canopy must be present with a canopy cover of at least 15 per cent.
- The canopy must be dominated by *Melaleuca viridiflora* (Broad leaf tea-tree).
- At least 10 perennial native plant species are present in the understorey (shrub and ground layers, excluding juvenile canopy trees) of a patch.
- Perennial non-native plant species account for no more than 40% of the total ground layer vegetation cover at any time of the year.

Littoral Rainforest and Coastal Vine Thickets of Eastern Australia

The listed Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community comprises those patches that meet the following key diagnostic characteristics and condition thresholds.

Key Diagnostic Characteristics

- The ecological community occurs in the following IBRA bioregions: Cape York Peninsula (from Princess Charlotte Bay southwards), Wet Tropics, Central Mackay Coast, South Eastern Queensland, NSW North Coast, Sydney Basin and South East Corner.
- Patches of the ecological community occur within two kilometres of the east coast, including offshore islands, or adjacent to a large body of salt water, such as an estuary, where they are subject to maritime influence.
- The structure of the ecological community typically is a closed canopy of trees that can be interspersed with canopy gaps that are common in exposed situations or with storm events. Usually, several vegetation strata are present. However, where there is extreme exposure to salt laden winds, these strata may merge into a height continuum rather than occurring as distinct vegetation layers. The canopy forms a mosaic due to canopy regeneration, typically in the form of basal coppice following canopy decapitation due to prevailing salt laden winds and storm events. Wind sheared canopy can be present on the frontal section leading to closed secondary canopies. Emergents may be present, for example, species from the genera Araucaria (northern bioregions only), Banksia or Eucalyptus. The ground stratum of the vegetation typically is very sparse.
- The ecological community contains a range of plant life forms including trees, shrubs, vines, herbs, ferns and epiphytes. To the north, most plant species diversity is in the tree and shrub (i.e. canopy) layers rather than in lower strata. The converse generally occurs from the Sydney Basin Bioregion southwards. Feather palms, fan palms, large leaved vascular epiphytes and species that exhibit buttressing are generally rare. Ground ferns and vascular epiphytes are lower in diversity in littoral rainforests compared to most other rainforest types.
- Plants with xeromorphic and succulent features are generally more common in littoral rainforest than in hinterland rainforest types. Canopy stem sizes also tend to be smaller compared to that in hinterland rainforest. Trunks rarely host mosses though lichens are usually common.
- Whilst species can be regionally predictable, there may be considerable variation in the composition of individual stands of the ecological community within any given bioregion. Attachment A provides a list of flora species for each relevant bioregion.

Condition Thresholds

- Small patches can be resilient and viable, but the minimum size of a patch needs to be 0.1 hectares.
- The cover of transformer weed species is 70% or less. Transformer weeds are highly invasive taxa with the potential to seriously alter the structure and function of the ecological community. This threshold recognises the relative resilience and recoverability of the ecological community to invasion by weed species.
- The patch must have:
    - at least 25% of the native plant species diversity characteristic of this ecological community in that bioregion; or
    - at least 30% canopy cover of one rainforest canopy (either tree or shrub) species (excluding Banksia and Eucalyptus species that may be part of the ecological community).

4.4 Random Meander Technique

Various parts of the study area were traversed using the Random Meander technique documented by Cropper (1993) and recommended as the preferred approach in the *Flora Survey Guidelines – Protected Plants* (EHP 2014). This technique was applied to supplement other survey techniques and to:

- locate and record any flora species not identified in the vegetation assessment transects,
- target threatened flora species,
- validate vegetation community mapping,
- determine the presence and extent of pest species.

5. Fauna Survey Methodology

5.1 Survey Timing and Environmental Conditions

The fauna survey incorporated survey timing and effort recommendations outlined in the *Terrestrial Vertebrate Survey Guidelines for Queensland* (Eyre *et al*. 2014). Surveys were conducted over two different seasonal periods to identify seasonal variation in species presence, abundance and habitat utilisation. The first survey was conducted during autumn, from 11-15 May 2015. During autumn, the air is still moist which coincides with grass seeding and growing. Vertebrate activity is high as animals start to disperse and migrate due to the onset of decreasing temperatures (Eyre *et al.* 2014). The second survey was conducted during late-spring/early-summer from 30 November – 6 December 2015. The timing of this survey incorporates a period where temperatures begin to warm up after winter and there is a peak in vertebrate activity with the commencement of breeding activity for many species (Eyre *et al.* 2014). The second survey was also time to coincide with peak periods for migratory shorebird presence.

Weather data relevant to the fauna survey period were collected from the Bureau of Meteorology (BoM) Hamilton Island Airport weather station (station number 033106) and a summary is provided in Table 4. The weather before and during each fauna survey period was

characterised by warm to hot days and cooler nights. Overall the weather conditions for each survey period were considered favourable for detecting most vertebrate fauna groups.

Table 4: Weather conditions relevant to each fauna survey period

PERIOD	DATE	RAINFALL (MM)	TEMPERATURE (°C)		HUMIDITY
			MINIMUM	MAXIMUM	
May 2015 Pre-survey	04/05/2015	0	21.9	26.9	70
	05/05/2015	0	21.8	27.7	59
	06/05/2015	0	22.8	27.3	70
	07/05/2015	0	23.0	27.6	74
	08/05/2015	0	20.8	23.7	42
	09/05/2015	0	20.7	25.0	51
	10/05/2015	0	21.5	25.7	71
May 2015 During Survey	11/05/2015	0	21.1	25.9	56
	12/05/2015	0	21.6	25.5	54
	13/05/2015	0	20.6	26.2	56
	14/04/2015	0	18.2	20.5	53
	15/05/2015	0	17.3	22.9	54
November - December 2015 Pre-survey	24/11/2015	0	24.0	29.0	62
	25/11/2015	0	24.2	29.5	68
	26/11/2015	0	25.1	29.4	68
	27/11/2015	0	23.7	32.0	77
	28/11/2015	0	24.5	32.4	71
	29/11/2015	0	25.2	30.5	58
November - December 2015 During Survey	30/11/2015	0	24.0	29.5	65
	01/12/2015	0	24.5	29.8	69
	02/12/2015	0	24.8	29.8	71
	03/12/2015	0	25.6	30.4	61
	04/12/2015	0	24.4	29.7	64
	05/12/2015	0.2	24.8	30.4	55
	06/12/2015	0	24.7	30.6	62

5.2 Systematic Survey Sites

Over the two survey period, six systematic survey sites were established where an array of fauna trapping and surveying techniques were employed. These systematic survey sites were located in a variety of different habitat types within the study area (Table 5).

Overall, the six systematic survey sites were positioned to provide an appropriate spatial distribution within the study area as well as encompassing the different habitat types. A description of the habitat present at each systematic survey site is provided in Table 5. The location of each systematic trapping site is depicted in the fauna survey map in Appendix A.

Table 5: Habitat descriptions for systematic fauna survey sites

SITE NUMBER AND LOCATION	HABITAT DESCRIPTION	PHOTOGRAPH OF HABITAT
1. Northwest section of the study area. Surveyed during the autumn 2015 survey event.	**Remnant RE 8.12.12d** *Eucalyptus* woodland to open forest on hill slopes on igneous rocks. Low to moderate levels of microhabitat features in the form of hollow-bearing trees, loose bark and coarse woody debris and litter.	
2. Southwest section of the study area. Surveyed during the autumn 2015 survey event.	**Remnant RE 8.12.11c** Coastal rainforest/vine-thicket community with a dense canopy and diverse structure and composition. Low to moderate levels of microhabitat features in the form of hollow-bearing trees, loose bark and coarse woody debris, litter. Generally high abundance of boulder and rock cover.	
3. Adjacent to the Gap Creek Dam wall. Surveyed during the autumn 2015 survey event.	**Mature regrowth** *Eucalyptus* and *Pandanus* forest on shallow rocky soils. Low levels of microhabitat features in the form of rocky habitats and hollow-bearing trees. High abundance of leaf litter.	

SITE NUMBER AND LOCATION	HABITAT DESCRIPTION	PHOTOGRAPH OF HABITAT
4. Eastern side of the runway strip. Surveyed during the spring-summer 2015 survey event.	**Remnant RE 8.3.2** *Melaleuca viridiflora* woodland with dense native ground cover in low-lying area near drainage line. Approximately three to four years since fire. Low level of microhabitat features low and sparse structure of the woodland and relatively recent fire event. However, ground cover is very dense.	
5. North end of Gap Creek Dam. Surveyed during the spring-summer 2015 survey event.	**Remnant RE 8.12.12d** Mixed eucalypt woodland dominated by *E. platyphylla*. Adjacent to wetland habitat associated with Gap Creek Dam. Characterised by presence of flora species associated with wetter areas with poor drainage such as *Melaleuca* and *Pandanus* species. Low – moderate levels of microhabitat features including course wood debris and leaf litter.	
6. Western site of golf course Surveyed during the spring-summer 2015 survey event.	**Remnant RE 8.12.12d** Mixed eucalypt woodland on steep gradient dominated by *E. crebra* with a very sparse to sparse understorey and dense ground cover. Moderate to high levels of microhabitat features, mostly in the form of rocks, boulders and rocky outcrops.	

5.3 Survey Techniques

The survey techniques employed at each systematic survey site are detailed in Table 6. Some of these techniques were also used at other locations throughout the study area, and these are discussed in the following sections.

Table 6: Fauna survey methods employed at systematic survey sites

SURVEY METHOD	DESCRIPTION
Elliott traps	20 type A Elliott style traps were placed on the ground approximately 5-10m apart in a straight line for four nights at each of the trapping sites. All traps were baited with a mixture of rolled oats, peanut butter and honey.
Pitfall and Funnel traps	Drift fence lines incorporating pitfall and funnel traps were established for four nights at each of the systematic survey sites. At each of these sites, three pitfall traps (20 litre buckets) were buried flush with the ground surface with the drift fence intersecting the centre of each bucket. Six funnel traps were located along the drift fencing at each site. A shade cloth covering each funnel trap was deployed to protect trapped species from exposure. No pitfall-buckets were deployed at site S2 as the boulder and rocky substrate prohibited the use of this equipment. However, a drift fence was established with funnel traps within this habitat.
Cage traps	Four cage traps were placed at each site and baited with a mixture of rolled oats and a variety of different meats.
Anabat detectors	An Anabat SD2 detector was deployed for at least one night near each of the main trapping sites, and was also placed opportunistically in likely flyway zones at other targeted fauna surveys sites.
Active diurnal searches	Active diurnal searches were undertaken within each of the sites. This technique involved intensive investigation of ground layer habitat features (such as under logs, rocks and leaf litter), low vegetation (under bark and tree stumps) for cryptic fauna, particularly reptiles. The timing of searches was focussed on parts of the day when reptile activity was likely to be at its peak. Incidental observations made while conducting other survey techniques were also recorded.
Diurnal bird surveys	Birds were surveyed within each vegetation community for a total of at least one hour at multiple periods throughout the day, but with a particular focus during peak activity in the morning. Incidental observations made whilst conducting other survey techniques were also recorded. Birds were identified from either direct observation or by their calls.
Nocturnal surveys	High-powered spotlights were used to survey nocturnal mammals (flying, arboreal and terrestrial), birds (active nocturnal species, and roosting diurnal species), reptiles and frogs in each of the main trapping sites, as well as other locations throughout the study area.

5.4 Additional Survey Areas and Techniques

The systematic surveying and trapping sites were generally focussed on describing the biodiversity values of areas within the existing lease areas that may be subject to disturbance as part of the proposed development. In addition to the systematic survey sites, a number of additional survey sites were established to target specific areas and habitat types within the current lease and surrounding National Park areas. The purpose of the targeted habitat surveys was to identify the biodiversity values of the broader area, including the National Park, and incorporate these values into the impact assessment process and project environmental management strategies. The location and a description of the habitat type for each of the targeted fauna survey sites is provided in Table 7.

During the fauna survey period the Anabat detector was deployed and active diurnal search, diurnal bird survey and nocturnal survey techniques were performed at additional locations outside the systematic and targeted survey sites. The locations of these are depicted in the Fauna Survey Sites map in Appendix A.

In addition to the techniques outlined previously, camera traps (motion-sensing infrared cameras) were utilised at multiple locations within the study area to target fauna that may be too large or 'shy' to be detected by other trapping techniques, or utilising areas outside of the main trapping sites. Camera traps were baited with the rolled oat mixture, fruit, nuts and a variety of meats.

Targeted searches for nocturnal fauna were performed in areas considered higher quality habitat for such species. These areas included the rocky hill habitats along the coastline.

Fauna species were continually observed throughout the survey period and records were frequently obtained outside of the systematic methodology of the survey. Any observations, tracks, scats or other signs of fauna were recorded with reference to the location and habitat type within the study area.

Table 7: Habitat descriptions for targeted fauna survey sites

SITE NUMBER AND LOCATION	HABITAT DESCRIPTION	PHOTOGRAPH OF HABITAT
T1. North of the runway strip in adjacent National Park tenure. Surveyed during the spring-summer 2015 survey event.	**Remnant RE 8.12.14c** *Eucalyptus/Lophostemon* woodland to open forest on hill slopes with mid-dense sub-canopy layers often dominated by dry rainforest species. This site is near the ecotone of several vegetation communities including mixed eucalypt woodland, *L. confertus* open forest and vine-thicket gullies. Low to moderate levels of microhabitat features in the form of hollow-bearing trees, loose bark and coarse woody debris. Vegetative ground cover is very low with a dense layer of leaf litter.	

SITE NUMBER AND LOCATION	HABITAT DESCRIPTION	PHOTOGRAPH OF HABITAT
T2. Northeast of current lease areas in adjacent National Park tenure. Surveyed during the spring-summer 2015 survey event.	**Remnant RE 8.12.14c** *Lophostemon confertus* open forest on steep hill slope with mid-dense sub-canopy layers dominated by dry rainforest species. Low to moderate levels of microhabitat features in the form of hollow-bearing trees, loose bark and coarse woody debris. Vegetative ground cover is very low with a dense layer of leaf litter.	
T3. Southwest section of lease areas in native grassland adjacent to golf course. Surveyed during the spring-summer 2015 survey event.	**Remnant RE 8.12.13a** Native grassland dominated by *Heteropogon contortus* on steep hill slope with southeast aspect. Very low levels of microhabitat features with occasional rocks and very dense ground cover. Shrub and tree layers virtually absent.	
T4. Southeast section of lease area in native grassland near water tower. Surveyed during the spring-summer 2015 survey event.	**Remnant RE 8.12.13a** Native grassland dominated by *Imperata cylindrica* on steep hill slope with southern aspect. Very low levels of microhabitat features with occasional rocks and very dense ground cover. Shrub and tree layers virtually absent.	
B1. Various viewpoints around Gap Creek Dam (particularly at point marked as B1 on the flora survey map).	Wetland Habitat This site was repeatedly surveyed for wetland birds over the course of all survey events. This large water body contains aquatic vegetation, foraging and roosting habitat for wetland bird species.	

5.5 Targeted Techniques

Coastal Sheathtail Bat

Targeted techniques were used to increase the likelihood of detection for the Coastal Sheathtail Bat (*Taphozous australis*), which is near threatened under the NC Act. Targeted searches for this species followed the *'Targeted Species Survey Guidelines: Taphozous australis'* published by the State of Queensland. The guidelines recommend spending one hour per two kilometres of rocky coastline within the study area to find caves, boulder piles, and fissures that contained roosting bats.

Northern Masked Owl

Even though the Northern Masked Owl (*Tyto novaehollandiae kimberli*) was not regarded as likely to occur in the study area (see discussion in later sections), call play-back techniques were used during nocturnal surveys, as this is known to be an effective method for increasing the likelihood of detecting this species. Call play-back for the Northern Masked Owl was typically conducted at the beginning of each spotlighting (nocturnal survey) session, using the methodology recommended by Ward (2010), as follows:

1. The call of the Northern Masked Owl was broadcast.
2. For the first five minutes of the broadcast, the survey team listened for calls of Masked Owls and watched for birds flying in to the area around the speaker (without the use of spotlights).
3. In the second five minutes, the survey team continued to listen for owl calls, spotlights were also used to look for owls in the trees around the site.
4. During subsequent spotlighting surveys, the survey team continued to listen and spotlight for owls, while also searching for other nocturnal species.

Greater Large-eared Horseshoe Bat

The Greater Large-eared Horseshoe Bat (*Rhinolophus philippinensis*) was considered to have at least some potential to occur within the study area based on the desktop results (see below). This species has a distinct echolocation call, so would have a high probability of detection using bat detectors. Anabat detectors were deployed at the systematic sampling sites, as well as additional sites within the study area to increase the likelihood of detection for this species.

Shorebirds

Shorebird surveys were conducted at multiple locations where suitable habitat was present for these species to forage. These locations are depicted on the Fauna Survey Map in Appendix A, and include the resort beaches, Coconut Beach, Gap Beach and an unnamed beach to the south of Coconut Beach. Shorebird surveys were focussed during low tide periods when intertidal areas are exposed providing greater foraging habitat. The surveys involved using binoculars to scan beaches, intertidal areas and rocky shorelines for bird species. The purpose of these surveys was to identify the presence of shorebird species and their use of shoreline

habitats in the study area and surrounding National Park land. These techniques were also used to target species of conservation significance with potential to occur, such as those listed as threatened or migratory under State and Commonwealth legislation. Particular focus was given to this survey technique during the spring-summer surveys (November-December 2015), as this survey period coincides with the presence of migratory shorebird species in the region.

5.6 Survey Effort

The survey effort employed for each of the aforementioned techniques is outlined in Table 8, showing the effort employed at each systematic survey site and the total survey effort over the period (including effort outside the systematic surveys).

Table 8: Fauna survey effort for each technique

METHOD	EFFORT PER SITE – AUTUMN	EFFORT PER SITE – SPRING/SUMMER	TOTAL SURVEY EFFORT
Pitfall trapping	12 trap nights (Array of three pits for four nights)	15 Trap nights for sites S5 and S6. 18 Trap nights for site S4 (Array of three pits for five nights at S5 and S6, and 6 nights at S4)	72 trap nights*
Funnel trapping	24 trap nights (Array of six funnels for four nights)	24 trap nights for systematic sites and 12 trap nights for targeted sites (Array of six funnels for four nights at systematic trap sites and two nights for targeted trap sites)	168 trap nights
Elliott trapping	80 trap nights (Array of 20 traps for four nights)	120 trap nights for systematic sites and 30 trap nights for targeted sites (Array of 20 traps for four nights at systematic trap sites and three nights for targeted trap sites)	720 trap nights
Cage trapping	12 - 16 trap nights (Array of three - four cages for four nights)	24 trap nights (Four cages for six nights)	112 trap nights
Camera Trapping	Four trap nights (One camera x four nights)	Six trap nights (One camera for six nights)	30 trap nights
Anabat call detector	One detector night (One detector for one night)	One detector night (One detector for one night)	Ten detector nights (including additional detector nights outside survey sites)

METHOD	EFFORT PER SITE – AUTUMN	EFFORT PER SITE – SPRING/SUMMER	TOTAL SURVEY EFFORT
Diurnal active search	Three person hours (30 minute search x three people x two events)	Two person hours (30 minute search x two people x two events)	Approx. 25 person hours (Three at each systematic survey site plus min 10 minutes at 24 additional active search sites)
Diurnal bird survey	Three person hours (Six x 10 minute surveys x three people)	Three person hours (Six x 20 minute surveys x two people)	Approx. 34 person hours (18 person hours at systematic survey sites plus 16 additional person hours outside survey sites)
Spotlight/ nocturnal searches	Six person hours (two hour search x three people)	Four person hours (two hour search x two people)	48 person hours (30 person hours at systematic survey sites plus 18 additional person hours outside survey sites)
Call playback (owls)	Minimum 10 minutes call playback session at each site plus subsequent spotlight surveys	Minimum 10 minutes call playback session at each site plus subsequent spotlight surveys	Nine call playback sessions (>10 minutes each)
Shorebird survey	One hour surveys were conducted two times at the resort beaches and the unnamed beach near site 1	One hour surveys were conducted two times at the resort beaches and the unnamed beach near site 1, and once at Coconut Beach and Gap Beach	10 surveys at four different shoreline areas – total 10 hours

*Pitfall traps were not established at Site 2 due to the rocky substrate at this site.

Desktop Analysis Results

1. Literature Review and Previous Studies

1.1 NRC Vegetation Survey and Offset Requirements Report (2013)

Surveys and Reporting

NRC conducted a flora assessment at Lindeman Island in 2013, which included:

- Desktop investigations of flora species and vegetation communities,
- Field surveys of flora species and vegetation communities,
- Mapping of Regional Ecosystems.

The *Vegetation Survey and Offset Requirements Report* (NRC 2013) details the results of those field surveys and associated desktop analyses. There is a large area of overlap between the study area for the vegetation surveys conducted in 2013 and the modified study area for the 2015 surveys. The 2013 surveys resolved large areas of heterogeneous polygons on the RE mapping into single unit polygons. The surveys culminated in amendments to the RE mapping in the form of a PMAV. The main outcome of these surveys was the majority of the grassland surrounding the golf course and resort was ground-truthed as disturbed non-remnant grassland dominated by non-native species. Five REs were recorded during the 2013 surveys, two of which equate to federally listed TECs. The presence and status of these communities is discussed further below.

Conservation Significant Matters

The NRC report identified two conservation significant vegetation communities in the study area. The broad leaf tea-tree (*Melaleuca viridiflora*) woodland community is listed as endangered under the EPBC Act and the VM Act and the littoral rainforest/vine-thicket community is listed as critically endangered under the EPBC Act. The endangered broad leaf tea-tree woodland occurs on the eastern and western margins of the runway strip. Coastal vine thicket communities were ground-truthed and mapped in a variety of small polygons along the southern extent of the island as well as one large polygon along the western coastline. The outcomes of these assessments informed the survey design and key areas of interest for the 2015 surveys.

No flora species listed as threatened under the EPBC Act or the NC Act were detected during the NRC survey. The 2013 assessment did not include desktop or field surveys for fauna.

2. Database Searches

The EPBC Protected Matters Report (DoE 2015a) and Wildlife Online Database extract (EHP 2015a) incorporating a 50 kilometre buffer around the study area are included in Appendix B and Appendix C of this document respectively. The Wildlife Online extract and Protected Matters Report identified 17 threatened flora species, 23 threatened fauna species, and 45 migratory fauna species with potential relevance to the current study area. The results of all desktop searches for determining conservation significant flora and fauna species of relevance to the proposed development are discussed in the following sections of this report.

2.1 Threatened Ecological Communities

Two TECs were identified in the Protected Matters Report as potentially occurring within the study area or within a 50 kilometre radius. The surveys conducted by NRC in 2013 confirmed the presence of these TECs within the study area. The critically endangered Littoral Rainforest and Coastal Vine Thickets of Eastern Australia were found in small pockets on the southwest coastline. Two polygons on the east and west side of the runway strip (shown on the RE mapping as RE 8.3.2) contain the Broad Leaf Tea-tree (*Melaleuca viridiflora*) Woodlands in High Rainfall Coastal North Queensland TEC.

2.2 Threatened Flora Species

A total of 17 near threatened or threatened flora species were returned in the database searches. The EPBC Protected Matters Report predicted seven threatened plant species potentially occurring within a 50 kilometre radius of the study area (DoE 2015a, see Appendix B). The Queensland Government Wildlife Online extract shows records of 12 near threatened or threatened plant species within a 50 kilometre radius of the study area (EHP 2015a, see Appendix C). The results of these searches have been combined in Table 9 to show all near threatened and threatened flora species recorded from the database searches and their status under State and Commonwealth legislation, as well as their likelihood of occurring within the study area.

Table D1 in Appendix D provides a justification for how the likelihood of occurrence was determined for each species. Of the 17 flora species detected in the desktop analyses, only ten were considered to have a moderate to high likelihood of occurring within the study area; the remaining seven species were considered to have a low likelihood of occurring. All species that were considered to have a moderate or high likelihood of occurring within the study area are discussed in the further detail in the Impact Assessment section of this report.

The study area did not fall with a 'high risk area' on the protected plants flora survey trigger map.

2.3 Threatened Fauna Species

A total of 26 near threatened and threatened fauna species were returned from the database searches of a 50 kilometre radius surrounding the study area. These included 18 from the Protected Matters Report (DoE 2015a, see Appendix B), and eight from the Wildlife Online

extract (EHP 2015a, see Appendix C). The results of these searches have been combined in Table 10, which also provides an interpretation on the likelihood that each of these species would occur within the study area. Table D2 in Appendix D provides justification for how the likelihood of occurrence was determined for each species.

Only six species were considered to have a moderate or high likelihood of occurring within the study area; the remaining 17 species were considered to have a low likelihood of occurring. All species that were considered to have a moderate or high likelihood of occurring within the study area are discussed in the further detail in the Impact Assessment section of this report.

The DNRM regulated vegetation mapping shows all remnant vegetation on Lindeman Island is classified as essential habitat for the Coastal Sheathtail Bat, which is listed as near threatened under the NC Act. Database searches show multiple records of the Coastal Sheathtail Bat within a 50 kilometre radius of the study area (EHP, 2015a) and one record on Lindeman Island (Atlas of Living Australia, 2015).

2.4 Migratory Species

The EPBC Protected Matters Search Tool predicted 45 migratory species to potentially occur within 50 kilometres of the study area. The results of this search are included in Table 11 along with interpretation on the likelihood that each of these species would occur within the study area. Table D3 in Appendix D provides a justification for how the likelihood of occurrence was determined for each species. The potential impacts of the proposed development on migratory species are discussed in the Impact Assessment section of this report.

Table 9: Near threatened and threatened flora species identified from database searches

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	RECORDS	LIKELIHOOD OF OCCURRENCE
NCA	EPBC						
LC	V	Myrtaceae	*Eucalyptus raveretiana*	Black Ironbox	PM	0	Low
V	V	Rutaceae	*Medicosma obovata*		PM/WO	5	Low
V	V	Apocynaceae	*Neisosperma kilneri*		PM/WO	9	Low
V	V	Euphorbiaceae	*Omphalea celata*		PM	0	Low
V	V	Asteraceae	*Ozothamnus eriocephalus*		PM	0	Low
E	E	Orchidaceae	*Phaius australis*	Lesser Swamp Orchid	PM	0	Low
LC	E	Moraceae	*Streblus pendulinus*	Isaac Wood	PM	0	Low
V	-	Euphorbiaceae	*Trigonostemon inopinatus*		WO	2	Moderate
NT	-	Flacourtiaceae	*Xylosma ovata*		WO	2	Moderate
E	-	Lamiaceae	*Callicarpa thozetii*		WO	1	High
V	-	Myrtaceae	*Ristantia waterhousei*		WO	5	High
NT	-	Myrtaceae	*Rhodamnia glabrescens*		WO	8	Moderate
NT	-	Solanaceae	*Solanum sporadotrichum*		WO	2	High
NT	-	Sterculiaceae	*Brachychiton compactus*		WO	16	High
NT	-	Hernandiaceae	*Hernandia bivalvis*	Cudgerie	WO	1	High
V	-	Arecaceae	*Livistona drudei*	Halifax Fan Palm	WO	1	High
NT	-	Orchidaceae	*Aphyllorchis anomala*		WO	1	High

- 1. Status: LC = Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered, M = Migratory
- 2. WO = Wildlife Online Database, PM = EPBC Protected Matters Report

Table 10: Near threatened and threatened fauna species identified from database searches

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	LIKELIHOOD OF OCCURRENCE
NCA	EPBC						
		BIRDS					
E	V	Accipitridae	*Erythrotriorchis radiatus*	Red Goshawk	PM	0	Low
LC	V	Oceanitidae	*Fregetta grallaria grallaria*	White-bellied Storm-petrel	PM	0	Low
E	E, M	Procellariidae	*Macronectes giganteus*	Southern Giant-petrel	PM	0	Low
LC	E	Estrildidae	*Neochmia ruficauda ruficauda*	Star Finch	PM	0	Low
E	E	Passeridae	*Poephila cincta cincta*	Black-throated Finch	PM	0	Low
E	CE	Procellariidae	*Pterodroma heraldica*	Herald Petrel	PM	0	Low
LC	V	Procellariidae	*Pterodroma neglecta neglecta*	Kermadec Petrel	PM	0	Low
V	E	Rostratulidae	*Rostratula australis*	Australian Painted Snipe	PM/WO	1	Moderate
V	V	Tytonidae	*Tyto novaehollandiae kimberli*	Masked Owl	PM	0	Low
V	-	Burhinidae	*Esacus magnirostris*	Beach Stone-curlew	WO	207	Present
V	V	Columbidae	*Geophaps scripta scripta*	Squatter Pigeon	WO	22	Low
NT	CE	Scolopacidae	*Numenius madagascariensis*	Eastern Curlew	WO	62	Present
		MAMMALS					
LC	E	Dasyuridae	*Dasyurus hallucatus*	Northern Quoll	PM	0	Low
SLC	V	Phascolarctidae	*Phascolarctos cinereus*	Koala	PM	0	Low
LC	V	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying Fox	PM	0	Low
E	E	Rhinolophidae	*Rhinolophus philippinensis*	Greater Large-eared Horseshoe Bat	PM	0	Low
E	E	Macropodidae	*Petrogale persephone*	Proserpine Rock Wallaby	PM/WO	187	Low

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	LIKELIHOOD OF OCCURRENCE
NCA	EPBC						
E	CE	Emballonuridae	*Saccolaimus saccolaimus nudicluniatus*	Bare-rumped Sheathtail Bat	PM	0	Low
V	V	Muridae	*Xeromys myoides*	Water Mouse	PM/WO	8	Low
NT	-	Emballonuridae	*Taphozous australis*	Coastal Sheathtail Bat	WO	24	Present
		REPTILES					
V	V	Elapidae	*Denisonia maculata*	Ornamental Snake	PM	0	Low
V	V	Scincidae	*Egernia rugosa*	Yakka Skink	PM	0	Low
NT	-	Elapidae	*Acanthophis antarcticus*	Common Death Adder	WO	6	Moderate

- 1. Status: LC = Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered, M = Migratory
- 2. WO = Wildlife Online Database, PM = EPBC Protected Matters Report

Table 11: EPBC Act listed migratory species from the Protected Matters Search Tool results

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	LIKELIHOOD OF OCCURRENCE
NCA	EPBC						
		BIRDS					
SLC	M	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	PM	506	Present
SLC	M	Ardeidae	*Ardea alba*	Great Egret	PM	66	High
SLC	M	Ardeidae	*Ardea ibis*	Cattle Egret	PM	16	High
-	M	Dicruridae	*Rhipidura rufifrons*	Rufous Fantail	WO	84	High
SLC	M	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	PM	8	High
SLC	M	Meropidae	*Merops ornatus*	Rainbow Bee-eater	PM, WO	222	High
-	M	Monarchidae	*Monarcha melanopsis*	Black-faced Monarch	PM	22	High
-	M	Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher	PM	14	High
V	E, M	Rostratulidae	*Rostratula benghalensis*	Painted Snipe	PM	1	High
SLC	M	Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	PM	3	High
SLC	M	Hirundinidae	*Hirundo rustica*	Barn Swallow	PM	0	High
-	M	Monarchidae	*Monarcha trivirgatus*	Spectacled Monarch	PM	157	Present
SLC	M	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	PM	5	High
SLC	M	Scolopacidae	*Arenaria interpres*	Ruddy Turnstone	PM	14	High
SLC	M	Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	PM	8	High
SLC	M	Scolopacidae	*Calidris alba*	Sanderling	PM	1	High
SLC	M	Scolopacidae	*Calidris canutus*	Red Knot	PM	2	High
SLC	CE, M	Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	PM	1	High

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	LIKELIHOOD OF OCCURRENCE
NCA	EPBC						
SLC	M	Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	PM	0	High
SLC	M	Scolopacidae	*Calidris ruficollis*	Red-necked Stint	PM	0	High
SLC	M	Scolopacidae	*Calidris tenuirostris*	Great Knot	PM	8	High
-	M	Charadriidae	*Charadrius bicinctus*	Double-banded Plover	PM	3	High
SLC	M	Charadriidae	*Charadrius leschenaultii*	Greater Sand Plover	PM	2	High
SLC	M	Charadriidae	*Charadrius mongolus*	Lesser Sand Plover	PM	12	High
-	M	Charadriidae	*Charadrius veredus*	Oriental Plover	PM	1	Moderate
SLC	M	Scolopacidae	*Gallinago megala*	Swinhoe's Snipe	PM	0	Moderate
SLC	M	Scolopacidae	*Gallinago stenura*	Pin-tailed Snipe	PM	0	Moderate
SLC	M	Scolopacidae	*Heteroscelus brevipes*	Grey-tailed Tattler	PM	28	High
SLC	M	Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit	PM	25	High
SLC	M	Scolopacidae	*Limosa limosa*	Black-tailed Godwit	PM	3	High
NT	CE	Scolopacidae	*Numenius madagascariensis*	Eastern Curlew	PM	62	High
SLC	M	Scolopacidae	*Numenius minutus*	Little Curlew	PM	2	High
SLC	M	Scolopacidae	*Numenius phaeopus*	Whimbrel	PM	119	High
SLC	M	Accipitridae	*Pandion cristatus*	Eastern Osprey	PM	540	Present
-	M	Charadriidae	*Pluvialis fulva*	Pacific Golden Plover	PM	16	High
SLC	M	Charadriidae	*Pluvialis squatarola*	Grey Plover	PM	4	High
SLC	M	Scolopacidae	*Tringa glareola*	Wood Sandpiper	PM	0	High
SLC	M	Scolopacidae	*Tringa incana*	Wandering Tattler	PM	2	High

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	LIKELIHOOD OF OCCURRENCE
NCA	EPBC						
SLC	M	Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	PM	1	High
SLC	M	Scolopacidae	*Xenus cinereus*	Terek Sandpiper	PM	5	High
SLC	M	Apodidae	*Apus pacificus*	Fork-tailed Swift	PM	3	High
E	E, M	Procellariidae	*Macronectes giganteus*	Southern Giant-Petrel	PM	0	Low
SLC	M	Procellariidae	*Puffinus carneipes*	Flesh-footed Shearwater	PM	0	High
SLC	M	Laridae	*Sterna albifrons*	Littler Tern	PM	15	High
SLC	M	Laridae	*Sterna sumatrana*	Black-naped Tern	PM	102	High

- 1. Status: SLC = Special Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered, M = Migratory
- 2. WO = Wildlife Online Database, PM = EPBC Protected Matters Report
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3. Regional Ecosystem Mapping

The RE mapping shows five REs within the study area as well as large areas comprised of non-remnant vegetation (DNRM 2015). Table 12 provides a summary of all the REs mapped within the study area.

Table 12: Regional ecosystem status and description for mapped remnant vegetation within study area

RE CODE	VM ACT STATUS	BIODIVERSITY STATUS	REGIONAL ECOSYSTEM DATABASE SHORT DESCRIPTION
8.3.2	Endangered	Endangered	*Melaleuca viridiflora* woodland often with emergent eucalypts and grassy/herbaceous ground layer, on seasonally inundated alluvial plains with impeded drainage.
8.12.11	Least concern	No concern at present	Semi-deciduous microphyll vine forest/thicket with emergent *Araucaria cunninghamii* in coastal areas including islands, on Mesozoic to Proterozoic igneous rocks and Tertiary acid to intermediate volcanics and granite.
8.12.12	Least concern	No concern at present	Variable *Corymbia* spp. +/- *Eucalyptus tereticornis* +/- *E. platyphylla* +/- *E. drepanophylla* +/- *E. portuensis* woodland on lower and mid-slopes of ranges on Mesozoic to Proterozoic igneous rocks.
8.12.13	Of concern	Of concern	*Xanthorrhoea latifolia* subsp. *latifolia* or *Imperata cylindrica* grassland, including some areas recently colonised by *Timonius timon* shrubland, on slopes of islands and headlands, on Mesozoic to Proterozoic igneous rocks and Tertiary acid to intermediate volcanics.
8.12.14	Least concern	No concern at present	Variable eucalypt dominated associations, often with *Eucalyptus drepanophylla*, *E. crebra*, *Acacia spirorbis*, subsp. *solandri*, *Lophostemon confertus* and *E. exserta*, on islands and rocky headlands, on Mesozoic to Proterozoic igneous rocks, and Tertiary acid to intermediate volcanics.

4. Geology Mapping

Geology mapping for the region was obtained from the Department of Natural Resources and Mines (Map Sheet SF 55-4). This mapping provides information relating to the relevant landzone for vegetation mapping and RE codes. One geology unit is shown throughout the study area, as shown in Table 13. The relevant landzone as defined in Wilson and Taylor (2012) is also shown. Refer also to *Geotechnical Assessment* prepared by Cardno (2015).

Table 13: Geology mapping units within the study area

MAP CODE	LITHOLOGY	ROCK TYPE	LANDZONE
Kw	Waterlaid acid to intermediate air-fall pyroclastics, minor pyroclastic flows and lavas	Igneous	12

5. Essential Habitat

The DNRM regulated vegetation map shows all remnant vegetation on Lindeman Island is mapped as essential habitat for the Coastal Sheathtail Bat, which is listed as near threatened under the NC Act. The essential habitat database identified three essential habitat factors for the Coastal Sheathtail Bat:

- Vegetation community: all habitats within a few kilometres of coast,
- Altitude: sea level to 150 metres,
- Regional Ecosystem: A vast number of coastal REs, including those mapped and ground-truthed within the study area.

Flora Survey Results

1. Vegetation Communities

1.1 EPBC Act Threatened Ecological Communities

The results of the 2015 surveys support the findings of the previous survey conducted in 2013 and the outcomes of the current desktop assessment. Two TECs listed under the EPBC Act were identified within the study area:

- Littoral Rainforest and Coastal Vine Thickets of Eastern Australia
- Broad Leaf Tea-tree (*Melaleuca viridiflora*) Woodlands in High Rainfall Coastal North Queensland

No other TECs listed under the EPBC Act were identified within the study area.

The 2015 surveys focussed on obtaining species composition and structure data from various locations within these communities to provide detailed technical descriptions for each community (see Table 14). These surveys also focussed on accurately mapping the spatial extent of these communities within the study area as they pertain to protection under the EPBC Act. In this regard, assessment against the key diagnostic characteristics and condition thresholds specified in the Commonwealth listing advice for each community (and presented in the Methodology section of this report) was required.

Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Community

The critically endangered Littoral Rainforest and Coastal Vine Thickets of Eastern Australia ecological community was confirmed present within the lease area and surrounding National Park land. Within the lease area, this community occurs mainly as small fragments restricted to the steep rocky slopes and gullies along the coastline. However, this community occurs as much larger patches in the surrounding National Park land, with one relatively large polygon ground-truthed along the west coast adjacent to the lease area. The ground-truthed extent of this community is shown as RE 8.12.11a on the Flora Survey Map in Appendix A. The vegetation community assessments revealed the full extent of this RE is consistent with the key diagnostic characteristics and the condition thresholds specified in the Commonwealth listing advice for this community. The species composition and structure of this community are discussed in the following sections of this report.

Broad Leaf Tea-tree (*Melaleuca viridiflora*) Woodlands in High Rainfall Coastal North Queensland Community

The December 2015 survey confirmed the presence of Broad leaf tea-tree communities on the margins of the runway strip, as identified in the State regional ecosystem mapping and previous field survey events. The field survey effort in December 2015 was focussed on assessing the

species composition and condition of this community and mapping the extent based on these attributes. The extent of Broad leaf tea-tree vegetation was found to be significantly greater than shown on the State published RE mapping, and the ground-truthed extent of this community as it relates to remnant vegetation under the VM Act (RE 8.3.2) is discussed further in this report. It is important to note that the ground-truthed extent of RE 8.3.2 does not wholly equate to the extent of the Broad Leaf Tea-tree (*Melaleuca viridiflora*) Woodlands in High Rainfall Coastal North Queensland TEC listed under the EPBC Act (see Broad Leaf Tea-tree Community Map in Appendix A). Field assessments based on the condition thresholds specified in the Commonwealth listing advice for this community revealed much of this vegetation community does not meet those criteria for protection under the EPBC Act.

The full extent of Broad leaf tea-tree vegetation on the western side of the runway strip is highly degraded, mostly due to invasion by the exotic grass species Guinea grass (*Megathyrsus maximus**). The ground cover in the majority of this patch is dominated by this exotic species, with a relative cover substantially greater than 50 per cent. Only a few small areas that are not dominated by Guinea grass remain in this patch, but all of these are significantly smaller than one hectare and therefore do not retain sufficient conservation value to be part of the listed community. Given this patch is highly degraded and does not meet the condition thresholds for protection under the EPBC Act, the patch of Broad leaf tea-tree vegetation on the western side of the runway strip has been excluded from the TEC mapping.

The majority of the Broad leaf tea-tree vegetation on the eastern side of the runway strip is in relatively good condition. While there is some exotic species invasion, particularly along its margins, the vast majority of the large patch on the eastern side of the runway strip is dominated by native grasses in the ground layer and meets the condition thresholds for protection under the EPBC Act (see Broad Leaf Tea-tree Community Map in Appendix A). However, some areas around the margins of this vegetation community are dominated by Guinea grass, with greater than 50% cover in the ground layer, and these areas have been excluded from the TEC mapping.

Overall, the total area of the Broad leaf tea-tree vegetation community within the study area is 12.85 hectares. However, only 5.38 hectares are consistent with the Broad Leaf Tea-tree (*Melaleuca viridiflora*) Woodlands in High Rainfall Coastal North Queensland TEC listed under the EPBC Act. The species composition and structure of this community are discussed in the following sections of this report. Potential impacts to this community are identified in the Impact Assessment section of this report.

1.2 *Vegetation Management Act 1999* Regional Ecosystems

Ground-truthing of the remnant vegetation within the study area revealed there are five remnant REs present. They are: 8.3.2, 8.12.11a, 8.12.12d, 8.12.13a, 8.12.14c (see details in Table 14). The vegetation types within the study area and surrounding National Park land are eucalypt woodland to open forest, Broad leaf tea-tree woodland, native grasslands, and coastal vine thicket to dry rainforest. There are also areas of non-remnant grassland within the study area, which are dominated by exotic species, particularly Guinea grass. Some vegetated areas surrounding the golf course contain regrowth of native vegetation communities and are typically comprised of species consistent with RE 8.12.12d.

The majority of the study area is eucalypt woodland (RE 8.12.12d), which is dominated by Poplar gum (*Eucalyptus platyphylla*), Clarkson's bloodwood (*Corymbia clarksoniana*) and Narrow-leaved ironbark (*Eucalyptus drepanophylla*) and occasionally Queensland Blue Gum (*Eucalyptus tereticornis*). The sub-canopy and shrub layers general very sparse and are comprised of species such as Rusty pittosporum (*Pittosporum ferrugineum*), Black Wattle (*Acacia spirorbis* subsp. *solandri*), Soap tree (*Alphitonia excelsa*) and canopy species. The ground layer is typically dense and dominated by native grasses, particularly Kangaroo grass (*Themeda triandra*), Blady grass (*Imperata cylindrica*) and Black speargrass (*Heteropogon contortus*). Overall, with the exception of exotic species invasion on the boundaries of previously cleared areas, the condition of this community is highly intact.

Coastal vine thicket (RE 8.12.11a) occurred where the terrain was characterised by shallow rocky soil and steep coastal slopes and gullies. The vine thicket canopy contained a variety of species, but was frequently dominated by a variety of *Ficus* species (particularly *Ficus virens* in rocky gullies), Brown Tulip Oak (*Argyrodendron polyandrum*) and *Acacia spirorbis* subsp. *solandri* with emergent Hoop pines (*Araucaria cunninghamii*) occasionally present. Common sub-canopy species include *Cleistanthus* (*Cleistanthus dallachyanus*), Python Tree (*Gossia bidwillii*), Coastal Boodyarra (*Aglaia elaeagnoidea*), Wild prune (*Sersalisia sericea*) and Chain fruit (*Alyxia spicata*). This community occurs in rocky areas and the ground cover is generally sparse and dominated by species such as Basket fern (*Drynaria sparsisora*), Common maidenhair fern (*Adiantum atroviride*), Saw sedge (*Gahnia aspera*) and Scrub pigeon grass (*Setaria australiensis*). Vegetation surveys within the study area revealed this community is highly intact where it occurs in relatively large (>1ha) patches. This community is subject to exotic species invasion along its margins and consequently many smaller patches are in poor condition. Patches near the existing resort infrastructure are subject to significant exotic species invasion, particularly the lower vegetation strata.

Many of the coastal slopes with a southerly aspect contained patches of native grasslands (RE 8.12.13a) dominated by Kangaroo grass, Blady grass and Black speargrass in some areas. All areas of native grassland are surrounded by non-native grassland vegetation dominated by Guinea grass, with other exotic species commonly present including Bidens (*Bidens alba* var*. radiata**), Lantana (*Lantana camara**), Streaked rattlepod (*Crotolaria pallida**) and Sensitive weed (*Mimosa pudica**). All areas of native grassland are subject to some degree of invasion by these exotic species. In general within the lease areas, only the very steep exposed slopes with a south or southeast aspect on the southern headlands support intact native grassland with a high proportion of native grass cover. All other areas within the lease areas are in poor condition due to exotic species invasion. By contrast, rapid assessments on the slopes of Mt Oldfield in the adjacent National Park land revealed these native grasslands to be highly intact, with very minimal exotic species invasion and a species composition highly consistent with the RE description.

As discussed previously for TECs under the EPBC Act, Broad leaf tea-tree vegetation consistent with RE 8.3.2 is present in the flat plains surrounding the runway strip. The canopy of this community is dominated by Broad leaf tea-tree with Poplar gum occasionally present in the canopy and as an emergent. The lower strata are dominated by juvenile canopy species and Beach pandanus (*Pandanus tectorius*) with Lantana common in the shrub layer throughout most areas. The grassy ground layer is dense with a patchy species composition, with each area

typically dominated by a single species. The main native grasses present are Kangaroo grass, Blady grass, Black speargrass and Golden beardgrass (*Chrysopogon fallax*). The extent of the TEC mapping for this community is consistent with the area where native grasses are dominant (see Appendix A). All other areas are dominated by Guinea grass in the ground layer. The presence of exotic species in the ground layer does not affect the status of this community under the VM Act, as the main criteria for remnant vegetation are related to the canopy layer.

RE 8.12.14c occurs on hill slopes in the National Park land surrounding the study area, particularly on the western side of Mt Oldfield and the rock gullies on the track to Gap Beach. The canopy of this closed forest community is typically dominated by Brush box (*Lophostemon confertus*) with other species such as Queensland blue gum associated or sub-dominant in the canopy. Shrub and low tree layers are sparse to mid-dense and include species such as *Acacia spirorbis* subsp. *solandri*, Rusty pittosporum, Red Kamala (*Mallotus philippensis*), Grey bollywood (*Neolitsea brassii*), Black sheoak (*Allocasuarina littoralis*) and Lantana. This community is more dense than 8.12.12d and consequently the ground cover is very sparse and typically comprised of recruiting canopy species as well as Common maidenhair fern, Wombat berry (*Eustrephus latifolius*), Razor grass (*Scleria sphaceolata*), Running mountain grass (*Oplismenus compositus*) and Saw sedge. There is generally a dense layer of leaf litter throughout this community.

RE 8.3.2 has an endangered VM Act class and biodiversity status, and RE 8.12.13a has an 'of concern' VM Act class and biodiversity status. All other REs identified have a 'least concern' VM Act class and biodiversity status. The potential impacts of the proposed development on vegetation communities are discussed in the Impact Assessment section of this report. The floristic composition and structure of these communities is described in Table 14. The mapping of remnant vegetation within the study area is presented in the map series in Appendix A. An application to update the spatial extent of RE 8.3.2 on the state mapping to reflect the results of the ground-truthing surveys, by means of a PMAV, was submitted to DNRM on 21 December 2016.

1.3 Non-remnant Vegetation

Most non-remnant vegetation is located throughout the existing disturbed areas of the resort, runway strip and golf course. Vegetation associated with resort gardens, maintained lawns, the golf course and the runway strip has been excluded from the remnant vegetation mapping due to an absence, or very low cover, of native species. As previously described, all non-remnant grassland areas have also been excluded from the remnant vegetation mapping. Exotic grasses, particularly Guinea grass, dominated these areas with scattered native and exotic shrubs and trees. Other common exotic species in disturbed areas include Bidens, Lantana, Sensitive weed, Streaked rattlepod and Leucaena (*Leucaena leucocephala*). As described in the Methodology section of this report, grassland areas with greater than 50% cover of non-native species are shown as non-remnant on the ground-truthed Regional Ecosystem Map (Appendix A). Some areas containing woody vegetation were also excluded from the remnant vegetation mapping such as ornamental gardens throughout the resort and golf course areas. Some areas of native regrowth occur in close proximity to the golf course and infrastructure for Gap Creek Dam and these areas are not mapped as remnant vegetation, as they do not meet the relevant height or cover criteria for remnant status.

2. Flora Species

A total of 158 flora species from 55 families were recorded from the various vegetation assessments within the study area. The majority of flora species observed throughout the study area are common and widespread throughout the region in coastal eucalypt woodland and vine thicket communities. The floristic composition is generally consistent within each vegetation community, with some variation due to changes in topography. There is disturbance on the margins of many remnant vegetation areas with edge effects such as exotic species invasion evident. A full list of flora identified during the flora surveys is included in Appendix E, which includes details of the RE in which each species was observed.

2.1 Threatened Flora Species

No threatened or near threatened flora species (as listed under the EPBC Act or NC Act) were identified during the vegetation surveys, despite targeted survey effort in potentially suitable habitat areas. The potential for impacts to threatened and near threatened flora species is discussed further in the Impact Assessment section of this report.

2.2 Pest Plant Species

Pest plant species were common throughout the study area, particularly in the non-remnant vegetation communities. Pest species commonly occurring in a variety of habitats within the study area include Guinea grass, Lantana, Sensitive weed, Bidens, Chinese burr (*Triumfetta rhomboidea**), Balloon cotton bush (*Gomphocarpus physocarpus**), Common centro (*Centrosema molle**), and Snake weed (*Stachytarpheta cayennensis**).

Leucaena is present in eucalypt woodland and native grassland areas along the margins of existing disturbance areas. A control program for this species has recently taken place (early 2015) and has significantly reduced the cover of this species in the resort area. However, some large patches still remain (e.g. at the western end of the cross-strip runway) and regeneration where control has taken place was evident during the December 2015 surveys.

Grader grass (*Themeda quadrivalvis**) is known to occur in disturbed areas on Lindeman Island, and the field surveys confirmed the presence of this species within the study area. The largest area of Grader grass occurs at the eastern end of the cross-strip runway, surrounding a drainage area on the southern side.

Three restricted species were observed during the field surveys: Giant rat's tail grass (*Sporobolus* sp.*), Singapore daisy (*Sphagneticola trilobata**) and Lantana. Giant rat's tail grass was not recorded anywhere within the lease areas, but was observed at a few locations along the National Park track to 'Boat Port' and has likely been introduced by visitors using the track. Giant rat's tail grass is a restricted invasive plant under the *Biosecurity Act (2014)*. Lantana is a restricted invasive plant under the *Biosecurity Act (2014)* that occurs in all communities surveyed within the study area. Singapore daisy is also a restricted invasive plant that was observed in resort garden areas and adjacent coastal vine thicket vegetation near existing resort infrastructure on the southern coastline. Implications and recommendations regarding the presence of pest species are discussed in the following sections of this report.

Table 14: Floristic composition and structure of Regional Ecosystems within the study area

DESCRIPTION AND STATUS	FLORISTIC COMPOSITION AND STRUCTURE	REPRESENTATIVE PHOTOGRAPH
RE 8.3.2 *Melaleuca viridiflora* var. *viridiflora* woodland. *Eucalyptus platyphylla* occurs as an occasional emergent. The dominant canopy species are *Melaleuca viridiflora* var. *viridiflora, Eucalyptus platyphylla, Pandanus tectorius,* and *Pittosporum ferrugineum.* There is a very sparse shrub layer, which includes *Melaleuca viridiflora* var. *viridiflora*, *Pittosporum ferrugineum, Mallotus philippensis* and *Lantana camara**. The ground layer is typically dense and varies due to the extent of exotic species invasion, with many areas dominated by *Megathyrsus maximus**, but some areas on the eastern side of the runway strip are dominated by one or more of the following native species: *Imperata cylindrica, Themeda triandra, Heteropogon contortus* and *Chrysopogon fallax.* Occurs in low-lying terrain on the margins of the existing runway strip. **VM Act Status:** Endangered **Biodiversity Status:** Endangered **EPBC Act Status:** Endangered	**E:** Very Sparse 12.5 m *Eucalyptus platyphylla* (D) **T1:** Sparse 7.7 m – 12.2 m *Melaleuca viridiflora* var. *viridiflora* (D), *Eucalyptus platyphylla* (A-SD), and *Pandanus tectorius* (A-SD) **T2:** Very Sparse 4.5 m *Melaleuca viridiflora* var. *viridiflora* (D), *Pandanus tectorius* (SD), *Pittosporum ferrugineum* (SD), *Cupaniopsis anacardioides* (A) and *Mallotus philippensis* (A) **S:** Very sparse 1.8 m *Melaleuca viridiflora* var. *viridiflora* (D), *Pandanus tectorius* (SD), and *Pittosporum ferrugineum* (SD), *Cupaniopsis anacardioides* (A), *Lantana camara** (A-D), *Pittosporum ferrugineum* (SD), *Eucalyptus platyphylla* (A), *Passiflora foetida** (A), *Jagera pseudorhus* (A), *Centrosema molle** (A), *Ficus opposita* (A), *Cupaniopsis anacardioides* (A), *Mallotus philippensis* (A), *Neolitsea brassii* (A) **G:** *Imperata cylindrica, Themeda triandra, Heteropogon contortus, Chrysopogon fallax, Megathyrsus maximus*, Mimosa pudica*, Eustrephus latifolius, Dianella longifolia, Cyanthillium cinereum, Smilax australis* and *Ageratum conyzoides*, Triumfetta rhomboidea*, Oplismenus compositus, Cassytha filiformis*	

DESCRIPTION AND STATUS	FLORISTIC COMPOSITION AND STRUCTURE	REPRESENTATIVE PHOTOGRAPH
RE 8.12.11a Vine thicket and littoral rainforest. Dominant canopy species include *Ficus vivens, Acacia spirorbis* subsp*. solandri,* and *Argyrodendron polyandrum.* The shrub and low tree layers includes species such as *Alyxia spicata, Planchonella pohlmaniana, Acronychia laevis, Diospyros compacta, Acacia spirorbis subsp. solandri, Pleiogynium timorense. Aglaia elaeagnoidea, Clerodendrum floribundum*, *Cleistanthus dallachyanus, Gossia bidwillii, Cupaniopsis anacardioides,* and *Lantana camara*.* The ground layer is sparse, with species such as *Setaria australiensis, Drynaria rigidula, Drynaria sparsisora, Alyxia spicata,* and *Dendrobium discolor.* Found in rocky and steep sloped areas on the southern and western coastline. **VM Act Status:** Least concern **Biodiversity Status:** No concern at present **EPBC Act Status:** Critically endangered	**T1:** Mid-dense 14.4 m *Ficus virens* (CD)*, Acacia spirorbis* subsp*. solandri* (CD), *Argyrodendron polyandrum* (SD), *Pleiogynium timorense* (A), *Paraserianthes toona* (A), *Schefflera actinophylla* (A) **T2:** Mid-dense 7.5 m *Acacia spirorbis subsp. solandri* (CD)*, Alyxia spicata* (CD), *Diospyros compacta* (CD)*, Planchonella pohlmaniana* SD), *Gossia bidwillii* (SD), *Cleistanthus dallachyanus* (SD), *Acronychia laevis* (A) *Paraserianthes toona* (A), *Jagera pseudorhus* (A), *Aglaia elaeagnoidea* (A)*, Clerodendrum floribundum* (A), *Sersalisia sericea* (A) **S:** Very sparse 2.5 m *Alyxia spicata,* (CD) *Gossia bidwillii* (CD)*, Cupaniopsis anacardioides* (CD), *Cleistanthus dallachyanus* (CD), *Clerodendrum floribundum* (CD), and *Acacia spirorbis* subsp*. solandri* (CD), *Drypetes deplanchei* (A), *Trophis scandens* (A), *Hoya australis* (A), *Pandorea pandorana* (A) **G:** *Setaria australiensis* (CD)*, Drynaria rigidula* (CD)*, Drynaria sparsisora* (CD)*, Alyxia spicata* (CD)*,* and *Dendrobium discolor* (SD), *Peperomia blanda var. floribunda* (SD), *Adiantum atroviride* (A-SD), *Gahnia aspera* (A-SD)	

DESCRIPTION AND STATUS	FLORISTIC COMPOSITION AND STRUCTURE	REPRESENTATIVE PHOTOGRAPH
RE 8.12.12d *Eucalyptus*/*Corymbia* woodland to open forest. Common co-dominant species include *Corymbia tessellaris, Eucalyptus platyphylla, C. dallachiana, E. drepanophylla,* and *E. tereticornis*. A secondary tree layer is sometimes present, usually consisting of *Corymbia* spp. and *Eucalyptus* spp. The ground layer is grassy, and is commonly dominated by species such as *Imperata cylindrica, Themeda trianda, Megathyrsus maximus*, Bidens alba* var. *radiata*, Lomandra longifolia, Mimosa pudica*,* and *Eustrephus latifolius* Found throughout the majority of the study area on landzone 12 (igneous) geologies. **VM Act Status:** Least concern **Biodiversity Status:** No concern at present **EPBC Act Status:** Not Listed	**T1:** Mid dense 13.1 m *Eucalyptus platyphylla* (CD-D)*, Eucalyptus drepanophylla* (CD-D)*, Corymbia clarksoniana* (CD)*, Corymbia tessellaris* (CD)*, Lophostemon confertus* (A)*, Corymbia intermedia* (A), *Corymbia dallachiana* (A), and *Eucalyptus tereticornis* (A) **T2:** Mid dense 5.4 m *Acacia spirorbis* subsp. *solandri* (CD), *Corymbia dallachiana* (CD), *Eucalyptus platyphylla* (CD), *Eucalyptus* drepanophylla (CD), *Alphitonia excelsa* (CD), *Pittosporum ferrugineum* (CD), *Cupaniopsis anacardioides* (A-CD), *Jagera pseudorhus* (A-CD), *Bursaria tenuifolia* (A), and *Sersalisia sericea* (A), *Allocasuarina littoralis* (A), *Melaleuca viridiflora* var. *viridiflora* (A), *Mallotus phillipensis* (A) **S:** Very sparse 2.5 m *Lantana camara** (CD), *Pittosporum ferrugineum* (CD), *Mallotus philippensis* (CD), *Ficus opposita* (CD) and occasional recruitment of canopy species **G:** *Imperata cylindrica, Themeda trianda, Megathyrsus maximus*, Bidens alba* var. *radiata*, Lomandra longifolia, Mimosa pudica*, Centrosema molle** and *Eustrephus latifolius*	

DESCRIPTION AND STATUS	FLORISTIC COMPOSITION AND STRUCTURE	REPRESENTATIVE PHOTOGRAPH
RE 8.12.13a Native grassland on southern facing slopes. A very sparse shrub layer of *Lantana camara*, Pittosporum ferrugineum, Ficus opposita, Eustrephus latifolius,* and *Passiflora foetida**. Dense gound cover of 0.3-1.0 m consisting of *Imperata cylindrica, Themeda triandra, Megathyrsus maximus, Eustrephus latifolius, Cassytha pubescens, Bidens alba var. radiata*, Passiflora suberosa*, Passiflora foetida*,* and *Lantana camara*.* Mostly found on slopes with southern aspect near the coastline. **VM Act Status:** Of concern **Biodiversity Status:** Of concern **EPBC Act Status:** Not Listed	**S: Very** Sparse 2.5 m *Lantana camara**(CD), *Pittosporum ferrugineum* (CD), *Ficus opposita* (CD), *Eustrephus latifolius* (A), and *Passiflora foetida** (A). **G:** *Imperata cylindrica* (D), *Themeda triandra* (SD), *Heteropogon contortus* (SD), *Megathyrsus maximus** (SD), *Bidens alba* var. *radiata* (SD), *Eustrephus latifolius* (A), *Cassytha pubescens* (A-SD), **, Passiflora suberosa** (A), *Passiflora foetida** (A), and *Lantana camara** (A).	

DESCRIPTION AND STATUS	FLORISTIC COMPOSITION AND STRUCTURE	REPRESENTATIVE PHOTOGRAPH
RE 8.12.14c Open forest with canopy dominated by *Lophostemon confertus*, *Eucalyptus tereticornis and* Acacia spirorbis subsp. solandri. The low tree and shrub layers are typically mid-dense and dominated by species such as *Lophostemon confertus*, *Acacia spirorbis* subsp. *solandri*, *Pittosporum ferrugineum, Mallotus philippensis*, *Neolitsea brassii*, *Allocasuarina littoralis* and *Lantana camara**. The ground cover is very sparse and typically comprised of recruiting canopy species as well as *Adiantum atroviride, Eustrephus latifolius, Scleria sphaceolata, Oplismenus compositus* and *Gahnia aspera*. There is generally a dense layer of leaf litter throughout this community. Located on hillslopes and broad gullies in the surrounding National Park land. **VM Act Status:** Least concern **Biodiversity Status:** No concern at present **EPBC Act Status:** Not Listed	**E:** Very Sparse 19.5 m *Eucalyptus tereticornis* occasional emergent throughout this community. **T1:** Mid-dense 12 m *Lophostemon confertus* (D), *Eucalyptus tereticornis* (SD), *Acacia spirorbis* subsp. *solandri* (A). **T2:** Mid-dense 6 m *Lophostemon confertus* (CD), *Acacia spirorbis* subsp. *solandri* (CD), *Pittosporum ferrugineum* (CD), *Mallotus philippensis* (SD), *Neolitsea brassii* (A), *Allocasuarina littoralis* (A), *Diosporus herbecarpa* (A). **S:** Sparse to mid-dense 2.5 m *Mallotus philippensis* (CD), *Neolitsea brassii* (CD), *Pittosporum ferrugineum* (SD), *Eustrephus latifolius* (A), *Lantana camara* (A). **G:** *Adiantum atroviride, Eustrephus latifolius, Scleria sphaceolata, Oplismenus compositus* and *Gahnia aspera.*	

Fauna Survey Results

1. Fauna Habitat

1.1 Vegetation

The remnant vegetation throughout the study area is primarily woodland dominated by *Corymbia* and *Eucalyptus* species. Small patches of coastal vine thicket occur on the steep rocky slopes of the coast and native grasslands are scattered throughout the study area. These main remnant vegetation types are generally intact, with minimal evidence of disturbance to the canopy layer. The density of the sub-canopy and shrub layers varies over the study area from virtually absent to mid-dense. The ground layer is generally dense and dominated by native grasses. Disturbance from exotic species invasion is prevalent along the margins of remnant areas, with some patches of exotic species also scattered within remnant woodland and grassland areas. Non-remnant areas have very low flora species richness and are frequently dominated by one or two non-native species.

The study area consists of remnant and non-remnant vegetation, providing habitat features for fauna species in the form of tree hollows, loose bark, coarse woody debris, boulders, crevices and rock piles. The presence of highly mobile fauna species (such as birds and bats) is likely to be influenced by seasonal characteristics such as rainfall, with these species foraging when suitable trees are flowering or fruiting.

1.2 Habitat Features

Habitat features vary across the study area and are largely influenced by vegetation type and topography. Overall, habitat values for most faunal groups are moderate in the majority of the study area and higher around the rocky coastal slopes and within the denser RE 8.12.14c vegetation.

There are a moderate number of hollow-bearing trees within the eucalypt woodlands in the study area, and a low to moderate amount of woody debris. Other microhabitat features such as boulder areas are common throughout the coastal vine thicket. The quality and abundance of habitat features in the non-remnant areas is very low due to a lack of woody vegetation and related microhabitat features.

1.3 Watercourse and Wetland Habitat

No Ramsar wetlands are located within the study area or within the broader region. Shoalwater and Corio Bays are the nearest Ramsar Wetlands and these are located over 200 km to the south of the study area. No referrable wetlands areas as shown on the Queensland referrable wetland mapping are located within the study area. However, the Queensland referrable

wetland mapping identifies some general ecological significance wetlands along some of the shoreline of Lindeman Island. These areas of shoreline potentially provide habitat and foraging areas for shorebirds.

There is one large permanent water body created by the construction of Gap Creek Dam near the centre of the study area, which contains some aquatic vegetation and wetland habitat values. This water body and associated aquatic vegetation provides habitat for a variety of wetland bird species (see below and Appendix F).

There are no watercourses as shown on the vegetation management watercourse map located within the study area, but one feature identified as Gap Creek is mapped on other State mapping layers. There are some ephemeral drainage features located within the study area in remnant and non-remnant areas. These features are located in steep and often rocky terrain with a very small catchment, and consequently they would likely only flow for very short periods of time immediately after rainfall events. These features do not sustain any significant aquatic habitat and there is no distinct riparian vegetation or additional biodiversity associated with the features. The vegetation communities surrounding these features represent a continuation of the surrounding non-riparian vegetation communities.

1.4 Connectivity

The study area is comprised of a mix of remnant and non-remnant areas with connectivity between habitats influenced by natural and artificial processes. Connectivity between most areas of woody vegetation is high, but some areas of vine-thicket occur as isolated patches in gullies and rocky slopes, particularly along the shoreline. These isolated vine thicket patches occur naturally and are known to be resilient even as very small areas (Commonwealth of Australia, 2009). Some woodland areas are bordered by native and non-native grassland and existing resort infrastructure. However, most woodland areas maintain at least some connectivity with larger tracts of remnant vegetation and habitat fragmentation is very low.

The existing runway strip bisects an area of remnant Broad-leaved tea tree woodland described in previous sections. The biodiversity value of this community is reduced by the invasion of exotic species, particularly the prevalence of Guinea grass in the ground layer. Disturbance to the species composition in the ground layer is likely due to historical grazing activities, but the current runway strip has significantly increased potential edge-effects for this community.

Non-native invasive ground cover species dominate much of the grassland community within the study area and this has resulted in isolated areas of native grassland. The isolation of the native grassland areas leaves them susceptible to further invasion. However, sloped areas with a southern aspect within the study area remain relatively intact, and this is the habitat typically occupied by the native grassland community. Therefore, this community may be resilient to invasion by exotic species in these areas.

Overall, connectivity between habitats on Lindeman Island is intact with minimal fragmentation or isolation of remnant vegetation. The study area itself does not form a critical link between any habitat areas and the connectivity value of the vegetation communities within the study area is generally low.

1.5 Existing Disturbance and Habitat Condition

The main disturbance to remnant vegetation in the study area is the existing resort, runway strip, and golf course. These areas comprise maintained lawns and ornamental flora species, with some native vegetation retained or regenerated throughout. As discussed previously, the existing infrastructure has resulted in the removal and fragmentation of some native vegetation, but the overall viability and connectivity of the native vegetation communities present is generally intact.

Lindeman Island has a history of multiple land uses including grazing activities and different resort developments. The grassland around the existing resort has been modified and exotic species dominate much of this area. Native grasslands occur naturally on island headlands in the region, particularly on slopes with a south and southeast aspect. Many of the sloped grassland sites within the study area, particularly those with a southern aspect, remain relatively intact, with minimal exotic species invasion. However, the majority of flat grassland areas are comprised of exotic species, particularly Guinea grass. Disturbance in these areas is likely due to historical grazing activities, and the extent of this disturbance has resulted in the fragmentation of native grassland habitat. While the native grassland contains a low diversity of flora species and low fauna habitat value, invasion by exotic grasses represents a significant threat to the biodiversity values of this community. As discussed previously, exotic species invasion has also significantly impacted the biodiversity values of the Broad leaf tea-tree community. All other communities within the study area are generally intact, with exotic species invasion generally restricted to the margins of previously cleared areas.

2. Fauna Species

A total of 76 fauna species from 42 families were identified within the study area using a variety of different observation and trapping techniques. This included 47 species of birds, 14 reptile species, two amphibian species, and 13 mammal species (including 12 bat species). Most of the native fauna recorded are common in coastal habitats throughout much of Queensland. A combined list of all species identified during the fauna surveys to date is included in Appendix F. The following sections provide a brief discussion of the species observed for each taxonomic group. Potential impacts to fauna are discussed in the latter sections of this report, with a focus on conservation significant species.

2.1 Mammals

A total of 13 species of mammals were observed within the study area over the two survey periods, including 12 bat species and one introduced species, the Black rat (*Rattus rattus)*. Black rats were captured multiple times at Sites 2, 3, 5 and 6.

Bats are the only native terrestrial mammals previously recorded on Lindeman Island. Black flying foxes (*Pteropus alecto*) have been recorded on Lindeman Island previously; with records from the Australian Museum in the Atlas of Living Australia database showing specimens from this location. During the current fauna surveys, this species was regularly observed flying over and foraging within the study area, particularly during the autumn survey period. Habitat

searches during both field survey events did not reveal the presence of camps within the study area.

The two fauna survey events identified a number of microbat species not previously recorded within the study area. Over the two survey events a total of eight species were positively identified to species level and two species were positively identified to genus from the call data collected. Some of the call data obtained was unresolved due to similarities between species, but one additional species, the Chocolate Wattled Bat (*Chalinolobus morio*), was potentially recorded during the December 2015 survey period. The *Microbat Call Interpretation Reports* from the Anabat data collected during each the fauna survey periods are included in Appendix G.

Some of the microbat echolocation call data obtained during the autumn survey event was only positively identifiable to genus level for *Taphozous*. Two *Taphozous* bats potentially occur within the study area: Troughton's sheath-tail bat (*T. troughtoni*) and the Coastal Sheathtail Bat (*T. australis*). Echolocation calls from these species are not distinguishable and the call data obtained may be from either of these species. The call data for *Taphozous* sp. was obtained on one night only (11 May 2015) and represents a very low proportion of the total files recorded over the two survey events (three calls from this genus out of a total of over 1500 files recorded). Call data for this genus was not recorded during the spring-summer survey event. Given the difficulty in distinguishing species in this genus from call data, the *Targeted Species Survey Guidelines* (Queensland) for the Coastal sheathtail bat recommends roost searches as the optimal survey approach. The field survey revealed suitable habitat for the Coastal sheathtail bat is present within some of the rocky slopes along shorelines surrounding the study area and targeted searches were conducted in accordance with the survey guidelines. These searches for roost sites were conducted within suitable habitat along the rocky coastline areas at low tide. No active roost sites were located during these targeted searches.

No evidence of any other mammals listed as threatened or near threatened was observed within the study area during either of the fauna survey events.

2.2 Reptiles

In total, 14 species of reptiles from four families were observed within the study area (see Appendix F). The majority of reptile species recorded are common and widespread throughout the region and in many cases distributed over a large expanse of coastal and sub-coastal Queensland.

The eucalypt woodlands throughout the study area in particular provide habitat for an array of skink species, with a total of nine species recorded over the two survey events. Schmeltz's Rainbow Skink (*Carlia schmeltzi*) and the Lively Rainbow Skink (*Carlia vivax*) were recorded commonly throughout a variety of habitats within the study area. The Major Skink (*Bellatorias frerei*) was recorded in more dense vegetation on hill slopes dominated by RE 8.12.14c in the surrounding National Park areas. The Northern Bar-sided Skink (*Concinnia brachyscoma*) was recorded in rocky habitats, generally associated with vine thicket vegetation. While the Fine Spotted Mulch Skink (*Glaphyromorphus punctulatus*) was only recorded at sites 3 and 4, this is a cryptic species sheltering beneath leaf litter and soft soils and likely occurs in a variety of habitats throughout the study area.

Brown Tree Snakes (*Boiga irregularis*) were recorded during both survey events near the intertidal zone where a drainage line occurs within rocky vine thicket habitat. A single Lesser Black Whipsnake (*Demansia vestigiata*) was captured within Broad-leaf Tea-tree woodland, and this capture is notable as there are very few records of this species from Lindeman Island.

No evidence of any reptiles listed as near threatened or threatened was observed within the study area.

2.3 Amphibians

The only native amphibian species recorded within the study area was the Green tree frog (*Litoria caerulea).* There are no records of any other native amphibian species occurring on Lindeman Island. The introduced pest species, Cane toad (*Rhinella marina*) was observed to be abundant within drainage lines throughout the study area as well as habitat surrounding Gap Creek Dam. However, this pest species was observed in virtually all habitat types throughout the study area.

There are no threatened amphibian species known to occur in the region, and this was supported by the outcomes of the desktop analyses.

2.4 Birds

A total of 47 species of birds from 30 families were observed within the study area over the two survey periods. This species assemblage includes a number of sedentary, nomadic, and migratory species. The majority of species observed are common in eucalypt woodland habitats throughout the region. The wetland habitat associated with Gap Creek Dam also supports a variety of common wetland bird species.

Both fauna survey events included shoreline surveys for shorebirds, and focussed on identifying their presence and habitat use in the study area and surrounding National Park land. These surveys were also performed to target threatened shorebird species, identified during desktop analyses as likely to be present. These include the Beach Stone-curlew (*Esacus magnirostris)* and the Eastern Curlew (*Numenius madagascariensis*). The only shorebird species identified during these targeted surveys was the Sooty Oystercatcher (*Haematopus fuliginosus*). A pair of Sooty Oystercatchers were observed flying south along the shoreline in the bay to the south of Coconut Beach during the May 2015 survey period. This species has a ‘least concern’ conservation status and occurs on coasts and islands throughout Australia.

Four species listed as migratory under the EPBC Act were recorded in the study area. White-bellied Sea-eagle (*Haliaeetus leucogaster*), and Eastern Osprey (*Pandion haliaetus*) were recorded flying above the coastline in the study area. These species occur over a broad distribution comprising much of coastal Australia. The Brown Booby (*Sula leucogaster*) was observed flying over water between Lindeman Island and Shaw Island. One Spectacled Monarch (*Monarcha trivirgatus*) was recorded in the *Eucalyptus* and *Pandanus* forest at Site 3. This species occurs throughout many habitats on the east coast of Australia. While not specifically identified as migratory in the species lists under the EPBC Act, the Crested Tern (*Thalasseus bergii*) is listed in the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). The Crested Tern was observed roosting on channel markers for

the existing jetty. The likelihood of impacts to these species and other migratory species listed under the EPBC Act are discussed in the Impact Assessment section of this report.

2.5 Pest Animal Species

Evidence or direct observation of three pest species was detected during the fauna surveys, all of which commonly occur in disturbed habitats throughout Queensland. The following species were observed within the study area:

- Cane toad (**Rhinella marina*)
- Black rat (**Rattus rattus*)
- Asian house gecko (**Hemidactylus frenata*)

Impact Assessment

1. Matters of State Environmental Significance

The following sections detail the presence of MSES, as identified in the *Environmental Offsets Regulation 2014* (Qld). The potential for impacts to these matters is discussed with reference to the *Queensland Environmental Offsets Policy – Significant Residual Impact Guideline*. Habitat for endangered or vulnerable species ('protected wildlife') is discussed in section 1.4; however, further details regarding the potential occurrence of conservation significant species is provided in sections 3 and 4.

1.1 Regulated Vegetation

General Impacts

The majority of the regulated vegetation within the study area is RE 8.12.12d, which has a 'least concern' VM Act class and a 'no concern at present' biodiversity status. Under the current design concept (dated November 2016), this community represents the main vegetation type where disturbance to remnant vegetation will occur. The total area of this remnant community to be cleared as a result of the operational disturbance footprint of the proposed action is 4.97 hectares (see Remnant Vegetation Disturbance Map in Appendix A). Disturbance to this community includes an Asset Protection Zone, as identified in the *Bushfire Hazard and Risk Assessment* prepared by Cardno (2016). This protection zone will involve some disturbance to remnant RE 8.12.12d vegetation as well as management of vegetation to reduce fuel loads. All remnant vegetation disturbance for the Asset Protection Zone is proposed to occur within this 'least concern' RE 8.12.12d community and the total area is 2.0 hectares (see Remnant Vegetation Disturbance Map in Appendix A). Fuel reduction practices are unlikely to significantly impact the biodiversity values of this community, particularly since key fuel reduction strategies involve removal of environmental weed species such as Guinea Grass and Lantana. This vegetation community is widespread on Lindeman Island and in the broader area, and it is unlikely clearing the small areas of this community located within the proposed disturbance footprint will significantly impact the functioning of this vegetation community. This community does not equate to MSES as defined in the *Environmental Offsets Regulation 2014* (Qld).

Multiple areas containing remnant vegetation consistent with RE 8.12.11a occur within the disturbance footprint of the current design concept (dated November 2016). RE 8.12.11a has a 'least concern' VM Act class and 'no concern at present' biodiversity status. However, it is listed as a TEC under the EPBC Act, and is therefore discussed as a MNES below in Section 2. The ground-truthed extent of this community has been incorporated into the current design concept and impacts to this community have been avoided by design. Locations where this community occurs in close proximity to vegetation clearing areas will include buffers and will be managed to ensure the maintenance of the biodiversity values they support. RE 8.12.11 is not a MSES

under the Queensland environmental offsets framework, but this community is listed as a TEC under the EPBC Act and potential impacts to this community and relevant impact mitigation and management strategies are discussed in Section 2.1.

In the current design (dated November 2016) a small extension of the disturbance area at the northern end of the runway strip may impact some vegetation at the ecotone of RE 8.12.12d and RE 8.12.14c. This is the only location where disturbance to RE 8.12.14c vegetation may occur, although no direct disturbance to this community is proposed. RE 8.12.14c has a 'least concern' VM Act class and 'no concern at present' biodiversity status. All other areas of RE 8.12.14c are located within the lease area to be surrendered or the current National Park land. This vegetation community is widespread on Lindeman Island and in the broader area, and it is unlikely the small disturbance area proposed for this community will result in a significant impact to the community at any scale. This community does not equate to a matter of state environmental significance as defined in the *Environmental Offsets Regulation 2014* (Qld).

Endangered Regional Ecosystem 8.3.2

RE 8.3.2 is an endangered community under the VM Act, which is dominated by Broad leaf tea-tree, and occurs in the area surrounding the existing runway strip. The current development design (dated November 2016) includes an expansion of the disturbance area relating to the runway strip. Consequently some disturbance to RE 8.3.2 vegetation will occur as part of this expansion (see Broad leaf tea-tree community map in Appendix A).

The proposed disturbance to this community involves a small expansion of the cleared area for the runway and some lopping of vegetation beyond the cleared areas to heights appropriate for compliance with relevant aviation standards and codes. Vegetation trimming/lopping will need to occur as a height gradient, with a 20**°** transitional surface commencing at the edge of the 60 metre wide runway strip.

Vegetation assessments conducted throughout various sections of this community revealed the mean undisturbed canopy height to be 9.9 metres. This canopy height is consistent with the technical description published by the Queensland Herbarium, which identifies the mean height for this community as 9.8 metres. In applying the criteria for remnant vegetation status under the VM Act, the predominant canopy must average greater than 70% of the vegetation's undisturbed height. Any lopping of vegetation that does not retain greater than 70% (>7 metres) of the mean height for this community will result in a significant change to the structure of the community and should be regarded as 'clearing' for the purposes of impact assessment.

Lopping of vegetation that retains greater than 70% of the mean height is unlikely to result in changes to the structure and composition of this community to an extent that remnant status will be affected, and this activity is not classified as clearing in the following impact assessment. This is consistent with the definitions provided in the VM Act, whereby "*lopping a tree, means cutting or pruning its branches, but does not include –*

- *removing its trunk; and*
- *cutting or pruning its branches so severely that it is likely to die.*"

The areas where 'clearing' (vegetation trimmed to <7 metres height) and 'lopping' (vegetation retained to >7 metres height) of RE 8.3.2 are proposed are shown on the Broad Leaf Tea-tree Community map in Appendix A. This map also shows the areas of this community that will

remain undisturbed. Appendix A also includes a figure showing cross section of the runway strip and the ground-truthed extent of RE 8.3.2 as it relates to the proposed disturbance areas including the transitional surface from the edge of the runway strip (DBI 2016).

The total ground-truthed area of RE 8.3.2 is 12.85 hectares and, under the current design concept (November 2016), 7.71 hectares are to be retained undisturbed. In addition to the undisturbed areas, a further 1.94 hectares will have the canopy trimmed only and will be retained as a buffer zone to the remnant community. The 7.71 hectares of RE 8.3.2 to be retained outside the clearing area equates to 60% of the total ground-truthed extent of this community within the study area. The proposed disturbance area for clearing of RE 8.3.2 is 3.18 hectares, which equates to 24.7% of the ground-truthed extent of this community in the study area. The trimmed vegetation to be retained as a buffer zone (1.96 hectares) equates to 15.3% of the ground-truthed extent of this community. The combined footprint for clearing and trimming of this community is 5.14 hectares and this forms the 'impact area' for the purposes of this impact assessment

RE 8.3.2 is not known from other islands in the Lindeman-Whitsunday area, but is present in coastal areas on the mainland. Data provided by the Queensland Herbarium (2011), and published in the Commonwealth Listing Advice for this community (TSSC 2012), identifies the extent of RE 8.3.2 (in 2009) as 7,758 hectares. The proposed clearing disturbance area (including vegetation to be trimmed) for this community therefore represents a 0.066% loss to the extent of this community in the Central Queensland Coast bioregion.

The location options for a runway strip on Lindeman Island are limited by topographical constraints, and utilising the existing disturbance area represents the most appropriate way to minimise vegetation clearing. The proposed expansion of the runway strip has minimised the disturbance to RE 8.3.2 where possible by aligning construction with the western edge of the existing disturbance area. As discussed previously, ground-truthing and vegetation condition assessments revealed the full extent of the community on the western side of the runway strip is subject to significant disturbance from exotic species, particularly Guinea grass, which has considerably reduced the biodiversity values for this area. The proposed expansion has been aligned such that disturbance to remnant vegetation is concentrated on areas of poorer condition. Disturbance where the community is relatively intact is minimised.

The approach to vegetation clearing for the runway strip expansion includes methods to minimise the total disturbance as much as possible. In this regard, trimming, rather than complete removal of vegetation, is proposed to meet the requirements of relevant aviation codes. While this approach will affect the remnant status of some areas and result in some changes to the community structure, it allows for at least some retention of biodiversity values associated with this community.

The proposed alignment of the runway strip also represents the minimum possible disturbance to National Park tenure for a runway strip compliant with relevant codes and standards. By aligning the proposed runway strip to the western side of the existing disturbance area, the proposed clearing area, including vegetation to be trimmed to less than seven metres height, primarily occurs within the existing perpetual lease tenure. Clearing within National Park land, including areas subject to a current term lease has been avoided to the fullest possible extent.

The extent of this community to be retained is located in lease areas intended to be surrendered to National Park land under new tenure arrangements. This approach ensures the long-term

protection of this community and the biodiversity values it supports. One of the key approaches to ensuring the long-term maintenance of biodiversity values will be the implementation of a weed management and control program. This will ensure the maintenance of biodiversity values for retained vegetation, as well as improving the condition of areas that have existing weed invasion. While these approaches may result in increased protection and improved condition for the retained areas, assessment against the significant residual impact guideline under the Queensland environmental offsets framework is required in the context of the scale of disturbance.

The significant residual impact guideline identifies two hectares as the relevant threshold for disturbance to RE 8.3.2 (which has a 'sparse' structural category). Therefore, significant residual impacts to this community resulting from the 5.14 hectare impact area will be mitigated by way of an environmental offset in accordance with the requirements under the Queensland environmental offsets framework. The proposed environmental offset delivery mechanism is discussed in 'Section 2 - Environmental Offsets' of the 'Impact Management and Recommendations' section below.

Of Concern Regional Ecosystem 8.12.13a

Scattered areas of the native grassland community RE 8.12.13a are located within the study area. Under the current design concept (November 2016) some areas of these grassland communities have the potential to be impacted by direct disturbance from development in these areas. RE 8.12.13a has an 'of concern' VM Act class and biodiversity status and is therefore a MSES under the Queensland environmental offsets framework.

There are five patches of this grassland community with relevance to the proposed disturbance footprint, including two at the southeast extent and two at the southwest extent of the current lease area (see Native Grassland Disturbance Areas Map in Appendix A). A commercial camping area has also been proposed in an area supporting a patch of native grassland vegetation in in the adjacent National Park (Appendix A). The development design has avoided areas of the critically endangered Littoral Rainforest and Coastal Vine Thickets of Eastern Australia community listed under the EPBC Act. However, partly as a consequence of this, the development disturbance footprint includes some small areas of native grassland. As discussed in previous sections, the biodiversity values of the native grassland areas within the lease areas have been significantly impacted by historical land uses and consequently non-native species are abundant and remnant areas are highly fragmented. Rapid assessments and observations in the surrounding National Park land show the native grassland community occurs over a much larger area in the adjacent National Park, and in general these areas are less fragmented and degraded by exotic species invasion. Overall, the disturbance to native grassland has been restricted to small fragments with low biodiversity value, while larger more intact areas will remain in the surrounding National park land.

The location of proposed resort infrastructure with respect to the extent of RE 8.12.13a is depicted in the Native Grassland Disturbance Areas Map (Appendix A). The total ground-truthed extent of this community in areas where resort infrastructure is proposed is 4.19 hectares. The disturbance footprint for the resort infrastructure at each of the four patches in the existing lease area encompasses these patches in such a way that the biodiversity values of the grassland community cannot be retained. These areas form a total of 4.19 hectares of native grassland

disturbance area. However, the proposed camping-style infrastructure in the National Park land on the western point has been designed to avoid remnant areas of RE 8.12.13a and retain the native grassland values in this area.

Spatial interrogation of the vegetation management regional ecosystem and remnant map (DNRM 2015) identified the total area where RE 8.12.13a occurs as a single unity polygon is 2,014 hectares. This is the most conservative area estimate possible for RE 8.12.13a, because this community also occurs commonly as part of mixed polygons. Therefore, as a generous estimate, the proposed disturbance to RE 8.12.13a represents a 0.21% loss at the regional scale. However, the actual loss is likely to be significantly less than this figure. For example, this community is mapped over an additional 2,230 hectares where it occurs as the primary RE unit in mixed polygons. Furthermore, this approach has also excluded areas where vegetation is mapped as RE 8.12.13 without specifying the community type ('a' or 'b').

The *Queensland Environmental Offsets Policy – Significant Residual Impacts Guideline* identifies a disturbance area threshold of two hectares for significant residual impacts to REs with a 'sparse' structural category. The proposed disturbance to RE 8.12.13a is in excess of the two hectare threshold, and therefore the proposed disturbance equates to a significant residual impact under the Queensland environmental offsets framework. Significant residual impacts to this community will be mitigated by way of an environmental offset in accordance with the requirements under the Queensland environmental offsets framework. The proposed environmental offset delivery mechanism is discussed in 'Section 2 - Environmental Offsets' of the 'Impact Management and Recommendations' section below.

1.2 Connectivity Areas

As stated previously the study area itself does not form a critical link between any habitat areas, and therefore the connectivity value of the vegetation communities within the study area is generally low. The majority of native vegetation clearing associated with the proposed action is to occur within or immediately adjacent to areas of existing disturbance for the current resort development. The current design concept (November 2016) will not result in significant fragmentation or isolation of any habitat areas. Consequently, movement of fauna and other factors affecting biodiversity (such as plant propagation, vegetation community structure, feeding patterns and genetic flow) in the area are unlikely to be any further impacted by the small loss of habitat associated with the current design concept. It is unlikely the function of connectivity will be affected significantly at any scale.

Given the proposed actions is primarily limited to the existing disturbance footprint and will not result in the fragmentation or isolation of any habitat areas, the establishment of movement corridors within the development footprint is unwarranted. There is no advantage to biodiversity values to be gained by encouraging wildlife to move through the resort area through the establishment of corridors.

1.3 Watercourses and Wetlands

Gap Creek Dam is located within the study area and this feature supports a permanent water body, aquatic vegetation and a variety of wetland associated fauna species. This water body is

to be retained as part of the proposed action, with a minor increase in size due to the addition of a drainage diversion northeast of the existing footprint. While there is some resort infrastructure proposed along the western margin of the dam, development in this area is unlikely to impact the habitat or lifecycle of any wetland species. The proposed drainage diversion represents a minor alteration to increase surface flows to the dam. This modification will not significantly alter the hydrological regime of the existing wetland habitat.

There are no wetlands of international significance (e.g. Ramsar wetlands) within or near the study area. No wetland protection areas are shown on the Queensland Map of Referrable Wetlands within the study area. However, some areas of the shoreline contain mapped areas of 'General Ecological Significance' wetlands, including the southern portion of the study area and the proposed location for the safe harbour and other revetment works. There are no significant or critical terrestrial flora and fauna biodiversity values associated with these shoreline areas. Increased visitation on shoreline areas associated with the resort may reduce the suitability of these habitat areas for shorebird species. However, the majority of shoreline areas involving visitation relevant to the proposed action are the same as those utilised by the existing resort development. The shoreline habitat relevant to the proposed action is not an important area of habitat for shorebirds or other migratory species. There are substantial areas of similar or better quality habitat for shorebirds at the locality and in the broader region. The proposed action is unlikely to impact the lifecycle of an ecologically significant proportion of any shorebird species with potential to occur in the area.

There are some minor drainage features within the study area and surrounding landscape, but none of these features retain water in such a way as to provide significant aquatic habitat. The drainage features do not support riparian vegetation communities and in general they do not contain any significant additional biodiversity to the surrounding landscape. The vegetation in these drainage areas is a continuation of the non-riparian eucalypt woodland and coastal vine thicket communities of the surrounding area. None of the drainage features in close proximity to the study area are shown on a Vegetation Management Watercourse Map, and therefore the vegetation associated with these features does not represent a MSES under the Queensland environmental offsets framework.

1.4 Protected Wildlife Habitat

Essential habitat is mapped within the project area for the Coastal Sheathtail Bat, as shown on the State regulated vegetation mapping. All mapped remnant vegetation on Lindeman Island is identified as essential habitat for this species on the State published regulated vegetation map. The conservation status of this species was changed to near threatened on 12 December 2014 and therefore this species is not considered protected wildlife in accordance with the VM Act.

While habitat for this species does not equate to a MSES, potential impacts to this conservation significant species have been evaluated to ensure appropriate impact avoidance and management strategies are employed. Most of the vegetation communities in the study area support suitable foraging habitat for this species and similar habitat is abundant in the surrounding landscape. It is unlikely the proposed action will cause significant impacts to foraging habitat for the Coastal Sheathtail Bat.

Rocky areas within the large polygon of coastal vine thicket on the west coast of the study area provide potential roosting habitat for this species. The *'Targeted Species Survey Guidelines: Taphozous australis'* published by the State of Queensland identifies this species depends on coastal roosts, preferring sea caves and rocky clefts. Rocky areas are present along various parts of the shoreline within the study area, particularly within the western portion mapped as RE 8.12.11a and these areas provide some potential roosting habitat for this species. However, this species was not detected during targeted roost searches within this habitat.

Echolocation call data potentially attributable to this species (identifiable to the genus level only) was recorded from an Anabat detector located on Gap Creek Dam wall on 11 May 2015. Only a very small proportion of the files recorded (three of the 687) at that location were attributed to *Taphozous*. Call data from this genus was not recorded at any other locations or habitat types during the remainder of the May 2015 survey and no call data from this genus was recorded during the December 2015 survey.

The main area of rocky habitat containing potentially suitable roosting habitat near the study area is located outside the current lease area. Disturbance to this habitat will be avoided and a substantial buffer will be implemented. On the basis of this avoidance approach, it is unlikely there will be a significant impact on roosting habitat for this species.

The Coastal Sheathtail Bat is listed as near threatened under the NC Reg and is not listed under the EPBC Act. Habitat for near threatened species is not a prescribed matter in the *Environmental Offsets Regulation 2014*. Therefore, an assessment against the significant residual impact criteria is not required for this species. However, as discussed previously, it is unlikely the proposed action will result in a significant impact to this species or its habitat.

1.5 Protected Areas

Some of the current perpetual lease and term lease areas are proposed for surrender to the Lindeman Islands National Park. These areas are depicted as A1, A2 and A3 on the proposed tenure plan arrangements map.

Area 'A1' is National Park land subject to a current term lease that is to be surrendered under the proposed tenure plan. This land supports multiple remnant vegetation communities that are generally highly intact and consistent with the biodiversity values and ecological condition of the surrounding protected area estate. This land supports a Broad-leaf Tea Tree community (RE 8.3.2), which has an 'endangered' VM Act class and biodiversity status and part of this community is equivalent to a TEC listed under the EPBC Act. The full extent of the community that equates to the TEC listed under the EPBC Act (minus a small section of vegetation proposed to be cleared for expansion of the runway strip) occurs within the land proposed for surrender to the National Park. The surrender of land supporting the Broad-leaf Tea Tree community represents a significant addition to the biodiversity values of the National Park, as this endangered community is currently poorly represented within protected areas in the sub-region. Lindeman Island is also the only location in which this community occurs on an Island within the Whitsunday group. The biodiversity values associated with this community contained within area A1 are therefore consistent with, or higher than, the values represented within the surrounding National Park land.

The other vegetation communities present within area A1 are Eucalypt woodland (RE 8.12.12d) and Brush Box open forest (RE 8.12.14c). These communities characterise the vast majority of vegetated areas on Lindeman Island and are broadly represented in the surrounding protected area estate. The values supported by these communities in area A1 are consistent with those of the communities located in the National Park. Overall these communities are generally intact, but there is some disturbance from invasion by exotic ground cover species in the southern portion of area A1 on the eastern side of the runway strip. There are also edge effects in the form of exotic ground cover species present in area A1 on the western side of the runway strip. This disturbance is representative of conditions in the surrounding area, including National Park tenure, which includes a history of grazing by introduced species.

Area A2 supports Eucalypt woodland (RE 8.12.12d) and Broad-leaf Tea Tree vegetation communities (RE 8.3.2) similar to those described previously for area A1. The eucalypt woodland community is intact and represents equivalent condition and habitat value to the same community in the surrounding National Park land. The Broad-leaf Tea Tree community is subject to significant disturbance from exotic ground cover species invasion, as described previously. While the full extent of this community in area A2 represents an endangered RE, the biodiversity value is somewhat compromised by the abundance of these exotic species. A restoration program in conjunction with delivery of an environmental offset is proposed for the full spatial extent of this community in area A2. The proposed drainage diversion for Gap Creek Dam is located in area A2. All disturbance resulting from the construction of this drainage diversion will be rehabilitated prior to the surrender of this land. While there is some existing and proposed disturbance in area A2, the rehabilitation and restoration works for the vegetation communities in this area will restore the ecological condition to a state consistent with National Park values.

Some areas containing the endangered Broad Leaf Tea-tree community may be held under a term lease to enable vegetation management and environmental offset activities to occur, including improvements to the condition of this community through the eradication of weed species. These works will improve the ecological condition of impacted areas of this community and restore ecological function to ensure the long-term maintenance of biodiversity values. Further details on approach to environmental offset deliver and rehabilitation are provided in the following sections of this report.

Area A3 supports a mosaic of native and non-native grassland vegetation, which has been impacted by historical land uses in such a way that some areas are dominated by non-native species. While this disturbance reflects a habitat condition similar to much of the adjacent land located within the National Park tenure, a vegetation management program to restore the ecological condition of this community is proposed as part of the tenure swap. These restoration works may also form part of an environmental offset strategy for impacts to areas of this grassland community located within the perpetual lease area. Overall area A3 supports values consistent with those located within the surrounding National Park land, and the ultimate protection of the ‘of concern’ grassland community within the protected area estate represents a positive conservation outcome.

An area on the western coastline is proposed for a commercial camping facility and will be subject to a term lease, and therefore not removed from National Park tenure. A commercial operator permit will be required for activities conducted in this National Park area. The siting of

this infrastructure has been designed to avoid disturbance to the 'of-concern' grassland community present at this location. The facility is located within disturbed areas of non-remnant vegetation with access from the existing resort disturbance footprint via an area of 'least-concern' (RE 8.12.12d) eucalypt woodland vegetation. The biodiversity value of the non-remnant area is low due to the abundance of invasive (non-native) ground cover and shrub species. The biodiversity value of the eucalypt woodland vegetation is similar to that of the remaining extent of this community within the National Park tenure, and this community is broadly represented in the surrounding landscape.

Some of the existing and proposed resort infrastructure is located within a current term lease area. This land is intended to be removed from the National Park and placed under a perpetual lease. Areas proposed to be removed from National Park land will need to be offset through tenure swap negotiations and financial compensation arrangements.

Disturbance to certain areas of the protected area estate are unavoidable for reasons such as aviation safety. Detailed descriptions of proposed land tenure arrangements are provided in Section 6 of the EIS and include requirements for protected area revocation and proposed compensation arrangements. Areas proposed for revocation largely encompass areas of existing disturbance from the current resort infrastructure footprint such as the golf course.

There is one larger area of native habitat located in the area to be revoked and this is intended to be subject to a Nature Refuge agreement (see Chapter 6 of EIS – identified as area 'C2' on the Tenure Plan Arrangements Map). This area (C2) supports a remnant Eucalypt woodland community (RE 8.12.12d) and associated habitat values. This community provides potential foraging habitat for the near threatened Coastal Sheathtail Bat and there is a record and potential call data from this species in the local area. The remnant community is adjacent to Gap Creek Dam and provides generic foraging, roosting and nesting habitat for fauna species in the local area. The habitat at this location is generally intact, remnant woodland vegetation dominated by eucalypt species such as Poplar Gum and Narrow-leaved Ironbark. There is relatively minimal invasion by exotic species, and a similar composition of microhabitat features to those found in the same habitat types in the surrounding protected area estate.

Potential impacts to various biodiversity values of the protected area estate and relevant management strategies have been identified and discussed in the Impact Assessment and Impact Management sections of this report (see Regulated Vegetation, Connectivity Areas, Listed Threatened Ecological Communities, Conservation Significant Fauna Species, Risk Assessment, and Environmental Offsets).

2. Matters of National Environmental Significance

The following sections detail the presence of MNES and potential impacts to these matters as assessed with reference to the *Matters of National Environmental Significance - Significant Impact Guidelines 1.1* (Commonwealth of Australia, 2013). Listed threatened species and ecological communities are discussed in Section 2.1 and 2.2 respectively; however, further details regarding the potential occurrence of conservation significant species are provided in Sections 3 and 4.

2.1 Listed Threatened Species

No evidence of any threatened flora or fauna species was detected during the systematic and targeted survey approaches conducted within the lease areas and surrounding National Park land. The flora and fauna surveys included substantial coverage of the habitat types and general spatial variability within the study area, as well as incorporating multiple seasonal conditions into the survey. It is possible that some threatened species with potential to occur in the area, particularly non-resident species, may go undetected during field surveys. To account for this, desktop analyses including database searches were employed in conjunction with the field survey programs to assess the likelihood of occurrence of threatened species including those not detected during field surveys. This approach ensures consideration is given to all threatened species that may occur within the study area. The outcome of the desktop analysis and field surveys is that it is unlikely the proposed action will result in significant impacts to any terrestrial threatened flora or fauna species listed under the EPBC Act. Further details on assessments of significance for threatened species are provided below in sections 3 and 4.

2.2 Listed Threatened Ecological Communities

Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Community

The EPBC Act listed Littoral Rainforest and Coastal Vine Thickets of Eastern Australia TEC occurs in multiple sections of the study area. Small areas of this community are located along the southern and south-western coastline and a larger continuous tract occurs along rocky slopes of the western coastline. The current design concept (November 2016) avoids disturbance to all ground-truthed areas where this community occurs. On the basis of this approach, direct disturbance to this community has been avoided entirely.

This community should be buffered with a hazard reduction zone of at least five metres. This buffer zone will allow for the management of indirect impacts, such as invasion by pest plant species on the margins of these communities. Invasion by weeds has the potential to structurally transform and reduce the biodiversity values of these communities (DEWHA, 2009). The implementation of a hazard reduction zone will also allow for the prevention of disturbance from inappropriate fire regimes and visitor impacts.

Broad Leaf Tea-tree (*Melaleuca viridiflora*) Woodlands in High Rainfall Coastal North Queensland Community

Description of Community and Nature of Impacts

As discussed in previous sections, not all of the Broad leaf tea-tree vegetation within the study area equates to the TEC listed under the EPBC Act. Only the high-value vegetation that meets the condition thresholds for protection under the EPBC Act has been included in the community mapping and impacts assessment. Highly degraded patches of Broad leaf tea-tree woodland have been excluded from the mapping and impact assessment (see map in Appendix A).

The full extent of vegetation consistent with the Broad leaf tea-tree woodland TEC is restricted to a single patch on the eastern side of the runway strip (Appendix A). The total patch size for

this area of the Broad leaf tea-tree woodland TEC is 5.38 hectares. Under the current design concept (November 2016), there is a proposed expansion of the runway strip and some vegetation clearing and lopping is required to comply with relevant aviation codes. The extent of this disturbance, as it relates to MNES, has been minimised by aligning the runway upgrade to the western edge of the existing disturbance area. This approach has resulted in the majority of vegetation disturbance occurring in areas of degraded habitat, and minimised disturbance to the mapped area of the TEC. However, some disturbance to this community is unavoidable.

As discussed in previous sections, the approach to vegetation clearing for the runway strip expansion includes methods to minimise the total disturbance as much as possible. In this regard, trimming, rather than complete removal, of vegetation is proposed to meet the requirements of relevant aviation codes. While this approach will result in some changes to the community structure, it allows for the retention of biodiversity values associated with this community.

As discussed for RE 8.3.2, the extent of this community to be retained is located in lease areas intended for surrender to National Park land under new tenure arrangements. This approach ensures the long-term protection of this community and the biodiversity values it supports. One of the key approaches to ensuring the long-term maintenance of biodiversity values will be the implementation of a weed management and control program. This will ensure the maintenance of biodiversity values for the community and prevent degradation from weed invasion. While these approaches may result in increased protection and improved condition for the TEC, consideration must be given to the scale of the impact from direct and indirect disturbances resulting from the proposed action.

Assessment of Significance

In accordance with the *MNES Significant Impact Guidelines*, an action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- reduce the extent of an ecological community
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
- adversely affect habitat critical to the survival of an ecological community
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
    - assisting invasive species, that are harmful to the listed ecological community, to become established, or

- causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
- interfere with the recovery of an ecological community.

The following sections detail an assessment of significance for impacts to the Broad leaf tea-tree woodland with specific reference to the criteria identified in the *MNES Significant Impact Guidelines.*

Reduction in extent

The disturbance area for the proposed runway strip expansion includes 1.5 hectares of the Broad leaf tea-tree woodland TEC. This area includes all vegetation to be trimmed as part of the transitional surface requirements associated with the runway strip. As discussed previously for RE 8.3.2, it is unlikely areas where trimming will still retain greater than 70% of the mean height of the community will be significantly impacted, as the species composition and structure will be retained. Nonetheless, as a precautionary approach, the impact area for the purposes of this assessment is the full 1.5 hectare disturbance area (including 0.69 hectares that it to be trimmed only). The proposed disturbance area will result in a 27.9% reduction in the extent of this TEC on Lindeman Island. The Broad leaf tea-tree woodland TEC occurs across the central Queensland coast and wet tropics bioregions. The Commonwealth listing advice for this community (TSSC 2012) provides estimates on the current extent (2009) of this community, based on data from the Queensland Herbarium (2011). The estimated extent of this community in the listing advice (TSSC 2012) is 28,396 hectares. The proposed disturbance area equates to less than a 0.003% reduction in the total extent of this community. Experts from the Queensland Herbarium put forward estimates of the extent to which this community remains in an ecologically functional state (Queensland Herbarium 2011). These estimates identified the current ‘functional’ area of this community as 16,175 hectares. Therefore, using this more conservative figure, the proposed disturbance area represents a 0.0049% reduction in the total extent of this community. The reduction in extent at the regional scale is very minor; however, this community has a very limited distribution at the local scale. While the proposed action will only result in significant disturbance to 1.5 hectares of the community, this reduction in extent will require provision of an environmental offset for impacts at the local scale. Environmental offset delivery mechanisms are discussed in ‘Section 2 - Environmental Offsets’ of the ‘Impact Management and Recommendations’ section below.

Fragmentation

The relevant disturbance footprint is restricted to one edge of the TEC polygon and will not cause increased fragmentation of the community (see map in Appendix A).

Critical Habitat

Other than the previously identified 1.5 hectare clearing area, the proposed action is not likely to adversely affect habitat critical to the survival of the community. Impacts to relevant habitat will be restricted to the disturbance footprint. This small disturbance area is unlikely to significantly impact the survival of this community at any scale.

Abiotic factors

The nature of the proposed disturbance to the community will be minimised as much as possible, and will not involve significant alteration to abiotic factors relevant to the survival of the community.

Species Composition

As discussed previously for RE 8.3.2, trimming of vegetation in some areas may result in changes to the species composition, but this disturbance has been incorporated into the 1.5 hectare impact area discussed above. Any significant impacts to species composition will be restricted to the disturbance area discussed previously in *Reduction in extent*.

Ecological integrity

The proposed disturbance involves clearing or trimming vegetation along the margin of the community. The vegetation condition assessments and community surveys revealed edge effects from exotic species invasion are currently present within the community. As noted in previous sections, invasion by exotic grass species represents the most significant threat to this community, and has significantly impacted other patches of Broad leaf tea-tree woodland in the study area. The proposed disturbance will not result in a greater perimeter exposed to edge effects, and the extent to which the margin of the community is exposed to potential edge effects will be approximately the same. The trimmed vegetation area provides a buffer zone with a minimum of 15 metres where vegetation will be retained and managed to prevent impacts from edge effects to the retained areas of the listed community. The main focus of this buffer zone will be to prevent impacts from exotic species invasion in the ground layer which is a known local threat to this community. Weed management practices specific to preventing degradation of this community should be implemented during the construction phase and ongoing monitoring should be conducted to ensure the maintenance of biodiversity values. The potential for impacts to the ecological integrity of the community will be mitigated through the implementation of a *Vegetation Management Plan*. This plan will incorporate specific measures to manage exotic species invasion, particularly exotic grass species that pose a threat to the ecological integrity of the Broad leaf tea-tree TEC.

Recovery

There is no recovery plan currently in place for the Broad leaf tea-tree woodlands TEC. Given the small size of the proposed disturbance area relevant to this TEC, and that the remaining extent of this community on Lindeman Island is unlikely to be impacted, it is unlikely the proposed action will negatively affect the recovery of this community at any scale. The implementation of weed control measures in the degraded patches of this community could result in the increased recovery of this community at the local scale.

2.3 Listed Migratory Species

Four migratory bird species listed under the EPBC Act as migratory were observed during the survey. These included:

- White-bellied Sea-Eagle (*Haliaeetus leucogaster*)
- Eastern Osprey (*Pandion haliaetus*)
- Spectacled Monarch (*Monarcha trivirgatus*)

- Brown Booby (*Sula leucogaster*)

These observed species are relatively common throughout their distribution and suitable habitat is found throughout the local area. No habitat features unique to the study area and no nesting sites for these species were detected during the filed surveys. Given the broad distribution and highly mobile nature of these species, it is unlikely the proposed action will have a significant impact on any the migratory species observed within the study area.

Table D3 in Appendix D provides a list of all migratory species that have the potential to occur within the study area and an assessment of their likelihood of occurrence. Of these 42 listed migratory bird species, the majority are widespread throughout coastal Australia. These species occur in a broad range of habitats including those present on the shorelines as well those associated with Gap Creek Dam. However, none of the habitat features present are unique to the study area, but rather, these features are abundant in the local area and throughout the region.

No nesting sites for any listed migratory bird species were observed during the surveys. The habitat within the study area may provide foraging opportunities for migratory species, particularly intertidal zones and sandy shorelines. Disturbance from increased visitation on shoreline areas may restrict the suitability of these habitats for foraging by bird species. However, the shoreline habitat relevant to the proposed action is not an important area of habitat for shorebirds or other migratory species. There are substantial areas of similar or better quality habitat for shorebirds at the locality and the broader region. Therefore, the proposed action will not cause a significant decline in the availability and quality of the habitat for these species. The proposed action is unlikely to impact the lifecycle of an ecologically significant proportion of any shorebird species with potential to occur in the area.

2.4 Wetlands of International Importance

There are no declared Ramsar wetland areas or other wetlands of international importance within the study area or the broader area. It is therefore unlikely there will be any significant impacts to wetlands of international importance as a consequence of the proposed action.

2.5 Great Barrier Reef World Heritage Area

The terrestrial ecological values within the study area relevant to the Great Barrier Reef World Heritage Area (WHA) have been discussed in the above Results and Impact Assessment sections. There are no additional biodiversity values relevant to the Great Barrier Reef WHA. With respect to ecological values for World Heritage properties, beyond those impacts previously described, the proposed action will not:

- reduce the diversity or modify the composition of plant and animal species in all or part of the WHA
- fragment, isolate or substantially damage habitat important for the conservation of biological diversity in the WHA
- cause a long-term reduction in rare, endemic or unique plant or animal populations or species in the WHA, or

- fragment, isolate or substantially damage habitat for rare, endemic or unique animal populations or species in the WHA.

2.6 Great Barrier Reef Marine Park

Lindeman Island is located within the Great Barrier Reef Marine Park, which is listed as a MNES under the EPBC Act. Marine protected areas are not part of the scope covered in this terrestrial flora and fauna assessment.

3. Conservation Significant Flora Species

No threatened or near threatened flora species were detected within the study area, despite extensive flora surveys over three different survey periods and a variety of seasonal conditions. A total of 17 conservation significant flora species with relevance to the study area were identified in the desktop analyses, based on a 50km buffer for the search area. The likelihood of occurrence within the study area for each of these species was assessed during desktop analyses using key criteria such as presence of local records, and habitat suitability/quality. From this assessment, ten species were considered to have a moderate or high likelihood of occurrence. All species with a moderate or high likelihood of occurrence are discussed below. The remaining seven conservation significant flora species identified in the desktop analyses were considered to have a low likelihood of occurring within the study area, and are not discussed further. However, details of the likelihood of occurrence assessments conducted as part of the desktop analyses are provided Appendix D, including those species identified as having a low likelihood of occurring within the study area.

Species considered to have a moderate or high likelihood of occurring within the study area as a results of the desktop analyses were as follows:

- *Trigonostemon inopinatus* (Moderate)
- *Xylosma ovata* (Moderate)
- *Callicarpa thozetti* (High)
- *Ristantia waterhousei* (High)
- *Rhodamnia glabrescens* (Moderate)
- *Solanum sporadotrichum* (High)
- *Brachychiton compactus* (High)
- *Hernandia bivalvis* (High)
- *Livistona drudei* (High)
- *Aphyllorchis anomala* (High)

With the exception of *Ristantia waterhousei, Rhodamnia glabrescens,* and *Brachychiton compactus* all other species listed above are known from only one or two records within the 50 kilometre radius search area. Many of these species were given 'moderate' likelihood of occurrence in the desktop analyses as a conservative approach based on the limited information available on their distribution and habitat requirements. Targeted field-based

surveys were therefore a key aspect for the determining the presence and potential for impacts to those species.

The distribution of *Ristantia waterhousei* is restricted to the area of Dryander National Park approximately 50km northwest of the study area on the mainland. Herbarium specimen records obtained from the Atlas of Living Australia show this species has been recorded in complex notophyll vine forests with one record specifying the landzone type as an alluvial flat. While the study area is outside the known distribution for this species, the study area does contain notophyll vine forest habitat that is potentially suitable for this species. However, despite targeted searches in suitable habitat, *Ristantia waterhousei* was not detected anywhere within the study area.

Specimen records for *Rhodamnia glabrescens* show this species occurs in two main areas, with a substantial distance between these areas. One area is located in the region surrounding Miriam Vale, which is approximately 500km south of the study area. However, another population of this species is located in Dryander National Park. There is little information available on the habitat requirements for this species, but herbarium records from specimens collected form Dryander National Park show this species has been recorded in complex notophyll vine forest on the southern slopes of Mt Dryander. The study area contains potentially suitable habitat for this species, but targeted searches in such habitat areas did not reveal any evidence of this species.

Extensive surveys have been carried out for *Brachychiton compactus* throughout the Whitsunday region and trees have only been recorded within a radius of 40km from Airlie beach. Herbarium specimen records on the Atlas of Living Australia show this species has been recorded on a number of the Whitsunday Islands and potentially suitable habitat is available in the coastal vine thicket on the western coast of the study area. This species is a conspicuous and distinctive tree and given it has not been detected over multiple survey periods, it is unlikely this species is present within the study area.

Multiple survey and targeted search techniques were conducted throughout the study area over the three survey periods and different seasonal conditions to maximise the likelihood of detecting conservation significant flora species. Numerous flora transects were conducted throughout the study area, with an emphasis on encompassing all of the vegetation communities present in the study area, and random meanders were performed to further increase the likelihood of detecting threatened flora. Despite these efforts, no threatened or near threatened flora species were found within the study are. Given the extent of the study area covered over the survey periods, and the fact that surveys were conducted during the optimal timing for the detection of these species suggests that these species are unlikely to be present with the study area. Furthermore, many of the conservation significant species considered to have potential to occur within the study during the desktop analyses are found in vine forest habitat types. The vast majority of vine forest habitat located within the study area is to be retained as part of the proposed action. Given the lack of evidence for any conservation significant flora species and the retention of potential habitat areas, it is unlikely there will be a significant impact to any threatened or near threatened flora species as a result of the proposed development.

4. Conservation Significant Fauna Species

No threatened fauna species were observed within the study area during any of the surveys conducted to date. Potential call data from the near-threatened Coastal Sheathtail Bat was recorded on one night during the fauna survey in May 2015. The potential for impacts to this species and species habitat is discussed in the following sections, as well as other conservation significant species determined to have a moderate or high likelihood of occurrence during the desktop assessment. Conservation significant species with a low likelihood of occurrence are not included in the following impact assessment. However, justification regarding the low likelihood of occurrence determination for each species is provided in Appendix D.

4.1 Australian Painted Snipe

The Australian Painted Snipe (*Rostratula australis*) is listed as endangered under the EPBC Act and vulnerable under the NC Act. This species has been recorded at wetland sites throughout much of Australia, and is most common in the eastern states. It is a distinct species, but is rarely seen due to its cryptic and crepuscular behaviour. This species typically occurs in shallow freshwater wetlands and other permanently or temporarily inundated areas, particularly where rank tussocks of grasses, sedges, rushes, or reeds are present (DoE 2015b). It forages in shallow freshwater areas and will disperse if conditions become unsuitable.

There are no records of the Australian Painted Snipe in the study area or within the Whitsunday and Lindeman Island groups. The nearest record identified in the desktop analyses is around Proserpine, approximately 50km from the survey site (as shown in the Birdlife Australia Birdata database).

No evidence of this species was detected during the fauna surveys. The margins of the artificial water body located in the centre of the study area provide potentially suitable habitat for this species. Given this species is highly cryptic in behaviour, and has migratory/dispersive movements, it is possible it could occur in the study area from time to time. The current design concept (November 2016) involves minimal disturbance to the existing water body and surrounding remnant vegetation. Given this species has not been recorded in the study area and the proposed action will result in minimal disturbance to the habitat associated with the water body, it is unlikely this species would be significantly impacted by the proposed action.

4.2 Beach Stone-curlew

The Beach Stone-curlew (*Esacus magnirostris)* is listed as vulnerable under the NC Act and it is ranked as a high priority under the Department of Environment and Heritage Protection Back on Track species prioritisation framework. In Queensland, this species occurs throughout the coastline and surrounding islands. The Beach Stone-curlew is usually found on open, undisturbed beaches, islands, reefs, and estuarine intertidal sand and mudflats, preferring beaches with estuaries or mangroves nearby (EHP 2015c).

There are multiple records of this species from Lindeman Island (Atlas of Living Australia) and over 200 sightings are within a 50km radius of the study area (Wildlife Online Extract). While this species was not observed during the fauna surveys, which included targeted searches, it is

likely this species would occur on shoreline areas on Lindeman Island. Increased visitation and shore-based activities associated with the proposed action may impact the natural behaviour of this species within the study area. However, the extent of habitat for this species within the study area is minimal compared with habitat available in the Lindeman Islands National Park and broader region. The proposed action is unlikely to lead to a long term decrease in the size of the local population or reduce the extent of occurrence for this species. It is therefore unlikely there will be a significant impact on this species as a result of the proposed action.

4.3 Eastern Curlew

The Eastern Curlew (*Numenius madagascariensis*) is listed as critically endangered under the EPBC Act and near threatened under the NC Act. The largest wader in Australia, the Eastern Curlew is a migrant to Australia and found along the coast from August to March. This species is found along the coast in every state of Australia with a continuous distribution from mid Western Australia, through the Northern Territory and along the east coast of Queensland. This species is a cautious wader, which is quick to take flight when disturbed. It prefers sheltered coasts, especially estuaries, bays, harbour, inlets, and coastal lagoons with large intertidal mudflats or sandflats (DoE, 2015b).

There are several areas of suitable habitat in the form of coastal beaches around Lindeman Island. There are numerous records of this species within 50km of the study area (Wildlife Online extract) including a single record on Lindeman Island (as shown on the Atlas of Living Australia). Due to the small scale of disturbance to potential habitat areas, and the availability of undisturbed habitat in the locality, it is unlikely that the proposed project will have a significant impact on the Eastern Curlew.

4.4 Coastal Sheathtail Bat

The Coastal Sheathtail Bat is listed as near threatened under the NC Act. This species occurs only in coastal east Queensland, from the Cape York Peninsula southwards to Shoalwater Bay. This species is distributed along the Queensland coast from Shoalwater Bay to Cape York, extending no more than a few kilometres inland and is believed to be unevenly distributed throughout its range, due to its reliance on coastal roosts (EHP 2015c). This species forages over most coastal vegetation types including open forests, mangroves, scrub, heath, and swamps (Menkhorst and Knight, 2010).

Preferred roosting habitat such as rocky clefts and boulder piles are present along various parts of the Lindeman Island coastline. There are numerous records within 50km of the study area (Wildlife Online extract) as well as one record within the study area (Australian Museum). While this species was not detected during targeted searches, some of the echolocation call data collected is potentially attributable to this species. This call data was identified to genus level only (*Taphozous*), as calls from the Coastal Sheathtail Bat and Troughton's Sheathtail Bat (*T. troughtoni*) are indistinguishable.

No roosting areas were recorded with the study area. The proposed nature refuge encompassing the coastal vine thicket TEC will maintain potential roosting habitat for this species as boulder piles occur throughout the area. Given that potential roosting habitat for this

species will be retained and there is an abundance of similar foraging habitat in the locality, it is unlikely the proposed action will have a significant impact on the Coastal Sheathtail Bat.

4.5 Common Death Adder

The Common Death Adder (*Acanthophis antarcticus*) is listed as near threatened under the NC Act. This is a slow-moving cryptic snake that lies motionless and partly concealed under heavy leaf litter and low vegetation (Wilson and Swan, 2010), and is found in a variety of habitats across central and eastern Queensland. The Common Death Adder is found in a wide variety of habitats in association with deep leaf litter, including rainforests, wet sclerophyll forests, woodland, grasslands, chenopod dominated shrublands, and coastal heathlands (EHP 2015c). This species is declining in many areas due to habitat loss and altered fire regimes.

This species is considered to have a moderate likelihood of occurring in the study area. There are records of Common Death Adders on two islands in the Whitsunday group and suitable habitat that falls within the broad habitat preference descriptions is available throughout Lindeman Island. This species was not detected during the field surveys, but it is quite cryptic and can be difficult to detect in the field, and therefore its absence in survey data does not necessarily confirm its absence from the study area. However, the prevalence of Cane Toads on the island is likely to have had a significant impact on the population of this species on the island if it is present. Nonetheless, the study area does not contain any unique habitat features for this species. Habitat of a similar nature is abundant in the surrounding National Park and the broader region. It is unlikely this species would be significantly impacted by any disturbance to the potential habitat within the study area.

5. Pest Species

Pest plant species occur commonly throughout the study area, particularly in the non-remnant vegetation communities. Three restricted pest species were observed during the field surveys; Giant rat's tail grass, Singapore daisy and Lantana. Other significant environmental weeds were observed to be common in the study area, some of which are impacting the biodiversity values of native vegetation communities. In particular exotic grasses and pasture species such as Guinea grass, Grader grass, Sensitive weed, and Bidens have significantly reduced the biodiversity value of native grasslands areas and these species continue to pose a significant threat to the native grassland areas. Lantana, Guinea grass and Leucaena are also common on the margins of native woodland and open-forest areas where they adjoin non-remnant areas.

It is recommended a vegetation management plan is developed to manage threats from pest plant species to local biodiversity values. The weed management plan should be implemented prior to the commencement of vegetation clearing and include management strategies for before and after construction. Refer also to the Biosecurity Plan prepared by Cardno (2016).

No declared pest animal species were observed in the study area, but several non-native fauna species were observed in various parts of the study area. Black rats were recorded at Sites 2, 3, 5 and 6 (see Fauna Sites map in Appendix A). Cane toads were found throughout all areas that contain pools of freshwater and Asian house geckos were recorded around existing resort

infrastructure. A pest animal management plan including a program to reduce the population of Black rats should be implemented.

With the implementation of industry standard pest management plans, the construction and operation of the proposed project is not expected to significantly modify the landscape in any way that would increase the occurrence of pest plant and animal species or the threat they represent to local biodiversity values. Refer also to the Biosecurity Plan prepared by Cardno (2016).

6. Contamination

Sources of land contamination from historical activities within the project area as well as during the construction an operation of the proposed action are identified in Chapter 23 of the EIS. Chapter 26 also details the management framework for land contaminants, including site investigations and relevant impact mitigation measures. The implementation of the relevant impact mitigation measures within this management framework will avoid an inappropriate level of risk of land contamination. It is therefore unlikely there will be significant impacts to terrestrial biodiversity values from contamination.

7. Noise and Vibration

Noise and vibration sources associated with the construction and operation phases of the proposed actions are identified and quantified in Chapter 16 of the EIS along with relevant mitigation measures. The only substantial vibration levels identified will be during the construction phase when driven piling and general construction works are occurring. These impacts are temporary in nature and therefore unlikely to result in significant impacts to terrestrial biodiversity values.

The are no native ground-dwelling or arboreal mammals present on Lindeman Island and the only native mammal species are bats. The more major noise sources such aircraft arrivals and departures will be restricted daytime periods only, in accordance with the relevant aviation codes. Any bats roosting in close proximity to the development area are unlikely to be significantly affected by these noise sources during the day. Noise sources during night hours will be low and permanent sources will be mitigated through the use of noise screening or enclosures. Bats foraging at night are unlikely to be significantly affected by the lower level noise sources. Potential noise impacts on reptiles are not well studied, but it is unlikely noise levels associated with construction and operation would significantly affect any reptile species present on the island.

Terrestrial bird species may be deterred from foraging or nesting within the local area from noise levels associated with construction and operation of the site. However, there are no critical habitat areas within close proximity to the development for any terrestrial bird species. It is unlikely there will be significant impacts from potential noise sources to the local population of any terrestrial bird species. Marine and shorebird species and potential impacts to those species are discussed in Chapter 9 of the EIS – Marine Ecology.

8. Risk Assessment

In accordance with the requirements of the EIS Terms of Reference, whereby impact mitigation and management measures must be identified, a risk assessment has been performed for the potential impacts to terrestrial flora and fauna biodiversity values discussed previously in this section. The risk assessment approach incorporates a scoring system based on the matrix presented in Table 15. The risk assessment for these matters is presented in Table 16.

Table 15: Risk assessment matrix

RISK MATRIX	CONSEQUENCES				
PROBABILITY	Catastrophic Irreversible Permanent (5)	Major Long Term (4)	Moderate Medium Term (3)	Minor Short Term Manageable (2)	Insignificant Manageable (1)
Almost Certain (5)	(25) Extreme	(20) Extreme	(15) High	(10) Medium	(5) Medium
Likely (4)	(20) Extreme	(16) High	(12) High	(8) Medium	(4) Low
Possible (3)	(15) High	(12) High	(9) Medium	(6) Medium	(3) Low
Unlikely (2)	(10) Medium	(8) Medium	(6) Medium	(4) Low	(2) Low
Rare (1)	(5) Medium	(4) Low	(3) Low	(2) Low	(1) Low

Table 16: Risk assessment for potential impacts to terrestrial flora and fauna biodiversity values

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Flora Species					
Reduction in flora species diversity	(12) High: Possible impacts to areas supporting higher flora species diversity or areas containing flora species with limited spatial distribution on the island.	• Fine scale vegetation community mapping completed as part of impact assessment process. • Avoidance of areas supporting higher flora species diversity (e.g. littoral rainforest and coastal vine thicket community). • Use of existing resort infrastructure disturbance footprint. • Disturbance footprint centred on areas of existing clearing and disturbance.	• Approved disturbance footprint clearly marked to prevent unauthorised clearing. • Implementation of buffer zones for environmentally sensitive areas. • Restricted access to environmentally sensitive areas. • Implementation of Pest Management Plan. • Implementation of Environmental Management Plan. • Locally occurring native species to be used for rehabilitation • Contractor induction programs to include education and awareness component for significant biodiversity matters.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan including a monitoring and auditing program and management of corrective actions. • Locally occurring native species to be used for rehabilitation and non-invasive species to be used for landscaping purposes. • Restricted access for visitors to environmentally sensitive areas. • Educational information and signage for visitors and guests regarding environmentally sensitive areas	(4) Low • Residual impacts are unlikely to be significant and will be manageable through the implementation of management plans.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Fauna Species					
Reduction in fauna species diversity	(12) High: Possible impacts to areas supporting higher fauna species diversity or habitats with limited spatial distribution on the island.	• Avoidance of areas supporting structurally complex vegetation communities and habitats (e.g. littoral rainforest and coastal vine thicket community). • Use of existing resort infrastructure disturbance footprint. • Disturbance footprint centred on areas of existing clearing and disturbance.	• Clearing of habitats to occur in a sequentially where possible, to allow fauna to move away from clearing areas. • Excavations to include safe egress points and to be checked regularly for trapped individuals. • Significant microhabitat features such as large hollow logs to be retained where possible during clearing for use in rehabilitation areas. • Implementation of Pest Management Plan. • Implementation of Environmental Management Plan. • Contractor induction programs to include education component for significant biodiversity matters. • Mulching of cleared vegetation to occur as soon as possible after clearing to prevent establishment as habitat.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan including a monitoring and auditing program and management of corrective actions.. • Restricted access for visitors to environmentally sensitive areas. • Educational information and signage for visitors and guests regarding environmentally sensitive areas	(4) Low Residual impacts are unlikely to be significant and will be manageable through the implementation of management plans.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Impacts to near threatened and threatened species populations	(12) High: Possible significant impacts to near-threatened or threatened fauna species.	• Avoidance of areas supporting potential roosting habitat for Coastal Sheathtail Bat (e.g. rocky outcrops and crevices in the littoral rainforest and coastal vine thicket community). • Use of existing resort infrastructure disturbance footprint. • Disturbance footprint centred on areas of existing clearing and disturbance. • No essential habitat for threatened species present in disturbance footprint.	As for general fauna species	As for general fauna species	(4) Low Residual impacts are unlikely to be significant and will be manageable through the implementation of management plans.
Impacts to populations of migratory species	(12) High: Possible significant impacts to populations of migratory species.	• Use of existing resort infrastructure disturbance footprint. • Proposed action not within a 'Significant Bird Site'. • Shoreline disturbance primarily limited to location of existing resort infrastructure.	As for general fauna species	As for general fauna species	(4) Low Residual impacts are unlikely to be significant and will be manageable through the implementation of management plans.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Vegetation Communities, Flora and Fauna Species Habitat and Connectivity					
Reduction in the spatial extent and ecological integrity of the critically endangered *littoral rainforest and coastal vine thickets of eastern Australia* community	(16) High: Likely reduction in extent of this community on Lindeman Island	• Terrestrial flora and fauna assessment included detailed mapping of the spatial extent of this community. • The full extent of this community has been avoided in the design concept. • Buffer zones have been included in design to avoid direct impacts and allow for pest and fire management.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan. • Contractor induction programs to include education component for significant biodiversity matters. • Implementation of buffer zones.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan including a monitoring and auditing program and management of corrective actions.. • Restricted access for visitors to environmentally sensitive areas. • Awareness information and signage for visitors and guests regarding environmentally sensitive areas. • Bushfire management strategy to prevent inappropriate fire regimes within this community.	(2) Low Residual impacts are unlikely to be significant and will be manageable through the implementation of mitigation measures described.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Reduction in the spatial extent and ecological integrity of the *Broad leaf tea-tree (Melaleuca viridiflora) woodlands in high rainfall coastal north Queensland* endangered ecological community	(16) High: Likely reduction in extent of this community on Lindeman Island	• Terrestrial flora and fauna assessment included detailed mapping of the spatial extent of this community. • Existing runway strip disturbance footprint and degraded areas of Broad leaf tea-tree to be utilised to the full extent possible. • Areas with higher condition values avoided. • Environmental offset to be provided for residual impacts to areas unable to be avoided by design.	• Approved disturbance footprint clearly marked to prevent unauthorised clearing. • Implementation of Pest Management Plan. • Implementation of Environmental Management Plan. • Locally occurring native species to be used for rehabilitation • Contractor induction programs to include education and awareness component for significant biodiversity matters.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan including a monitoring and auditing program and management of corrective actions.. • Implementation for Environmental Offset Management plan for land-based environmental offsets (if required). • Locally occurring native species to be used for rehabilitation and non-invasive species to be used for landscaping purposes. • Restricted access for visitors to environmentally sensitive areas. • Awareness information and signage for visitors and guests regarding environmentally sensitive areas	(4) Low Community avoided where possible, with significant residual impacts to be offset through land-based environmental offset approach to maintain the extent and promote the biodiversity values of this community.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Reduction in the spatial extent and ecological integrity the native grassland community, regional ecosystem 8.12.13 (of concern status)	(16) High: Likely reduction in extent of this community on Lindeman Island	• Terrestrial flora and fauna assessment included detailed mapping of the spatial extent of this community. • Existing resort disturbance footprint to be utilised for proposed action. • Areas with higher condition values avoided where possible. • Scale of disturbance minimised where possible.	• Approved disturbance footprint clearly marked to prevent unauthorised clearing. • Implementation of Pest Management Plan. • Implementation of Environmental Management Plan. • Locally occurring native species to be used for rehabilitation • Contractor induction programs to include education and awareness component for significant biodiversity matters.	• Development and implementation of Environmental Offset Delivery Plan • Implementation of Pest Management Plan. • Implementation of Environmental Management Plan including a monitoring and auditing program and management of corrective actions.. • Locally occurring native species to be used for rehabilitation and non-invasive species to be used for landscaping purposes. • Restricted access for visitors to environmentally sensitive areas. • Awareness information and signage for visitors and guests regarding environmentally sensitive areas	(2) Low Community avoided where possible, with significant residual impacts to be offset through land-based environmental offset approach to maintain the extent and promote the biodiversity values of this community.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Reduction in spatial extent and ecological values of significant flora and fauna habitat areas	(12) High: Possible impacts to significant habitats	• Use of existing resort infrastructure disturbance footprint. • No essential habitat for threatened species present in disturbance footprint. • No distinct or spatially limited habitat features present in disturbance footprint. • Avoidance of areas supporting structurally complex vegetation communities and habitats (e.g. littoral rainforest and coastal vine thicket community).	• Significant microhabitat features such as large hollow logs to be retained where possible during clearing for use in rehabilitation areas. • Implementation of Pest Management Plan. • Implementation of Environmental Management Plan. • Contractor induction programs to include education component for significant biodiversity matters.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan including a monitoring and auditing program and management of corrective actions.. • Restricted access for visitors to environmentally sensitive areas. • Awareness information and signage for visitors and guests regarding environmentally sensitive areas. • Bushfire management strategy to prevent inappropriate fire regimes.	(2) Low Residual impacts are unlikely to be significant and will be manageable through the implementation mitigation measures described.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Reduction in habitat connectivity values through fragmentation and isolation of habitats	(12) High: Likely impacts to connectivity through fragmentation.	• Use of existing resort infrastructure disturbance footprint. • All proposed disturbance outside existing footprint is immediately adjacent to disturbed areas and avoids fragmentation and isolation of habitats	• Approved disturbance footprint clearly marked to prevent unauthorised clearing.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan including a monitoring and auditing program and management of corrective actions.. • Bushfire management strategy to prevent inappropriate fire regimes.	(2) Low Impacts to connectivity will be avoided by design. Residual impacts will be very low.
Watercourses and Wetlands					
Loss of riparian habitat values and biodiversity associated with watercourses	(9) Medium: Limited riparian habitat present in study area, but moderate impacts are possible without mitigation.	• No disturbance to vegetation associated with a watercourse shown on the Vegetation Management Watercourse Map. • Vegetation in close proximity to drainage features will be retained to prevent erosion issues.	• Approved disturbance footprint clearly marked to prevent unauthorised clearing.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan including a monitoring and auditing program and management of corrective actions.. • Bushfire management strategy to prevent inappropriate fire regimes.	(2) Low Impacts to riparian habitat values will be avoided by design. Residual impacts will be very low.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Loss of wetland habitat values and biodiversity	(12) High: Likely impacts to wetland habitat and hydrology without mitigation.	• Existing wetland habitat associated with Gap Creek dam to be retained. • Minor drainage diversion not likely to significantly alter hydrology of area.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan.	• Implementation of Pest Management Plan.	(4) Low Residual impacts are unlikely to be significant and will be manageable through the implementation of management plans.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Protected Areas					
National Park	(16) High: Clearing likely to occur in part of the protected area. Possible reduction in natural values.	• Use of existing resort infrastructure disturbance footprint. • Proposed resort infrastructure primarily located in existing perpetual lease tenure or disturbed areas of existing short-term lease area. • Proposed surrender of lease areas as partial compensation for revocation and clearing of current National Park tenure. • Investment in infrastructure to support public use and enjoyment of the protected area. • Financial compensation payment to offset residual impacts associated with revocation of National Park land.	• Approved disturbance footprint clearly marked to prevent unauthorised clearing. • Implementation of buffer zones for environmentally sensitive areas. • Restricted access to environmentally sensitive areas. • Implementation of Pest Management Plan. • Implementation of Environmental Management Plan. • Locally occurring native species to be used for rehabilitation. • Contractor induction programs to include education and awareness component for significant biodiversity matters.	• Implementation of Pest Management Plan. • Implementation of Environmental Management Plan. • Locally occurring native species to be used for rehabilitation and non-invasive species to be used for landscaping purposes. • Restricted access for visitors to environmentally sensitive areas. • Educational information and signage for visitors and guests regarding environmentally sensitive areas. • Maintenance of infrastructure to support public use and enjoyment of the protected area.	(4) Low Residual impacts after mitigation measures including financial compensation are unlikely to be significant and will be manageable through the implementation of management plans.

POTENTIAL IMPACT	SIGNIFICANCE OF IMPACT - UNMITIGATED	MITIGATION MEASURES			SIGNIFICANCE OF IMPACT - MITIGATED
		DESIGN	CONSTRUCTION	OPERATION	
Great Barrier Reef World Heritage Area	(16) High: Likely reduction in WHA ecological values on Lindeman Island. All relevant terrestrial ecological values are described previously in this table.	As described previously in this table for all matters of environmental significance			(4) Low Residual impacts after mitigation measures including financial compensation payments and environmental offsets are unlikely to be significant and will be manageable through the implementation of the previously listed management plans.
Pest Species					
Increase in pest species abundance/distribution and subsequent decrease in native flora and fauna species diversity	(16) High: Likely reduction of ecological values on Lindeman Island	• Measures to prevent introduction of pests to be incorporated in Environmental Management Plan. • Development of Pest Management Plan. • Design to include locally occurring native species for rehabilitation and non-invasive species to be used for landscaping purposes. • See further details in Biosecurity Assessment document (Cardno 2016).	• Implement Environmental Management Plan. • Implement Pest Management Plan. • Implement Black Rat eradication program. • Pest hygiene protocols for vehicles and materials. • See further details in Biosecurity Assessment document (Cardno 2016).	• Implement Environmental Management Plan. • Implement Pest Management Plan. • Implement Black Rat eradication program. • Pest hygiene protocols for vehicles and materials. • Educational information and signage for visitors and guests. • See further details in Biosecurity Assessment document (Cardno 2016)	(6) Medium Possible increase in pest species abundance and/or distribution. Management plans will limit any increases to short term and manageable events.

Impact Management and Recommendations

1. Conservation Significant Vegetation Communities

1.1 Coastal Vine Thicket

The Littoral Rainforest and Coastal Vine Thickets of Eastern Australia TEC is scattered throughout the rocky slopes of the shorelines within the study area. While this community is classed as a 'least concern' RE under the Queensland vegetation management framework, the full extent of this community equates to the critically endangered community listed under the EPBC Act. This community is therefore a MNES.

The current design concept (November 2016) includes resort infrastructure areas that occur in close proximity to this community. It is recommended a buffer zone of at least five metres be applied to all areas of this community. While small patches of this community can be resilient, invasion by exotic plant species represents a significant threat to this community. A pest plant management plan and the implementation of a five metre buffer zone will support the maintenance of biodiversity values for this community.

1.2 Broad Leaved Tea-Tree Woodland

Vegetation consistent with the Broad Leaf Tea-tree (*Melaleuca viridiflora*) Woodlands in High Rainfall Coastal North Queensland TEC is present within the current lease areas of the resort. The current design concept (November 2016) includes disturbance to this community through the proposed expansion of the runway strip footprint. Impacts to this community will be mitigated through the implementation of an environmental offset strategy as detailed in Section 2 below. Overall, the key construction/operation impact mitigation approach for disturbance to this community (in addition to or in combination with any environmental offset delivery requirements) is the implementation of a pest plant management plan. It is recommended that a management plan be prepared specific to managing vegetation, particularly pest plants, within this community. The management plan should focus on minimising the potential for impacts to this community outside the proposed disturbance area from exotic species invasion and other edge effects. The management plan will need to include routine monitoring within the management area for weed cover and condition assessments, particularly if the existing degraded areas are incorporated into an offset strategy. The management plan should also incorporate specific methodology relating to ongoing maintenance of the trimmed vegetation and buffer areas, and managing the visual amenity of these.

The majority of the Broad leaf tea-tree community is located within current lease areas that are proposed for surrender to the National Park. Pest plant management activities in degraded areas of this community could allow for significant improvement to the current condition and restore biodiversity values. Lindeman Island is the only location in the Whitsunday Islands group supporting this community. The conservation significance of the vegetation community present on land to be surrendered should be recognised during tenure negotiations and future management approaches specific to this community should be coordinated across the different tenures. A term lease covering areas of this community may be required as part of environmental offset and pest management commitments.

1.3 Native Grassland

Multiple areas of the native grassland community, RE 8.12.13a, occur within the study area. This community has an 'of concern' status under the Queensland vegetation management framework. Disturbance to this community should be avoided where possible, but it is noted the current design concept (November 2016) includes areas where this community is present. Where unavoidable, the provision of an environmental offset will be required for significant residual impacts to this community, in accordance with the Queensland environmental offsets framework (see Section 2 below). In addition to (or in combination with) environmental offset delivery requirements (see below), there are some general impact management approaches relevant to marinating the biodiversity values of this community. Invasion by pest plant species represents a significant threat to this community, although the geology and exposure in some locations favours the native species composition. The pest plant management strategies detailed in the following sections will be important for maintaining the biodiversity values of this community.

2. Environmental Offsets

2.1 Broad-leaf Tea Tree Woodland

The Broad-leaf tea tree woodland community occurs in two forms on Lindeman Island and the conservation status of the communities is different between these forms. The majority of the form on the eastern side of the runway strip is intact, whereas the form on the western side of the runway strip has been significantly degraded by exotic species invasion. The full ground-truthed extent of the Broad-leaf tea tree community equates to RE 8.3.2, which is an endangered community under the VM Act (Qld). However, only part of the ground-truthed extent meets condition thresholds for the endangered ecological community listed under the EPBC Act (Commonwealth). The scale of residual impacts and environmental offset liability is therefore different for these two forms.

Endangered Ecological Community – EPBC Act

The majority of the Broad-leaf tea tree woodland on the eastern side of the runway strip is consistent with the community listed under the EPBC Act, and is therefore a MNES (as depicted

in the maps in Appendix A). As detailed in the sections above, a number of approaches have been adopted through the design phase to avoid and minimise impacts to this community. Despite these impact avoidance and minimisation approaches, there is a significant residual impact to this community in the form of a 1.5 hectare reduction in the extent resulting from vegetation clearing and trimming requirements from the runway upgrade. This significant residual impact triggers the requirement for the provision of an environmental offset under the EPBC Act.

The 1.5 hectare clearing area will need to be offset by delivering a direct, on-the-ground, conservation outcome that improves or maintains the viability of this community. The most suitable mechanism for delivering an appropriate conservation outcome is the restoration of degraded areas of this community, such as the section that is to be retained on the western side of the runway. Under the current design concept (November 2016), there are at least 3.66 hectares of degraded Broad leaf tea-tree woodland to be retained that could be restored to an ecological condition consistent with the listed community. The net outcome of restoring this area would be an increase of more than 40% to the current extent of the listed community on Lindeman Island.

The 3.66 hectare area to be retained on the western side of the runway strip supporting degraded Broad-leaf tea tree woodland forms the proposed environmental offset area for impacts to this MNES. The proposed offset area is degraded through invasion by exotic ground cover species to the point that it does not meet condition thresholds for the listed community. The proposed restoration works for delivering the environmental offset will involve control of exotic ground cover species to promote native species regeneration within this area. The management objective of the offset area will be to reduce exotic ground cover abundance and promote native ground cover regeneration to establish an ecological condition consistent with the listed ecological community.

The areas on each side of the runway strip to be trimmed for aircraft safety code compliance will be managed as buffer zones to the endangered ecological community. While included in the ‘impact area’ calculations, these buffer zones will retain many of the biodiversity values associated with the ecological community. Vegetation management activities will also be conducted in these buffer zones to supplement the environmental offset restoration works and ensure the ongoing viability of the community. The Commonwealth Listing Advice (TSSC 2012) for this community identifies invasive species as one of the most significant threats to this community. The significance of this threat at the local scale is evident from existing disturbance. The vegetation management works proposed as part of the environmental offset delivery and buffer zones represent the optimal mechanism for maintaining and increasing the extent of this community and the biodiversity values within it.

Control of exotic ground cover species should allow for natural regeneration of native species. However, regeneration of native ground cover species could be supplemented through a seeding and planting program for locally occurring native ground cover species. This program could be supported by the establishment of an on-site nursery stocked from seed collection within the project lease area.

The suitability of this offset delivery mechanism will be demonstrated through field-based habitat assessments, systematically comparing values between the proposed impact and offset areas. The offset mechanism will be able to restore the community to similar condition to the impact

area, and given the proposed offset area is more than twice the size of the impact area, the proposed offset mechanism will deliver a 100% direct (land-based) environmental offset for impact to the EPBC Act listed community.

The ultimate intent for land supporting the listed community, including the proposed offset area once restoration works are complete, is for inclusion in National Park tenure for protection under the NC Act. This will ensure the long-term protection of the biodiversity values supported by the community. The approach will also enhance the biodiversity values of the National Park and ensure that leasehold land proposed for surrender is in good condition and consistent with National Park values. Land intended for surrender to the National Park will need to be staged to allow for restoration works to be completed.

Endangered Regional Ecosystem 8.3.2 – VM Act

The full extent of the Broad-leaf tea tee woodland on Lindeman Island equates to endangered RE 8.3.2. This is because the definitions for remnant vegetation under the VM Act are based on canopy attributes and to not take ground-cover attributes and condition into consideration. The community on both sides of the runway strip therefore equates to a MSES. As discussed in previous sections, the disturbance footprint has been aligned to minimise disturbance as much as possible, and therefore, where possible, the disturbance has been located in the degraded habitat on the western side of the runway strip. The total disturbance footprint for RE 8.3.2, including areas to be cleared or trimmed, is 5.14 hectares. The *Queensland Environmental Offsets Policy – Significant Residual Impacts Guideline* identifies the relevant impact area threshold for 'significant' impacts as 2 hectares (for communities with a sparse structural category). The 5.14 hectare disturbance footprint therefore equates to a significant residual impact to a MSES, which triggers the requirement for provision of an environmental offset under the Queensland Environmental Offsets Framework.

The total environmental offset liability for significant residual impacts to RE 8.3.2 will be determined through field-based habitat assessments of the proposed impact areas, as described for MNES. However, it is noted there is a maximum impact-offset ration of 4:1.

Suitable land and habitat for delivering land-based environmental offsets for this community on Lindeman Island is limited. Therefore, the environmental offset delivery mechanism for significant residual impacts to RE 8.3.2 will need to include a land-based and financial settlement approach. The land-based approach will be delivered as described previously for the Broad-leaf tea tree community listed under the EPBC Act. The degraded areas of RE 8.3.2 to be retained as part of the development design will be managed to reduce exotic species cover and promote restoration of native ground and shrub layer species. The proposed impact area for RE 8.3.2 is 5.14 hectares and the area to be retained and managed through the implementation of a restoration program is 3.66 hectares. Given the limited extent of habitat available for restoration works, an additional financial compensation payment will be required to deliver the residual environmental offset liability in addition to the land-based approach. The magnitude of this residual offset liability compensation payment is dependent on the extent to which the land-based mechanism contributes to the overall offset liability, which will be determined through the field-based habitat condition assessments.

2.2 Native Grassland – Regional Ecosystem 8.12.13

RE 8.12.13 has an 'of concern' status under the VM Act and is therefore a MSES, but is not listed as threatened under the EPBC Act. This community occurs on slopes and headlands surrounding various sections of the existing resort infrastructure. It also occurs on the western headland in the area nominated for the proposed 'glamping facility'.

Disturbance to this community has been avoided by design where possible by locating infrastructure in areas of existing disturbance. The proposed glamping facility has been designed to avoid disturbance to the grassland community in this area, with the disturbance footprint focussed on degraded (non-remnant) areas of existing disturbance. Similarly, some of the habitat supporting relatively intact grassland on the slopes of the southern headland are to be retained as part of the development design. The total disturbance footprint within RE 8.12.3 is 4.19 hectares.

Although RE 8.12.13 is described as a grassland community in the Regional Ecosystem Description Database (Queensland Herbarium 2015), the structural category for this community is defined as a 'sparse'. The Queensland Biodiversity Offset Policy – Significant Residual Impact Guidelines identify the relevant significant residual impact criteria for regulated vegetation. The clearing threshold for a sparse (structural category) RE, such as 8.12.13, is two hectares. Any clearing above this threshold is classified as a significant residual impact and requires provision of an environmental offset.

There are multiple areas of degraded grassland communities present within the existing resort lease area. There are also substantial areas of degraded grassland located within the surrounding National Park tenure, some of which are continuous with the communities within the lease. These degraded grassland areas have been impacted by historical land uses and have been subject to very substantial invasion by exotic grass and forb species. The biodiversity values of these degraded grassland areas have been significantly depleted and therefore restoration works will form a suitable land-based offset delivery mechanism for maintaining the extent of RE 8.12.13 and promoting associated biodiversity values. The total offset liability for land-based offsets will be determined through field-based habitat condition assessments. The extent of degraded grassland areas outside the development disturbance footprint likely provides ample habitat for inclusion in environmental offset delivery. However, any significant residual impacts beyond those that can be offset through a land-based approach could be offset through a combined approach that includes a financial compensation payment.

3. Rehabilitation of Native Vegetation

The only significant area of native vegetation that will be disturbed during the construction phase and consequently require rehabilitation during operation is an area associated with a minor drainage diversion. Gap Creek dam will provide the water supply for the resort and the current masterplan design includes an increase to shape and configuration of the existing dam to increase inflows from adjacent catchment area. Upon completion of these works during the construction phase, impacted areas of the remnant vegetation (0.46 hectares) will need to be rehabilitated to minimise impacts to the impacted communities. The balance of the extent of the Broad leaf tea-tree community on the western side of the runway is also proposed for

restoration works to offset disturbance to other areas of this community. The area on the western side is subject to substantial degradation from invasion by the exotic grass species Guinea grass and subsequent loss of ground layer flora diversity.

The rehabilitation approach and monitoring of rehabilitation progress should be included in the project Environmental Management Plan.

Vegetation characteristics should be monitored at control (analogue) sites in nearby habitat areas within the same community that are relatively intact (e.g. on the eastern side of the runway). The data collected from these control sites will form the basis for assessing rehabilitation progress and success. This control-impact monitoring design is a standard scientific approach to environmental monitoring and conforms to best practice principles for rehabilitation monitoring.

The monitoring design should incorporate sufficient effort to facilitate appropriately robust statistical analysis for comparing between control and rehabilitated impact areas. A minimum of three control and three rehabilitation sites should be established.

Monitoring of vegetation characteristics and condition at each site will involve a transect survey approach. Transects comprising a 25 metre by 20 metre permanent monitoring area should be established. Within these transect areas the following attributes should be measured:

- Ground layer cover (vegetated)
- Diversity of ground layer species
- Canopy height
- Crown cover
- Tree and shrub species richness
- Exotic species cover
- Exotic species richness

These attributes should be compared between control and rehabilitated sites using relevant statistical analysis, such as Analysis of Variance (ANOVA). Rehabilitation progress and success will be evaluated through temporal comparisons and assessment against rehabilitation success criteria based on vegetation characteristics such as those outlined below.

- Native vegetative groundcover is greater than 70% of the average cover measured within the corresponding control sites.
- Native groundcover species diversity must be greater than 70% control sites.
- Canopy cover is greater than 50% of the average cover measured within the corresponding land unit control sites.
- Canopy cover must be dominated by *Melaleuca viridiflora* (>50%).

4. Conservation Significant Fauna Species

No threatened or near threatened fauna species were observed during the fauna survey period. However, some of the bat echolocation call data obtained is potentially from the Coastal Sheathtail Bat, and it is likely this species would forage over the study area from time to time. The study area does not support any unique terrestrial habitat values for this species, and

similar habitat is available in the surrounding National Park areas. The steep rocky slopes along some of the shorelines within the study area represent potential roosting habitat for this species. It is recommended disturbance to these areas is minimised. In general, potential roosting habitat correlates strongly with the presence of the coastal vine thicket TEC, and therefore avoidance of this community will also result in avoidance of potential Coastal Sheathtail Bat roosting habitat.

5. General Vegetation Management and Clearing

During construction activities, the following measures should be implemented to minimise disturbance impacts and the potential harm to habitat values and flora present within the area:

- The boundary of areas to be cleared should be clearly marked, to ensure the disturbance footprint is minimised.
- Cleared vegetation should be managed according to the following best practice principles:
  - Where possible, logs and large branches with hollows should be reserved, and stockpiled separately (at the edge of the site) to maintain habitat values.
  - Any mulching should occur as near as possible to the time of clearing to prevent the establishment of stockpiles as fauna habitat.

The following measures are recommended to maintain and improve the biodiversity values for the aforementioned conservation significant vegetation communities:

- Remove key problem species (particularly Lantana for many of these patches) to reduce competition and smothering of native species.
- Implement hazard reduction zones in the vicinity of the remnant patches to prevent disturbance from inappropriate fire regimes.
- Ensure proper placement of paths/tracks and other infrastructure around the community to avoid direct damage and fragmentation.
- Restoring native grasslands by promoting native grass and shrub species, controlling non-native species, and implementing appropriate fire management strategies.

6. Soil Management

During construction, soil stockpiles should be managed to maximise suitability for future use in landscaping processes. Topsoil should be stockpiled separately from sub-soils, and stockpiled to a maximum height of two metres. This will maintain the quality of the soil and suitability for use in landscaping. Stockpiles should also be managed to allow passage for fauna by leaving a sufficient gap between stockpiles.

7. Pest Management

A number of pest plant species including Leucaena, Lantana, Guinea grass, Grader grass, Bidens and Singapore daisy were identified during the flora surveys. These species represent a significant threat to the biodiversity values of the various vegetation communities present. In

particular, exotic grasses and Lantana are impacting the integrity of some native grassland areas and the Broad leaf tea-tree community. Pest plant management activities should be conducted in consultation with the relevant National Park management authority to ensure strategies are consistent with approaches for the surrounding National Park.

Several restricted pest species were identified within the study area. Given the proposed action occurs immediately adjacent to National Park land, it will be important to manage pest species to minimise potential impacts to the surrounding protected areas.

The following recommendations are relevant to the construction phase as well as ongoing monitoring and management post-construction to minimise weed distribution and abundance:

- Wherever possible construction activities should work from areas with fewer weed species and smaller infestations towards areas where there is a greater abundance of weeds.
- Vehicles and machinery brought on site should be clean and free of weeds, dirt and other material that may contain weed seeds and cause exotic species to become established within the works areas.
- Weed spread should be minimised by implementing some control measures within the proposed works areas prior to construction.
- Disturbance sites and stockpiles should be regularly examined for incidence of weed species.
- Where any weed establishment is identified, appropriate control measures should be implemented to minimise the impacts of weeds on native habitat.

It is recommended a specific vegetation management plan be developed for the Broad-leaf tea-tree community to prevent indirect impacts form edge effects such as exotic species invasion. This will also allow for the restoration of degraded patches of this community where the ground layer is dominated by exotic species. However, management approaches will need to be coordinated across the different land tenures, as the majority of the land supporting this community is proposed for surrender to the National Park.

Non-native fauna species were recorded throughout the study area. These included Cane toads, Asian house geckos and Black rats. It is recommended a pest animal management program be put in place to reduce numbers of Black rats before, during, and after the construction phase.

8. Dust Management

Excavation and vehicle movements produce increased levels of dust, which can have a cumulative impact on plant function. Dust suppression techniques should be implemented where significant dust is being produced, including (but not limited to):

- application of water on trafficable surfaces,
- limiting activities in high wind conditions,
- application of water/ binding agent to construction sites during construction.

9. Fauna Management

Excavated areas can pose a risk to native fauna through entrapment and exposure. Excavated areas should be checked regularly for trapped fauna, with inspection occurring at least twice daily. These areas should be checked early in the morning for fauna that has become trapped overnight, and again in the late afternoon for fauna that has become trapped over the course of the day.

Safe egress points should be included to allow fauna to escape of their own accord. Any fauna that cannot escape of its own accord should be removed in a manner that is safe for both the animal and the person handling the animal. Dangerous fauna species, such as snakes, should only be handled by a suitably qualified and experienced person.

The use of a fauna spotter-catcher during the vegetation-clearing and construction period is recommended to minimise the chances of injury to native fauna. The fauna spotter-catcher should have a current rehabilitation permit, and should be present during clearing activities. The role of the spotter-catcher would be to advise on appropriate clearing methods to ensure animal escape paths are maintained and relocate fauna located within the disturbance area.

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Appendix summary

Appendix A

Mapping

711400 711600 711800 712000 712200 712400 712600 712800 713000 713200 713400 713600 713800 714000

7738200 7738000 7737800 7737600 7737400 7737200 7737000 7736800 7736600 7736400 7736200

8.12.14/8.12.26

8.12.14

8.12.12

8.3.2

8.12.13/8.12.11/8.12.14

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Document Path: D:\GIS Projects\White Horse Australia\maps_mxd\160114 - Flora Survey.mxd

WHITE HORSE AUSTRALIA

STATE MAPPED REGIONAL ECOSYSTEMS

Legend

- Current Lease Outline

STATE MAPPED REGIONAL ECOSYSTEMS

STATUS

- High Value Regrowth - Endangered
- High Value Regrowth - Of Concern
- High Value Regrowh - Least Concern
- Remnant - Endangered
- Remnant - Of Concern
- Remnant - Least Concern
- Non Remnant

Imagery from Google Earth, dated 2008

100 50 0 100

Metres

Scale: 1:8,000

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 14/01/2016

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WHITE HORSE AUSTRALIA

FLORA SURVEY 2015

Legend

- Current Lease Outline

Vegetation Survey Sites

- Grassland Site
- Quaternary Site
- Secondary Sites
- Tertiary Site

Ground Truthed Regional Ecosystems

- Endangered
- Least Concern
- Non-Remnant
- Of Concern

Imagery from Google Earth, dated 2008

100 50 0 100
Metres

Scale: 1:8,000

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 14/01/2016

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8.12.11a
8.12.12d
8.12.14c
8.12.13a
8.3.2
8.12.13a / non-rem

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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WHITE HORSE AUSTRALIA

EPBC ACT THREATENED ECOLOGICAL COMMUNITIES

Legend

- Current Lease Outline

Disturbance Type

- Vegetation Trimmed to <7m
- Vegetation Trimmed 7 - 10m

EPBC Act TEC Type

- Coastal Vine Thickets
- Broad Leaf Tea-Tree

Runway Extent taken from 16-04-27 Runway Sections.dwg provided by DBI Design

100 50 0 100
Metres
Scale: 1:8,000

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 14/01/2016

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711400 711600 711800 712000 712200 712400 712600 712800 713000 713200 713400 713600 713800

7738000 7737800 7737600 7737400 7737200 7737000 7736800 7736600 7736400 7736200

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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712400 712600 712800 713000 713200

7737800 7737600 7737400 7737200

WHITE HORSE AUSTRALIA

BROAD LEAF TEA-TREE COMMUNITY

Legend

Disturbance Type

- Vegetation Trimmed to <7 metres
- Vegetation Trimmed 7 - 10 metres

Vegetation Types

- Broad Leaf Tea-Tree TEC
- RE 8.3.2

Runway Extent taken from 16-04-27 Runway Sections.dwg provided by DBI Design

Imagery from Google Earth, dated 2008

30 15 0 30
Metres
Scale: 1:3,000

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 14/01/2016

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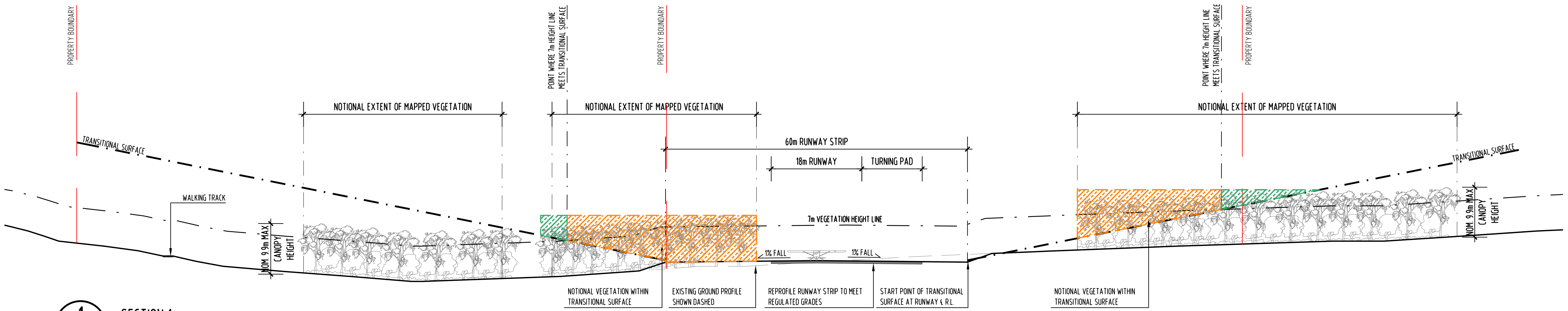

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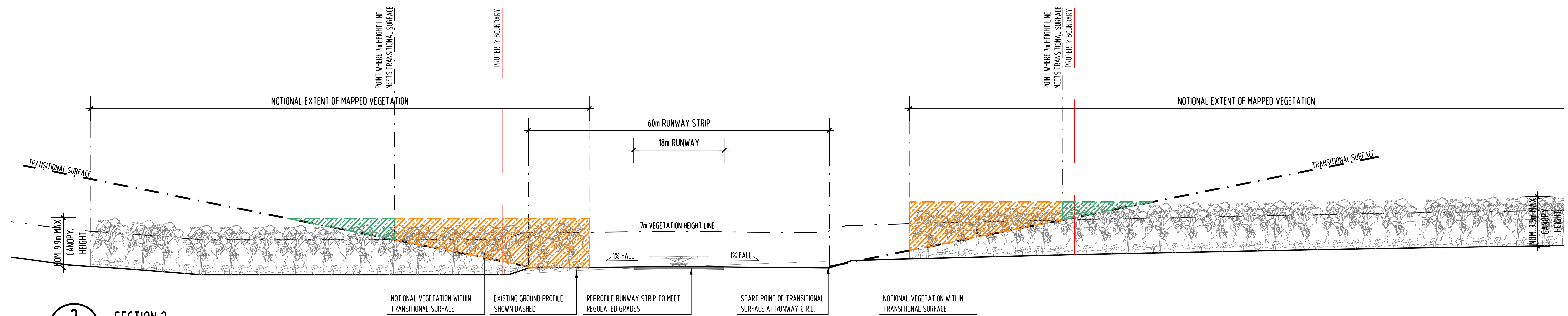

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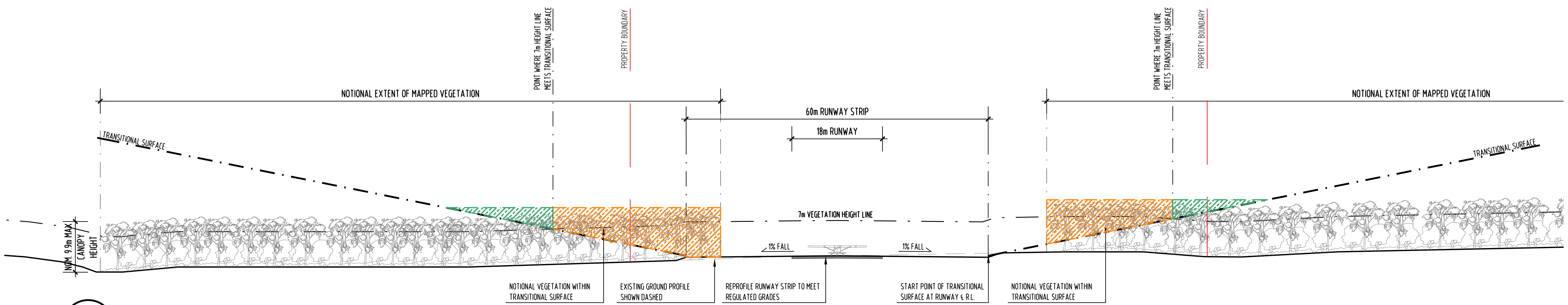

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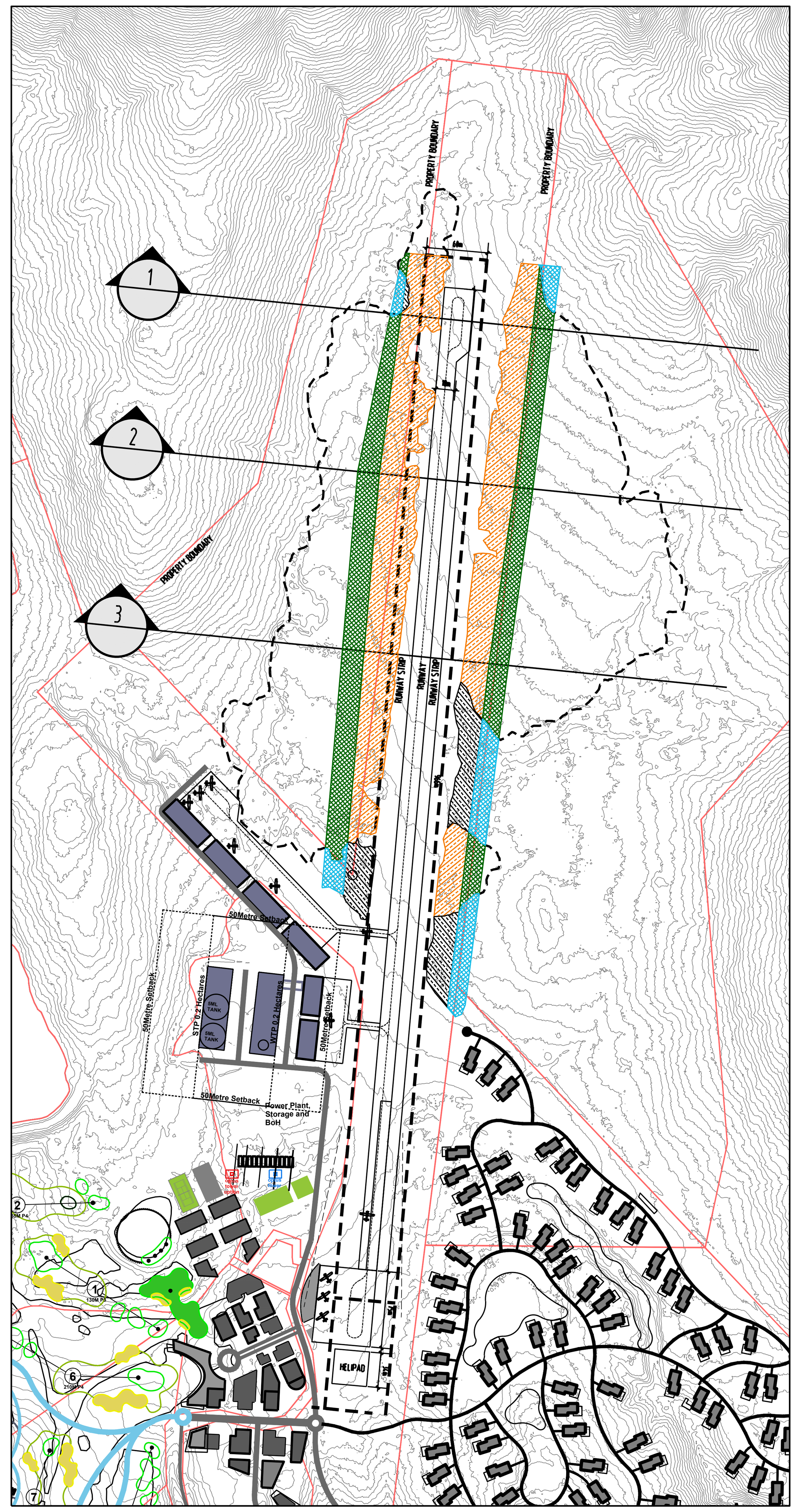

DBI LANDSCAPE

LINDEMAN ISLAN | PRELIMINARY AIR STRIP SECTIONS
CONCEPT DESIGN APRIL 2016 155020 SKT-01 A

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WHITE HORSE AUSTRALIA

NATIVE GRASSLAND DISTURBANCE AREAS

Legend

Proposed resort infrastructure displayed as per masterplan file provided to NRC

Current Lease Outline

Ground Truthed Regional Ecosystems

- Endangered
- Least Concern
- Non-Remnant
- Of Concern

Proposed Resort Infrastructure from 16-11-30 Masterplan.dwg provided by DBI Design

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 14/01/2016

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Scale: 1:8,000

Document Path: D:\GIS Projects\White Horse Australia\maps_mxd\01-2017\170125 - Native Grassland Disturbance Areas.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

WHITE HORSE AUSTRALIA

REMNANT VEGETAITON DISTURBANCE FOOTPRINT AND RESTORATION AREAS

Legend

Proposed resort infrastructure displayed as per masterplan file provided to NRC

Current Lease Outline

Ground Truthed Regional Ecosystems

- Endangered
- Least Concern
- Non-Remnant
- Of Concern

Disturbance Footprint

- Disturbance
- Assest Protection Zone
- Rehabilitation
- Restoration

90 45 0 90

Metres

Scale: 1:7,000

Proposed Resort Infrastructure from 16-11-30 Masterplan.dwg provided by DBI Design

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Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 14/02/2017

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WHITE HORSE AUSTRALIA

FAUNA SURVEY SITES

Legend

Fauna Survey Sites

- Active Search
- Anabat
- Cage Trap
- Infra-Red
- Pitfall and Funnel
- Shorebird Survey

Lines

- Elliot Trap
- Funnel Trap
- Current Lease Outline

Ground Truthed Regional Ecosystems

Status

- Endangered
- Least Concern
- Non-Remnant
- Of Concern

100 50 0 100
Metres

Scale: 1:8,000

N

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 14/01/2016

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T1 T2 T3 T4
S1 S2 S3 S4 S5 S6
B1
AB1.1 AB1.2 AB1.3 AB1.4
AB2.1 AB2.2 AB2.3 AB2.4 AB2.5 AB2.6
8.12.11a 8.12.12d 8.12.14c 8.12.13a 8.3.2 8.12.13a / non-rem

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Appendix B

EPBC Act Protected Matters Report

Australian Government

Department of the Environment

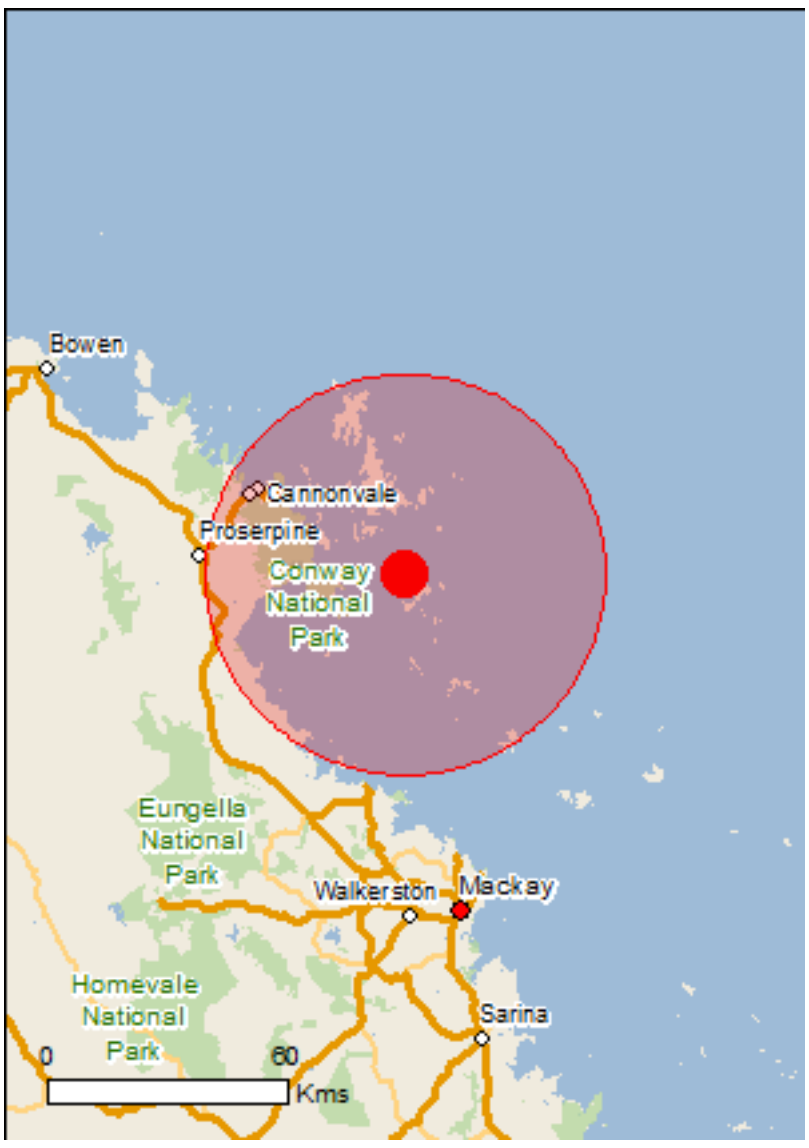
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

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

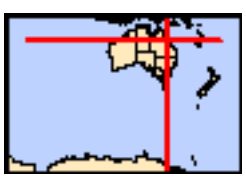
Report created: 20/08/15 14:32:24



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 50.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	58
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	36
Listed Migratory Species:	63

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	1
Listed Marine Species:	111
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	16
Regional Forest Agreements:	None
Invasive Species:	34
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
Great Barrier Reef	QLD	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Natural		
Great Barrier Reef	QLD	Listed place

Great Barrier Reef Marine Park [Resource Information]

Type	Zone	IUCN
Commonwealth Island (GBRMPA)	Dent Island (22058103)	VI
Commonwealth Island (GBRMPA)	Coppersmith Rock (20407101)	VI
Conservation Park	CP-20-4084	IV
Conservation Park	CP-20-4088	IV
Conservation Park	CP-20-4075	IV
Conservation Park	CP-20-4081	IV
Conservation Park	CP-20-4080	IV
Conservation Park	CP-20-4089	IV
Conservation Park	CP-20-4090	IV
Conservation Park	CP-20-4092	IV
Conservation Park	CP-20-4076	IV
Conservation Park	CP-20-4082	IV
Conservation Park	CP-20-4083	IV
Conservation Park	CP-20-4086	IV
Conservation Park	CP-20-4079	IV
Conservation Park	CP-20-4091	IV
Conservation Park	CP-20-4085	IV
Conservation Park	CP-20-4078	IV
General Use	GU-19-6010	VI
General Use	GU-16-6004	VI
Habitat Protection	HP-20-5220	VI
Habitat Protection	HP-20-5221	VI
Habitat Protection	HP-20-5224	VI
Habitat Protection	HP-20-5206	VI
Habitat Protection	HP-20-5205	VI
Habitat Protection	HP-20-5195	VI
Habitat Protection	HP-19-5165	VI
Habitat Protection	HP-20-5208	VI
Habitat Protection	HP-20-5223	VI
Habitat Protection	HP-20-5211	VI
Habitat Protection	HP-20-5203	VI
Habitat Protection	HP-20-5209	VI
Habitat Protection	HP-20-5197	VI
Habitat Protection	HP-20-5196	VI
Habitat Protection	HP-20-5215	VI
Habitat Protection	HP-20-5207	VI
Habitat Protection	HP-20-5214	VI
Habitat Protection	HP-20-5194	VI
Habitat Protection	HP-20-5199	VI
Habitat Protection	HP-20-5204	VI
Marine National Park	MNP-20-1131	II
Marine National Park	MNP-20-1132	II
Marine National Park	MNP-20-1123	II
Marine National Park	MNP-20-1116	II
Marine National Park	MNP-20-1118	II
Marine National Park	MNP-20-1111	II
Marine National Park	MNP-20-1119	II
Marine National Park	MNP-20-1130	II

Type	Zone	IUCN
Marine National Park	MNP-20-1136	II
Marine National Park	MNP-20-1125	II
Marine National Park	MNP-20-1129	II
Marine National Park	MNP-20-1112	II
Marine National Park	MNP-20-1134	II
Marine National Park	MNP-20-1128	II
Marine National Park	MNP-20-1117	II
Marine National Park	MNP-20-1115	II
Marine National Park	MNP-20-1121	II
Marine National Park	MNP-20-1127	II

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Broad leaf tea-tree (Melaleuca viridiflora) woodlands in high rainfall coastal north Queensland	Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Roosting known to occur within area
Erythrotriorchis radiatus		
Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria		
White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Macronectes giganteus		
Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Neochmia ruficauda ruficauda		
Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis		
Eastern Curlew [847]	Critically Endangered	Roosting known to occur within area
Poephila cincta cincta		
Black-throated Finch (southern) [64447]	Endangered	Species or species habitat may occur within area
Pterodroma heraldica		
Herald Petrel [66973]	Critically Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta		
Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may

Name	Status	Type of Presence
		occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll [331]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Petrogale persephone Proserpine Rock-wallaby [226]	Endangered	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Species or species habitat may occur within area
Rhinolophus philippinensis (large form) Greater Large-eared Horseshoe Bat [66890]	Endangered	Species or species habitat likely to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat known to occur within area
Plants		
Eucalyptus raveretiana Black Ironbox [16344]	Vulnerable	Species or species habitat likely to occur within area
Medicosma obovata [17533]	Vulnerable	Species or species habitat likely to occur within area
Neisosperma kilneri [14319]	Vulnerable	Species or species habitat likely to occur within area
Omphalea celata [64586]	Vulnerable	Species or species habitat likely to occur within area
Ozothamnus eriocephalus [56133]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Breeding known to occur within area
[Denisonia maculata](#) Ornamental Snake [1193]	Vulnerable	Species or species habitat may occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
[Egernia rugosa](#) Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
[Lepidochelys olivacea](#) Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
[Carcharodon carcharias](#) Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area
[Pristis zijsron](#) Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Macronectes giganteus](#) Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
[Puffinus carneipes](#) Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat may occur within area
[Sterna albifrons](#) Little Tern [813]		Species or species habitat may occur within area
[Sterna sumatrana](#) Black-naped Tern [800]		Breeding known to occur within area
Migratory Marine Species		
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat may occur within area
[Carcharodon carcharias](#) Great White Shark [64470]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Breeding known to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Roosting known to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]		Roosting known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Roosting known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Roosting known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]		Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area

Name	Threatened	Type of Presence
Gallinago megala		
Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura		
Pin-tailed Snipe [841]		Roosting likely to occur within area
Heteroscelus brevipes		
Grey-tailed Tattler [59311]		Roosting known to occur within area
Heteroscelus incanus		
Wandering Tattler [59547]		Roosting known to occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa		
Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis		
Eastern Curlew [847]	Critically Endangered	Roosting known to occur within area
Numenius minutus		
Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus		
Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Pluvialis fulva		
Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola		
Grey Plover [865]		Roosting known to occur within area
Tringa glareola		
Wood Sandpiper [829]		Roosting known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus		
Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Heritage Places		[Resource Information]
Name	State	Status
Historic		
Dent Island Lightstation	QLD	Listed place

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Roosting known to occur within area
Anseranas semipalmata		
Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]		Roosting known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Roosting known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Roosting known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]		Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Heteroscelus incanus Wandering Tattler [59547]		Roosting known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew [847]	Critically Endangered	Roosting known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat may occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna sumatrana Black-naped Tern [800]		Breeding known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys haematopterus Reef-top Pipefish [66201]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Corythoichthys paxtoni Paxton's Pipefish [66204]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Cosmocampus darrosanus D'Arros Pipefish [66207]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus bargibanti Pygmy Seahorse [66721]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus zebra Zebra Seahorse [66241]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Nannocampus pictus Painted Pipefish, Reef Pipefish [66263]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Enhydrina schistosa Beaked Seasnake [1126]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Laticauda colubrina a sea krait [1092]		Species or species habitat may occur within area
Laticauda laticaudata a sea krait [1093]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Breeding known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Bloomsbury	QLD
Brampton Islands	QLD
Cape Hillsborough	QLD
Conway	QLD
Conway	QLD
Conway West	QLD
Dryander	QLD
Lindeman Islands	QLD
Molle Islands	QLD
Mount Proserpine	QLD
Newry Islands	QLD
Petrogale	QLD
Repulse Islands	QLD
Skull Knob	QLD
Smith Islands	QLD
Whitsunday Islands	QLD

Invasive Species	[Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Gallus gallus Red Junglefowl, Domestic Fowl [917]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Andropogon gayanus Gamba Grass [66895]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood [6311]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Lepidodactylus lugubris Mourning Gecko [1712]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Great Barrier Reef Marine Park	QLD
Proserpine - Goorganga Plain	QLD
St Helens Bay Area	QLD

Caveat

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-20.4469 149.043

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

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

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix C

Wildlife Online Database Extract

Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: Native
Status: Rare and threatened species
Records: All
Date: All
Latitude: -20.4469
Longitude: 149.0430
Distance: 50
Email: scott@northres.com.au
Date submitted: Thursday 20 Aug 2015 14:31:01
Date extracted: Thursday 20 Aug 2015 14:40:16

The number of records retrieved = 28

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Burhinidae	*Esacus magnirostris*	beach stone-curlew		V		207/2
animals	birds	Columbidae	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)		V	V	22/4
animals	birds	Rostratulidae	*Rostratula australis*	Australian painted snipe		V	E	1
animals	birds	Scolopacidae	*Numenius madagascariensis*	eastern curlew		NT	CE	62
animals	mammals	Balaenopteridae	*Megaptera novaeangliae*	humpback whale		V	V	57/27
animals	mammals	Delphinidae	*Orcaella heinsohni*	Australian snubfin dolphin		NT		6/3
animals	mammals	Delphinidae	*Sousa sahulensis*	Australian humpback dolphin		NT		3
animals	mammals	Dugongidae	*Dugong dugon*	dugong		V		31
animals	mammals	Emballonuridae	*Taphozous australis*	coastal sheathtail bat		NT		24
animals	mammals	Macropodidae	*Petrogale persephone*	Proserpine rock-wallaby		E	E	187/4
animals	mammals	Muridae	*Xeromys myoides*	water mouse		V	V	8
animals	reptiles	Cheloniidae	*Eretmochelys imbricata*	hawksbill turtle		V	V	2
animals	reptiles	Cheloniidae	*Natator depressus*	flatback turtle		V	V	3
animals	reptiles	Cheloniidae	*Chelonia mydas*	green turtle		V	V	19
animals	reptiles	Crocodylidae	*Crocodylus porosus*	estuarine crocodile		V		169
animals	reptiles	Elapidae	*Acanthophis antarcticus*	common death adder		NT		6/1
plants	higher dicots	Apocynaceae	*Neisosperma kilneri*			V	V	9/8
plants	higher dicots	Euphorbiaceae	*Trigonostemon inopinatus*			V		2/2
plants	higher dicots	Flacourtiaceae	*Xylosma ovata*			NT		2/2
plants	higher dicots	Lamiaceae	*Callicarpa thozetii*			E		1/1
plants	higher dicots	Myrtaceae	*Ristantia waterhousei*			V		5/4
plants	higher dicots	Myrtaceae	*Rhodamnia glabrescens*			NT		8/8
plants	higher dicots	Rutaceae	*Medicosma obovata*			V	V	5/4
plants	higher dicots	Solanaceae	*Solanum sporadotrichum*			NT		2/2
plants	higher dicots	Sterculiaceae	*Brachychiton compactus*			NT		16/15
plants	lower dicots	Hernandiaceae	*Hernandia bivalvis*	cudgerie		NT		1/1
plants	monocots	Arecaceae	*Livistona drudei*	Halifax fan palm		V		1/1
plants	monocots	Orchidaceae	*Aphyllorchis anomala*			NT		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.* The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ( ).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.* The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix D

Potential Occurrence of EVNT Species

Table D1: Potential of Near Threatened and Threatened Flora identified in PMST and Wildlife Online database searches to occur within the study area

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
LC	V	Myrtaceae	*Eucalyptus raveretiana*	Black Ironbox	PM	0	Low - Normally found growing along watercourses or in open woodland in soils from sandy to heavy clay. This species is salt tolerant and is known from just south of Townsville down to Rockhampton. It is co-dominant with species such as Broad-leaved Teatree (*Melaleuca leucadendra*), *M. fluviatilis*, Forest Red Gum (*Eucalyptus tereticornis*), and Carbeen (*Corymbia tessellaris*) (DoE, 2015b). Given the lack of records within a 50km radius of the study area and no suitable habitat, the likelihood of Black Ironbox occurring is low.
V	V	Rutaceae	*Medicosma obovata*	-	PM/WO	5	Low - This species is only recorded from Mt. Dryander in Proserpine (Atlas of Living Australia). This species occurs in notophyll vine forest at altitudes between 80-700 m. The likelihood of this species being present within the study area is low as it is restricted to Mt Dryander and is not know to occur on any of the Whitsunday islands.
V	V	Apocynaceae	*Neisosperma kilneri*	-	PM/WO	9	Low - Restricted to granite boulder-strewn gullies or boulder-strewn slopes of low hills and ranges besides flowing streams within the Mackay-Whitsunday region. Occurring in notophyll vine forest and subtropical rainforest. Records within 50km of the study area are located on the mainland in Dryander National Park (Atlas of Living Australia). With no suitable habitat of flowing streams located within the study area and no records of the species on the Whitsunday Islands, this species has a low likelihood of occurring in the study area.
V	V	Euphorbiaceae	*Omphalea celata*	-	PM	0	Low - Occurs along watercourses with steep sided gullies on granite or heavily weathered metamorphic soils. This species has been recorded from Mackay to the Whitsunday region in semi-evergreen vine thicket and vine forest. Associated species include *Eucalyptus raveretiana*, *E. tereticornis*, *Lysiphyllum hookeri* and *Ficus opposita* (DoE, 2015b). The closest record is over 70km away on Gloucester Island. Given the habitat requirements and the distance to the nearest record, there is a low likelihood that this species would occur within the study area.
V	V	Asteraceae	*Ozothamnus eriocephalus*	-	PM	0	Low - Restricted to the east-central area of Queensland, between Bowen and Mackay. The closest record of this species is from Gloucester Island, approximately 70km for the study area. This species is known from a range of habitat types, including the margins of disturbed notophyll vine forest, margins of gallery forest, microphyll vine forest, tall open New England Blackbutt (*Eucalyptus andrewsii*), *E. resinifera* forest with an understorey of *Allocasuarina littoralis*, in open eucalypt forest and on rocky ridges with *Eucalyptus* spp. and *Acacia* spp (DoE, 2015b). This species ranges from 380-950 m. Due to the lack of records within 50km and the lack of suitable habitat within the study area, particularly within the specified altitudinal range, this species has a low likelihood of occurrence.
E	E	Orchidaceae	*Phaius australis*	Lesser Swamp Orchid	PM	0	Low - The Lesser Swamp Orchid occurs in southern Queensland and northern New South Whales. Areas inundated with water such as coastal wet heath/sedgeland wetlands, swampy grassland, or swampy forests are the preferred habitat (DoE, 2015b). Normally found in association with Broad-leaved Paperbark or Swamp Mahogany. The lack of local records for this species suggests the likelihood of occurrence within the study area is low.
LC	E	Moraceae	*Streblus pendulinus*	Isaac Wood	PM	0	Low - Occurring in a variety of forest habitats, the Isaac Wood is only found on Norfolk Island. The likelihood of this species being present on Lindeman Island is low.
V	-	Euphorbiaceae	*Trigonostemon inopinatus*	-	WO	2	Moderate - Endemic to a small area between Mackay and Proserpine in Queensland with the majority of sightings in Eungella National Park (Atlas of Living Australia). This species occurs in microphyll and notophyll vineforests on alluvium along rocky creek banks, and granite derived soils from 80-820 m (DoE, 2015b). This species has a moderate likelihood of occurring, as the majority of records are located greater than 50km from the study area, in Eungella National park. Similar habitat occurs within the study area, but the rocky drainage features present contain little alluvium and support only minor flows.
NT	-	Flacourtiaceae	*Xylosma ovata*	-	WO	2	Moderate - This species occurs in vine thickets and the northern-most records for this species are located on Goldsmith Island, which is south of the study area. All other records for this species are located near Rockhampton. While the study area is outside the known distribution for this species, it is considered to have a moderate likelihood of occurring within the study area, due to the presence of potentially suitable habitat and the presence of records on Goldsmith Island (approximately 25km to the south of the study area).

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
E	-	Lamiaceae	*Callicarpa thozetii*		WO	1	High - This species occurs within tall woodlands and semi-evergreen vine forests. Associated species and vegetation include: tall woodland of *Eucalyptus platyphylla*, *Lophostemon suaveolens* and *Corymbia intermedia* on clayey sand soils, and open forest of *Eucalyptus acmenoides*, *Corymbia citriodora* and *C. intermedia* on shallow, stony, clay loam soil (DEHP, 2015). The northern most record is at Conder Hill/Midge Point on a rainforest hillside (Atlas of Living Australia). All other sightings are in or around Rockhampton. This species has a high likelihood of occurring as suitable habitat and a record within 50km of the study area is present.
V	-	Myrtaceae	*Ristantia waterhousei*	-	WO	5	High - This species has only been recorded from Dryander National Park in complex notophyll vine forests on an alluvial flat according to Herbarium specimen records retrieved from the Atlas of Living Australia. Due to the presence of records within 50km of the study area and the presence of potentially suitable habitat available within the study area, this species has been assigned a high likelihood of occurrence.
NT	-	Myrtaceae	*Rhodamnia glabrescens*	Smooth Malletwood	WO	8	Moderate - The northern records of this species are located in Dryander National Park with the southern extent just north of Gin Gin. This species has been recorded in tall closed forests and complex notophyll vine forests on rocky slopes along creeks according to Herbarium specimen records retrieved from the Atlas of Living Australia. This species has a moderate likelihood of occurring as there are records within 50km and suitable habitat of complex notophyll vine forest on rocky slopes is available. However, no creeks or significant water features were observed in the preferred habitat, but rather, only minor drainage features that support minimal flow and riparian habitat.
NT	-	Solanaceae	*Solanum sporadotrichum*	-	WO	2	High - This species has multiple records from Dryander and Conway National Park as well Gloucester Island in moderate to very fertile soils. This species has been recorded in semi-evergreen vine thicket, notophyll rainforest, littoral rainforests, and Eucalypt open forest and woodland in association with *Brachychiton australis*, *Gyrocarpus americanus*, *Flindersia collina*, *Araucaria cunninghamii*, *Acacia fasciculifera* and *Drypetes deplanchei*. Given the presence of local records and suitable habitat within the study area, this species has been assigned a high likelihood of occurrence.
NT	-	Sterculiaceae	*Brachychiton compactus*	Whitsunday Bottle Tree	WO	16	High - Only found within 40km of Airlie beach including Hayman Island and Hook Island. Mainly found in semi-evergreen notophyll and microphyll vine thickets or low vine forests (DEHP, 2015). Occurring on steep lower slopes from 0-100 m with shallow gravely or stony soils. This species has a high likelihood of occurring due to multiple records within 50km and suitable habitat within the study area.
NT	-	Hernandiaceae	*Hernandia bivalvis*	Cudgerie	WO	1	High - Herbarium records indicate that this species occurs in vine thickets or microphyll vine forests on rock pavements and outcrops with shallow soils from 0-620 m. The Atlas of Living Australia database shows two specimen records from the Queensland Herbarium within Conway National Park, within 50km of the study area. Cudgerie has a high likelihood of occurring as it is found in habitat that occurs within the study area and this species has been recorded in the local area.
V	-	Arecaceae	*Livistona drudei*	Halifax Fan Palm	WO	1	High - Found from Tully south to Conway Beach from sea level up to 300m. This species grows along stream banks and coastal plains in *Melaleuca* swamp forests to fringes of gallery rainforest and Eucalypt forests. Database searches show two records within 50km of the study area. One record on Conway Beach with the other just north of the O'connell River. This species has a high likelihood of occurring due to adequate habitat being available and records within 50km of the study area.
NT	-	Orchidaceae	*Aphyllorchis anomala*	Simple Pauper Orchid	WO	1	High - Endemic to Queensland and grows from near sea level up to 700m. Grows in shady locations within rainforests from Eungella National Park north to Cape Tribulation. There is one record of this species within a 50 km radius of the study area, on the southern slopes of Mt. Dryander (Atlas of Living Australia). The preferred habitat and a record within 50km of the study area give this species a high likelihood of occurring.

- 1. Status: LC = Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered.
- 2. WO = Wildlife Online Database, PM = EPBC Protected Matters Report

Table D2: Potential of Near Threatened and Threatened Fauna identified in PMST and Wildlife Online database searches to occur within the study area

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
		BIRDS					
E	V	Accipitridae	*Erythrotriorchis radiatus*	Red Goshawk	PM	0	Low – There are no records of Red Goshawk in the local area. The nearest record on the Atlas of Living Australia and The Atlas of Australian Birds is east of Mackay, more than 70km from the survey site. This species prefers forest and woodland with a mosaic of vegetation types, particularly near riverine systems and permanent water, where there is an abundance of prey species (DoE 2015b, and references therein). The home range in northern Australia has been reported as up to 200km^2; with indications it may be even larger (Aumann & Baker-Gabb 1991). Given the lack of local records, this species has a low likelihood of occurrence within the study area. However, it is possible that this species may fly over the study site or even on occasion use the site as part of a much larger home range or foraging area.
LC	V	Oceanitidae	*Fregetta grallaria grallaria*	White-bellied Storm-petrel	PM	0	Low - There are no records of White-bellied Storm-petrels in the local area. The nearest record on the Atlas of Living Australia is from Lord Howe Island, over 2000km from the study area. The Lord Howe island group is the only known breeding location in Australia. During non-breeding times (June to August) it has been observed in sub-tropic and tropical waters in the Tasman and Coral seas. The pelagic distribution is poorly understood but has been observed foraging over near shore waters along the continental shelf of mainland Australia. It is estimated that only 1000 breeding pairs remain (Harrison 1983; Hutton 1991; Marchant & Higgins 1990; DoE 2015b). The likelihood of this species being present within the study area is low, however, it is possible that this species may fly over the study site during seasonal migration.
E	E	Procellariidae	*Macronectes giganteus*	Southern Giant-petrel	PM	0	Low - This species has not been recorded in the Whitsunday island group. The nearest record on the Atlas of Living Australia is over 250 km away to the east of Ingham. Southern Giant-petrels only breeds on six subantarctic and Antarctic islands in Australian territory starting in August and ending around March. During the breeding season birds are only found below 60° south but can forage widely for food. Tagged individuals ranged from 30 to over 2000 km while foraging. In winter they disperse widely and extend north from 50° south to the tropic of Capricorn (23°). Young and mature individuals are known to harbour in southeast Australia from June to December (DoE 2015b and references therein). The likelihood of this species occurring in the study area is low, however, it is possible that this species may fly over the study site during seasonal migration.
LC	E	Estrildidae	*Neochmia ruficauda ruficauda*	Star Finch	PM	0	Low – The eastern subspecies of the Star Finch is relatively poorly known and there is a lack of accepted records (DoE 2015b). It is a sedentary species estimated to have 50 or less breeding individuals. The current distribution of this species is not well known, but is considered restricted to Queensland and may extend north of Bowen and south to Wowan (DoE 2015b). This subspecies occur mainly in grasslands and grassy woodlands that can be partially disturbed or cleared and near a source of freshwater. The likelihood of this subspecies occurring within the study area is low due to the distance of the study area away from the mainland and the lack of local records.
E	E	Passeridae	*Poephila cincta cincta*	Black-throated Finch	PM	0	Low -. This species is locally common near Townsville and Charters Towers but declining elsewhere and mostly extinct south of the Burdekin River (DoE 2015b and references therein). This species occurs in grassy, open woodlands and forests dominated by *Eucalyptus*, *Corymbia*, and *Melaleuca* species near a source of freshwater. During heavy rainfall and drought it is known to locally disperse and will roam more widely after the breeding period. No observations of this species have been recorded below 23° since 1995. There is a single record within 50km of the study area shown on the Atlas of Living Australia. While there is suitable habitat within the study area and record with 50 km, the record is over 30 years old and the spatial data is not reliable. All other occurrence records of this subspecies are well outside the 50 km range with records only occurring on the mainland. This species is therefore considered to have a low likelihood of occurrence within the study area.
E	CE	Procellariidae	*Pterodroma heraldica*	Herald Petrel	PM	0	Low - A highly pelagic species, which occurs in the tropical and subtropical waters of the Pacific Ocean. Breeding occurs from February to September. The only breeding location in Australia has been on Raine Island with an estimated 10 or fewer breeding pairs. Off of the east coast of Australia occasional sightings are made on the edge of the continental shelf (30-36km offshore) and over waters of 250-270m in depth. Movements during the non-breeding season are poorly known but some individuals may follow the East Australian current south from the Coral Sea during the summer months. No observations have been recorded near Lindeman Island. The likelihood of this species occurring in the study area is low, however, it is possible that this species may fly over the study site during seasonal migration.

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
LC	V	Procellariidae	*Pterodroma neglecta neglecta*	Kermadec Petrel	PM	0	Low - A highly pelagic bird, which is only known in Australia to breed on the Lord Howe and Norfolk Island groups. There are estimated to be between 50-100 breeding pairs in Australia. Breeding occurs from October until June with individuals dispersing widely during the non-breeding season. A vagrant to the mainland of Australia with the pelagic distribution poorly known but observations has been made in subtropical and tropical waters of the Pacific Ocean. This species has not been recorded near the study area. The likelihood of this species occurring in the study area is low, however, it is possible that this species may fly over the study site during seasonal migration.
V	E, M	Rostratulidae	*Rostratula australis*	Australian Painted Snipe	PM/WO	1	Moderate - This species has been recorded at wetland sites throughout much of Australia, and is most common in the eastern States. The closest record is around Proserpine approximately 50km from the study area (Atlas of Living Australia). The Australian Painted Snipe is a distinct species, but its cryptic and crepuscular behaviour can make it difficult to detect. This species typically occurs in shallow freshwater wetlands and other permanently or temporarily inundated areas, particularly where rank tussocks of grasses, sedges, rushes or reeds are present (DoE 2015b). Potentially suitable wetland habitat is present within the study area. It is considered that this species has a moderate likelihood of occurring within the study area due to the presence of suitable habitat.
V	V	Tytonidae	*Tyto novaehollandiae kimberli*	Northern Masked Owl	PM	0	Low - There are no records of the Northern Masked Owl near the study area. The nearest record on the Atlas of Living Australia and The Atlas of Australian Birds is approximately 30km southwest of Port Douglas, more than 500km from the survey site. In Queensland, this subspecies occurs along the southern rim of the Gulf of Carpentaria, Cape York Peninsula and south at least as far as the Atherton Tablelands (Garnett *et al*. 2011, and references therein). There is some uncertainty about the southern limit of this subspecies in Queensland (DoE 2015b). It has been recorded in a variety of habitats including riverside forests, rainforest, open forest and paperbark swamps (Garnett *et al*. 2011). This subspecies is known to occupy home ranges of over 1000 ha in the non-breeding season (Higgins 1999; Kavanagh & Murray 1996). Given the lack of local records, this species has a low likelihood of occurrence.
V	-	Burhinidae	*Esacus magnirostris*	Beach Stone-curlew	WO	207	Present - Database searches revealed numerous records of this species in the region and the Atlas of Living Australia shows several records on Lindeman Island. Beach Stone-curlews favour undisturbed beach and tidal areas where they can forage in the intertidal zone. They are found throughout the north east coast of Australia and breed above the high tide line from September to March.
V	V	Columbidae	*Geophaps scripta scripta*	Squatter Pigeon	WO	22	Low - Database searches revealed records of the southern subspecies of Squatter pigeon in the Mackay-Whitsunday region. The southern subspecies is locally common at some sites in their northern extent but declining in the south. This subspecies is typically found in open forests and woodlands that are dominated by *Eucalyptus*, *Corymbia,* and *Acacia* species. Squatter pigeons are sedentary or locally nomadic depending on water. Although there are a high number of records within 50km of the study area, these have all been on the mainland with no records on islands in the region. Given this species is not known to occur on continental islands in the regions, there is a low likelihood this species would occur in the study area.
NT	CE	Scolopacidae	*Numenius madagascariensis*	Eastern Curlew	WO	62	Present - This species has been recorded on various islands of the Whitsunday group and there is one record on Lindeman Island included the Atlas of Living Australia database. The Eastern Curlew is found along the coast in every state of Australia but has a continuous distribution from mid Western Australia, through the Northern Territory and along the east coast of Queensland. It prefers sheltered coasts, especially estuaries, bays, harbours, inlets, and coastal lagoons with large intertidal mudflats or sandflats. Breeding does not occur in Australia with Eastern Curlews migrating to Australia around August and departing near March.
		MAMMALS					
LC	E	Dasyuridae	*Dasyurus hallucatus*	Northern Quoll	PM	0	Low - The database searches did not reveal any local records, and the study area does not fall within the species known range. Across its entire range, the Northern Quoll utilises a wide variety of habitats, However in Queensland it is believed that the species is more likely to be present in high relief areas with shallower soils, greater boulder cover, and low fire frequency; close to permanent water (DoE 2015b). With the lack of local records in the database searches, it is considered a low likelihood that this species would occur within the study area.

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
E	E	Macropodidae	*Petrogale persephone*	Proserpine Rock-wallaby	WO/PM	187	Low - This species is limited to a small area near the towns of Proserpine and Airlie Beach in QLD. Proserpine Rock-wallabies are also found on Gloucester Island in the north of the Whitsunday group and survive on Hayman Island where they were translocated. The nearest record on the Atlas of Living Australia database is in Airlie Beach, approximately 35km from Lindeman Island. This species is only found in pockets of semi-deciduous, semi-evergreen or complex micorphyll or notophyll vine forests with a high proportion of boulder piles to provide shelter during the day. This species does not move far from rock shelters with individuals having a typical home range of around 20 ha. Approximately 25 colonies of Proserpine Rock-wallabies are known to occur in the wild. This species does occur naturally on one inshore island but does not have an ability to disperse naturally to others in the Whitsunday island group. It is considered a low likelihood that this species would occur within the study area.
SLC	V	Phascolarctidae	*Phascolarctos cinereus*	Koala	PM	0	Low - This species range includes the eastern half of Queensland. While being widespread, suitable feed species and leaf moisture are the primary determinants of habitat suitability (DoE2015b). Suitable habitat is present within the study area and the surrounding landscape however, there are no records within 50km of the study area (source: Wildlife Online, Atlas of Living Australia), and no evidence of Koala was observed during the fauna survey. Given the distance from the mainland and the absence of records within the Whitsunday group, there is a low likelihood this species occurs within the study area.
LC	V	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	PM	0	Low - The Grey-headed Flying-fox is a highly mobile species that occurs from Rockhampton south to Melbourne in Victoria. Database searches have revealed the closest record being over 85km away inland of Mackay (Atlas of Living Australia). A canopy feeding species that uses a variety of habitats over large areas to obtain nectar and fruit. It has been observed feeding in rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands. Due to the patchy distribution of nectar and fruit, the species is highly migratory with a complex seasonal migration pattern. During summer when plants are flowering the Grey-headed Flying-fox is widespread but congregates to the coastal lowlands in winter (DoE, 2015b). Given the study area is outside the known distribution for this species, the likelihood of occurrence within the study area is low.
E	E	Rhinolophidae	*Rhinolophus philippinensis*	Greater Large-eared Horseshoe Bat	PM	0	Low - This species has not been recorded within the Whitsunday region (Atlas of Living Australia). The Greater Large-eared Horseshoe Bat is only known from a small number of locations in northern Queensland, from Iron range south to the Townsville area and inland to Chillagoe. This species is found in lowland rainforests, gallery forest-lined creeks, open Eucalypt forest, *Melaleuca* forest with a rainforest understory, open savannah woodland, and tall riparian woodland of *Melaleuca*. Caves, old mines, basal hollows in large trees, and dense vegetation are used as roosting sites (Pavey et al., 2008). Foraging occurs in relatively dense stands of vegetation and within woodlands. It is considered a low likelihood that this species would occur within the study area as no records occur near the Whitsunday region.
E	CE	Emballonuridae	*Saccolaimus saccolaimus nudicluniatus*	Bare-rumped Sheathtail Bat	PM	0	Low - This species is known from a few scattered locations between Iron range and Ayr in north Queensland. Two individuals in the last two decades have been recorded in north Queensland. This species occurs mostly in lowland areas such as Eucalypt woodland, forest, and open environments. Occasional records have shown this species around vine forest and rainforest. Foraging occurs around habitat edges with roosting sites in tree hollows. There are no records of this species within at least 50km of the study area. It is considered a low likelihood that this species would occur within the study area.
NT	-	Embalionuridae	*Taphozous australis*	Coastal Sheathtail Bat	WO	24	Present - This species has been recorded on Lindeman Island and within the study area (Atlas of Living Australia). This species occurs within one kilometre of the coastline along the Queensland coast from Cape York south to Shoalwater Bay including many offshore islands (Thomson *et. al*. 2001). Sea caves, rocky clefts, boulder piles, buildings, and mines provide roosting habitat for this species.
V	V	Muridae	*Xeromys myoides*	Water Mouse	WO/PM	8	Low – In Queensland this species occurs between Cannonvale in the Whitsundays region and Coomera. This species has a patchy distribution throughout its range but it is found in association with mangroves, saltmarsh, sedgelands, clay pans, heathlands, and freshwater wetlands. The study area is within its geographical range with records within 50km of the study area. However, it is considered to have a low likelihood of occurrence due to a lack of suitable habitat within the study area.
		REPTILES					
V	V	Elapidae	*Denisonia maculata*	Ornamental Snake	PM	0	Low - Known only from the Brigalow Belt biogeographical region with the majority recorded in the drainage system of the Fizroy and Dawson Rivers. Found in areas with high clay content in the soil, ample ground timber, and associated with gilgai mounds or other wetlands that support large number of its prey species, frogs (DoE, 2015b). Recorded in woodlands and open forests with dominant vegetation of Brigalow (*Acacia harpophylla*), Gidgee (*Acacia cambagei*), Blackwood (*Acacia argyrodendron*), or Coolibah (*Eucalyptus coolabah*) and associated moist areas. It is considered a low likelihood that this species would occur within the study area.

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
NT	-	Elapidae	*Acanthophis antarcticus*	Common Death Adder	WO	6	Moderate - A secretive and cryptic species that remains motionless in heavy leaf litter. Found in a variety of habitats across central and eastern Queensland. This species has been recorded in rainforests, wet sclerophyll forests, woodland, grasslands, chenopod dominated shrublands, and coastal heathlands in association with deep leaf litter (DoE 2015b). There is a record on Long Island and Hayman Island in the Whitsunday region (Atlas of Living Australia). This species is considered to have a moderate likelihood of occurring within the study area. It is known from two islands near the study area, and has suitable habitat on Lindeman Island.
V	V	Scincidae	*Egernia rugosa*	Yakka Skink	PM	0	Low - The highly fragmented distribution extends from the Queensland/New South Wales border north to Cape York Peninsula. Known from open dry sclerophyll forests, woodlands, and scrub associated with Brigalow (*Acacia harpophylla*), Mulga (*Acacia aneura*), Bendee (*Acacia catenulata*), Lancewood (*Acacia shirleyi*), Belah (*Casuarina cristata*), Poplar Box (*Eucalyptus populnea)*, Ironbark (*Euclayptus spp*.), and White Cypress pine (*Callitris glaucophylla*). A burrowing species that will excavate burrows under partially buried rocks, logs, or tree stumps. No records are located within 50km of the study area. It is considered a low likelihood that this species would occur within the study area.

- 1. Status: LC = Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered, M = Migratory
- 2. WO = Wildlife Online Database Extract, PM = EPBC Protected Matters Report

Table D3: Potential of Migratory Fauna identified in PMST and Wildlife Online database searches to occur within the study area

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
		BIRDS					
SLC	M	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	PM	506	Present - Occurring throughout Australia except the central arid interior (DoE, 2015b). Records of this species are throughout coasts and offshore islands. This species was recorded during field surveys.
SLC	M	Ardeidae	*Ardea alba*	Great Egret	PM	66	High - Widespread throughout Australia, occurring in all states and territories as well as offshore islands (DoE, 2015b). Found in a variety of habitats from open grasslands to woodlands near freshwater and wetlands. This species may use the parts of the study area as foraging and/or nesting habitat.
SLC	M	Ardeidae	*Ardea ibis*	Cattle Egret	PM	16	High - Widespread throughout Australia, occurring in all states and territories as well as offshore islands (DoE, 2015b). Found in a variety of habitats from open grasslands to woodlands near freshwater and wetlands. This species may use parts of the study area as foraging and/or nesting habitat.
-	M	Dicruridae	*Rhipidura rufifrons*	Rufous Fantail	WO	84	High - Occurring in coastal and near coastal districts of northern and eastern Australia (DoE, 2015b). Found in tropical rainforests and monsoon rainforests and vine thickets. This species may use parts of the study area as foraging and/or nesting habitat.
SLC	M	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	PM	8	High - Widespread in eastern and south eastern Australia in woodland habitats, rainforests, and open forests (DoE, 2015b). This species forages over various different habitat types and may occur in the study area.
SLC	M	Meropidae	*Merops ornatus*	Rainbow Bee-eater	PM, WO	222	High - Widespread across Australia and near shore islands in open forests, woodlands, shrublands, and semi-cleared habitats (DoE, 2015b). This species may use almost any part of the study area for foraging.
-	M	Monarchidae	*Monarcha melanopsis*	Black-faced Monarch	PM	22	High - Widespread in eastern Australia and offshore islands in all types of rainforest ecosystems (DoE, 2015b). This species may use parts of the study area for foraging.
-	M	Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher	PM	14	High - Widespread in eastern Australia. Occurring in coastal areas with heavily vegetated gullies in eucalypt dominated forests near wetland or watercourses (DoE, 2015b). This species may use parts of the study area for foraging.
V	E, M	Rostratulidae	*Rostratula benghalensis*	Painted Snipe	PM	1	Moderate - Occurs in wetlands of all states in Australia. More common in eastern Australia in shallow terrestrial freshwater wetlands. Habitats include temporary and permanent lakes, swamps, claypans, inundated grassland, saltmarsh, dams and bore drain (DoE, 2015b). This species may use parts of the study area for foraging.
SLC	M	Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	PM	3	Moderate - This species is distributed along the east coast of Australia from Cape York Peninsula south to south eastern Australia. Occurs in permanent and ephemeral wetlands with low to dense vegetation up to 2000 m above sea-level (DoE, 2015b). This species is known to occur close to humans and human activity. This species may use parts of the study area for foraging.
SLC	M	Hirundinidae	*Hirundo rustica*	Barn Swallow	PM	0	High - Widespread in coastal areas of Queensland, Northern Territory, and Western Australia. Found in open country of coastal lowlands near water, towns, cities, and offshore islands (DoE, 2015b). This species may use the study area for foraging.
-	M	Monarchidae	*Monarcha trivirgatus*	Spectacled Monarch	PM	157	Present - This species occurs throughout the coastal areas of eastern Australia in subtropical or tropical moist lowland forests, mangroves, and tropical moist montane forests (DoE, 2015b). This species uses the study area for foraging.
SLC	M	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	PM	5	High - Widespread but patchy distribution along all coastlines of Australia. Found in coastal wetlands and inland wetlands with varying levels of salinity (DoE, 2015b). Most commonly found in muddy or rocky shores of estuaries, deltas of streams, banks upstream, lakes, pools, billabongs, reservoirs, and dams. This species may use shoreline sections of the study area for foraging.

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
SLC	M	Scolopacidae	*Arenaria interpres*	Ruddy Turnstone	PM	14	High - Widespread throughout Australian coastline with preferences of rocky shores or beaches with deposits of rotting seaweed. Found in coastal regions with exposed rock coastlines, gravel beaches, and coral reefs. Occasionally found in estuaries, harbors, bays, mudflats, and coastal lagoons (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	PM	8	High - Widespread along the coastline of Australia. Habitat includes muddy edges of shallow fresh or brackish wetlands with low vegetation, lagoons, swamps, lakes, pools, dams, flooded grasslands, and intertidal mudflats in sheltered bays (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Calidris alba*	Sanderling	PM	1	High - Occurring along coastlines of Australia including offshore islands. Found on open sandy beaches exposed to open sea swell, sandbars and spits (DoE, 2105b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Calidris canutus*	Red Knot	PM	2	High - This species is common in suitable habitats around the coast of Australia. Habitats include mudflats, sandflats, sandy beaches of sheltered coasts and rarely freshwater swamps (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	CE, M	Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	PM	1	High - Found along the coasts and inland in all Australian states. Habitat includes intertidal mudflats in sheltered coastal areas, lakes, lagoons, dams, waterholes, and bore drains (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	PM	0	High - Widespread but scattered records in all states of Australia. Found in shallow fresh to saline wetlands, coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, river pools, floodplains, and artificial wetlands (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Calidris ruficollis*	Red-necked Stint	PM	0	High - Found throughout the Australian coastline in all states. Habitats include sheltered inlets, bays, lagoons, estuaries with intertidal mudflats, exposed ocean beaches of stone or rock, shallow wetlands near the coast, inland lagoons, lakes, swamps, river banks, dams and bore drains (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Calidris tenuirostris*	Great Knot	PM	8	High - Occurs along the Australian coastline but concentrated in northern Australia. An important habitat occurs to the south of the study area around Shoalwater Bay and the Mackay region. Sheltered coastal habitats with large intertidal mudflats or sandflats are the preferred habitat (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
-	M	Charadriidae	*Charadrius bicinctus*	Double-banded Plover	PM	3	High - Occurs in coastal and inland areas in eastern and southern Australia. Preferred habitats include fresh or saline terrestrial wetlands, muddy, sandy, shingled, or rocky beaches, bays and inlets with sea grass beds (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Charadriidae	*Charadrius leschenaultii*	Greater Sand Plover	PM	2	High - Found in coastal areas in all Australian states but concentrated in northern Australia. Habitats include sheltered sandy, shelly or muddy beaches with large intertidal mudflats and sandbanks, sandy estuarine lagoons and small rocky islands (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Charadriidae	*Charadrius mongolus*	Lesser Sand Plover	PM	12	High - Widespread in coastal regions in all states but mainly in northern and eastern Australia. Found in estuarine environments such as large intertidal sandflats, mudflats in shelter bays, sandy ocean beaches, coral reefs and rocky outcrops (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
-	M	Charadriidae	*Charadrius veredus*	Oriental Plover	PM	1	Moderate - Mostly inland distribution in north western Australia. This species will be found in some coastal areas, mainly in north west Australia, for a few weeks then move inland to flat, open, semi-arid or arid grasslands (DoE, 2015b). This species may use shoreline sections of the study area for foraging.

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
SLC	M	Scolopacidae	*Gallinago megala*	Swinhoe's Snipe	PM	0	Moderate - There are few records of this species in Queensland, with the closest in Cairns (Atlas of Living Australia). Most records are around coastal areas near Darwin and inland freshwater habitats. These habitats include wetlands, swamps, freshwater streams, grasslands, and other water bodies with vegetation along edges (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Gallinago stenura*	Pin-tailed Snipe	PM	0	Moderate - This species has few records in Queensland, with the closest in Ingham (Atlas of Living Australia). Most records are around coastal areas near Darwin and scattered in Western Australia. Habitats include shallow freshwater swamps, ponds, and lakes with sparse to dense cover of grass/sedge or other vegetation (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Heteroscelus brevipes*	Grey-tailed Tattler	PM	28	High - Found in northern coastal Australia, primarily on the coast of Queensland. This species occurs in sheltered coasts with reefs and rock platforms, intertidal mudflats, rocky and stony reefs exposed at low tide and gravel or shell shores (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit	PM	25	High - Important habitat for this species is located south from the study area at Shoalwater Bay. This species is found in coastal area in all Australian states and many offshore islands. Habitats include intertidal sandflats, banks, mudflats, estuaries, inlets, harbors, coastal lagoons, bays, sandy ocean beaches, rock platforms and coral reef flats (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Limosa limosa*	Black-tailed Godwit	PM	3	High - Widespread but scattered along coastline of Australia in all states. Coastal habitats include intertidal sandflats, banks, mudflats, estuaries, inlets, harbors, lagoons, and bays (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
NT	CE	Scolopacidae	*Numenius madagascariensis*	Eastern Curlew	PM	62	High - Found along the coast in all Australian states. Habitats include intertidal sandflats, banks, mudflats, estuaries, inlets, harbors, coastal lagoons and bays with sea grass beds (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Numenius minutus*	Little Curlew	PM	2	High - Widespread but scattered species along the coast, inland, and offshore islands of Australia. Found in short, dry grassland and sedgelands, dry floodplains, black soil plains with scattered shallow freshwater pools or areas seasonally inundated, open woodland, coastal swamps, mudflats, sandflats, beaches, and verges of roads (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Numenius phaeopus*	Whimbrel	PM	119	High - This species has a coastal distribution with scattered records inland in all states but more common in the north. This species is found in intertidal mudflats of sheltered coasts, harbors, lagoons, estuaries, river deltas, sandy or rocky beaches, rocky islets, and intertidal reefs (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Accipitridae	*Pandion cristatus*	Eastern Osprey	PM	540	Present - Found on the coasts, interior, and many offshore islands of Australia. This species occurs in coastal habitats and terrestrial wetlands of tropical and temperate Australia. This species may travel inland along major rivers in its northern distribution (DoE, 2015b). This species may use various parts of the study area for foraging and/or nesting.
-	M	Charadriidae	*Pluvialis fulva*	Pacific Golden Plover	PM	16	High - A widespread species that occurs in coastal regions and inland areas in all Australian states. This species is known to travel along major river systems and uses inland wetlands, beaches, mudflats, sandflats, lagoons, estuaries, islands, and coral cays (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Charadriidae	*Pluvialis squatarola*	Grey Plover	PM	4	High - This species has a scattered distribution around the coastline of Australia. Habitats include sheltered estuaries, lagoons with mudflats, sandflats, rocky coasts and terrestrial wetlands near the coast (DoE, 2015b). This species may use shoreline sections of the study area for foraging.

STATUS[1]		FAMILY	SCIENTIFIC NAME	COMMON NAME	SOURCE[2]	WO RECORDS	POTENTIAL TO OCCUR IN THE STUDY AREA
NCA	EPBC						
SLC	M	Scolopacidae	*Tringa glareola*	Wood Sandpiper	PM	0	Moderate - This species is sparsely scattered along the coastline of Queensland. It prefers well-vegetated freshwater wetlands, swamps, billabongs, lakes, pools, waterholes, wooded floodplains, and dams with dense vegetation and dead or live trees and fallen timber (DoE, 2015b). This species may use some sections of the study area for foraging.
SLC	M	Scolopacidae	*Tringa incana*	Wandering Tattler	PM	2	High - Known to occur along the Australian coastline and offshore/inshore islands. This species prefers rocky coasts with reefs, piers, spits, and shingle beaches (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper	PM	1	Moderate - Widespread throughout coastal and inland Australia. This species inhabits permanent or ephemeral wetlands of varying salinity, as well as, swamps, lagoons, billabongs, saltpans, estuaries, and mudflats (DoE, 2015b). This species may use some parts of the study area for foraging.
SLC	M	Scolopacidae	*Xenus cinereus*	Terek Sandpiper	PM	5	High - Important habitat for this species is located south of the study area in Shoalwater Bay. This species is widespread throughout the coastal regions of Australia and more common in the northern and eastern areas. Habitats include intertidal mudflats, sheltered estuaries, harbors, lagoons, mudbanks, sandbanks, spits, and occasionally sandy beaches and rocky areas (DoE, 2015b). This species may use shoreline sections of the study area for foraging.
SLC	M	Apodidae	*Apus pacificus*	Fork-tailed Swift	PM	3	High - Occurring along the coastline and inland of all states of Australia. Found well out to sea as well as over islands, cliffs, urban areas, cities, wooded, and non-wooded habitats (DoE, 2015b). This species may use various parts of the study area for foraging.
E	E, M	Procellariidae	*Macronectes giganteus*	Southern Giant-Petrel	PM	0	Low - This species has not been recorded in the Whitsunday island group. The nearest recording on the Atlas of Living Australia is over 250km away to the east of Ingham. Southern Giant-petrels only breeds on six subantarctic and Antarctic islands in Australian territory starting in August and ending around March. During the breeding season birds are only found below 60° south but can forage widely for food. Tagged individuals ranged from 30 to over 2000km while foraging. In winter they disperse widely and extend north from 50° south to the tropic of Capricorn (23°). Young and mature individuals are known to harbour in southeast Australia from June to December (DoE 2015b and references therein). The likelihood of this species occurring in the study area is low, however, it is possible that this species may fly over the study site during seasonal migration.
SLC	M	Procellariidae	*Puffinus carneipes*	Flesh-footed Shearwater	PM	0	Moderate - Found from south east Queensland down to South Australia. This species occurs in subtropics over the continental shelves and slopes, occasionally inshore water (DoE, 2015b). This species may fly near or over the study area during migration months.
SLC	M	Laridae	*Sterna albifrons*	Little Tern	PM	15	High - Known to occur on coastlines from northern WA, through the NT, and across northern QLD. Habitats include sheltered coastal environments, lagoons, estuaries, river mouths, deltas, lakes, inlets, sandbanks, exposed ocean beaches and occasionally offshore islands (DoE, 2015b). This species may occur on shoreline sections of the study area.
SLC	M	Laridae	*Sterna sumatrana*	Black-naped Tern	PM	102	High - Occurs in northern and north east Australia. Known throughout islands and waters of the Great Barrier Reef and Coral Sea. Breeds and roosts on islands with rocky or sandy shores, lagoons, coral cays, and coral reefs (DoE, 2015b). This species may occur on shoreline sections of the study.

- 1. Status: LC = Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered, M = Migratory
- 2. WO = Wildlife Online Database Extract, PM = EPBC Protected Matters Report

Appendix E

Flora Species List

Table E1: Flora species recorded within the study area

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS[1]	8.3.2	8.12.11	8.12.12	8.12.13	8.12.14	C[2]	NNG[3]	RG[4]	RES[5]
Acanthaceae	*Pseuderanthemum variabile*	Pastel flower	LC		X							
Adiantaceae	*Adiantum atroviride*	Maidenhair fern	LC		X			X				
Amaranthaceae	*Alternanthera brasiliana*	Purple joyweed	*		X							X
Amaranthaceae	*Achyranthes aspera*	Chaff flower								X		X
Anacardiaceae	*Mangifera indica*	Mango	*									X
Anacardiaceae	*Pleiogynium timorense*	Burdekin plum	LC		X			X	X			
Anacardiaceae	*Schinus terebinthifolius*	Brazilian pepper tree	*								X	
Annonaceae	*Fitzalania heteropetala*	Fitzalania	LC		X	X		X				
Apocynaceae	*Alyxia ruscifolia*	Prickly alyxia	LC					X				
Apocynaceae	*Alyxia spicata*	Chain fruit	LC		X	X		X			X	
Apocynaceae	*Gomphocarpus fruticosus*	Narrow leaf cotton bush	*				X			X		
Apocynaceae	*Gomphocarpus physocarpus*	Balloon cotton bush	*			X						
Apocynaceae	*Hoya australis*	Wax flower	LC		X							
Apocynaceae	*Nerium oleander*	Oleander	*									*
Apocynaceae	*Ochrosia elliptica*	Bloodhorn	LC		X				X			
Apocynaceae	*Parsonsia langiana*	Rough silkpod	LC		X	X						
Apocynaceae	*Parsonsia straminea*	Common silkpod	LC		X							
Apocynaceae	*Parsonsia velutina*	Silkpod	LC		X							
Apocynaceae	*Sarcostemma viminale*	Caustic vine	LC		X	X						
Araceae	*Monstera deliciosa*	Fruit salad plant	*									X

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS[1]	8.3.2	8.12.11	8.12.12	8.12.13	8.12.14	C[2]	NNG[3]	RG[4]	RES[5]
Araliaceae	*Polyscias elegans*	Celery wood	LC		X	X						
Araliaceae	*Schefflera actinophylla*	Umbrella tree	LC	X	X	X				X	X	X
Araucariaceae	*Araucaria cunninghamii*	Hoop pine	LC		X							X
Arecaceae	*Caryota* sp.	Fishtail palm	*									X
Arecaceae	*Cocos nucifera*	Coconut palm	LC						X			X
Arecaceae	*Dypsis lutescens*	Golden cane	*									X
Asparagaceae	*Eustrephus latifolius*	Wombat berry	LC	X	X	X	X	X		X	X	
Asparagaceae	*Lomandra longifolia*	Long leaved matrush	LC			X	X			X	X	
Aspleniaceae	*Asplenium attenuatum*	Walking fern	LC		X							
Asteraceae	*Ageratum conyzoides*	Billygoat weed	*	X	X	X					X	
Asteraceae	*Bidens alba* var. *radiata*	Bidens	*	X		X	X			X	X	
Asteraceae	*Cyanthillium cinereum*	Ironweed	LC	X								
Asteraceae	*Sphagneticola trilobata*	Singapore daisy	*		X							
Asteraceae	*Tridax procumbens*	Tridax daisy	*							X		
Bignoniaceae	*Pandorea pandorana*	Wonga vine	LC		X	X		X			X	
Boraginaceae	*Argusia argentia*	Octopus bush	LC		X							
Caesalpiniaceae	*Delonix regia*	Poinciana	*									X
Casuarinaceae	*Allocasuarina littoralis*	Black sheoak	LC	X		X		X				
Cycadaceae	*Cycas media*	Cycad	LC			X		X				
Cyperaceae	*Cyperus involucratus*	Umbrella Sedge	*								X	
Cyperaceae	*Cyperus polystachyos*	Bunchy sedge	LC				X					
Cyperaceae	*Gahnia aspera*	Red-berried saw-sedge	LC		X	X		X			X	
Cyperaceae	*Scleria sphacelata*		LC		X	X		X				

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS[1]	8.3.2	8.12.11	8.12.12	8.12.13	8.12.14	C[2]	NNG[3]	RG[4]	RES[5]
Ebenaceae	*Diospyros compacta*	Australian ebony	LC		X							
Ebenaceae	*Diospyros herbecarpa*	Scrub ebony	LC					X				
Euphorbiaceae	*Macaranga tanarius*	Macaranga	LC			X					X	
Euphorbiaceae	*Mallotus philippensis*	Red kamala	LC		X	X		X			X	
Fabaceae	*Caesalpinia bonduck*	Nicker nut	LC						X			
Fabaceae	*Centrosema molle*	Common centro	*	X		X	X			X	X	
Fabaceae	*Crotalaria brevis*	Rattlepod	LC	X			X					
Fabaceae	*Crotalaria pallida*	Streaked rattlepod	*			X	X			X	X	
Fabaceae	*Desmodium heterocarpon*		LC			X	X					
Fabaceae	*Flemingia parviflora*	Flemingia	LC			X						
Fabaceae	*Glycine tomentella*	Wooly Glycine	LC	X		X						
Fabaceae	*Leucaena leucocephala*	Leucaena	*		X					X	X	
Fabaceae	*Macroptilium atropurpureum*	Siratro	*	X		X	X			X	X	
Fabaceae	*Mimosa pudica*	Sensitive weed	*	X		X	X			X	X	
Fabaceae	*Mucuna gigantea*	Burny Bean	LC	X								
Fabaceae	*Senna pendula*	Cassia	*								X	
Fabaceae	*Sesbania cannabina*	Sesbania pea	LC	X		X	X					
Fabaceae	*Sophora tomentosa*	Silverbush	LC						X			
Fabaceae	*Stylosanthes scabra*	Shrubby stylo	*	X								
Goodeniaceae	*Scaevola taccada*	Beach cabbage	LC						X			X
Lamiaceae	*Clerodendrum floribundum*	Lolly bush	LC		X	X	X				X	
Lamiaceae	*Hyptis suavolens*	Hyptis	LC	X								
Lamiaceae	*Plectranthus diversus*		LC		X	X						

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS[1]	8.3.2	8.12.11	8.12.12	8.12.13	8.12.14	C[2]	NNG[3]	RG[4]	RES[5]
Lauraceae	*Cassytha filiformis*	Devil's Twine	LC			X				X	X	
Lauraceae	*Cassytha pubescens*	Devil's Twine	LC			X	X			X		
Lauraceae	*Cryptocarya triplinervis*	Brown laurel	LC			X					X	
Lauraceae	*Neolitsea brassii*	Grey Bollywood	LC	X		X		X				
Lecythidaceae	*Planchonia careya*	Cockatoo apple	LC	X		X					X	
Malvaceae	*Abutilon albescens*		LC			X						
Malvaceae	*Hibiscus rosa-sinensis*	Chinese hibiscus	*									X
Malvaceae	*Hibiscus tiliaceus*	Beach hibiscus	LC		X				X			
Malvaceae	*Sida hackettiana*	Golden sida	*			X					X	
Malvaceae	*Triumfetta rhomboidea*	Chinese Burr	*	X	X	X	X				X	
Meliaceae	*Aglaia elaeagnoidea*	Droopy leaf	LC		X			X				
Meliaceae	*Melia azedarach*	White cedar	LC			X						
Menispermaceae	*Stephania japonica*	Snake vine	LC			X	X				X	
Mimosaceae	*Acacia leptocarpa*	North coast wattle	LC			X				X	X	
Mimosaceae	*Acacia leptostachya*	Townsville wattle	LC		X	X						
Mimosaceae	*Acacia spirorbis* subsp. *solandri*	Wattle	LC		X	X		X			X	
Mimosaceae	*Albizia procera*	Siris	LC	X		X					X	
Mimosaceae	*Falcataria toona*	Mackay cedar	LC		X			X				
Moraceae	*Ficus benjamina*	Weeping fig	LC								X	X
Moraceae	*Ficus hispida*	Hairy fig	LC	X				X				
Moraceae	*Ficus microcarpa*	Curtain fig	LC		X	X					X	
Moraceae	*Ficus opposita*	Sandpaper fig	LC		X	X	X			X		

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS[1]	8.3.2	8.12.11	8.12.12	8.12.13	8.12.14	C[2]	NNG[3]	RG[4]	RES[5]
Moraceae	*Ficus racemosa*	Cluster fig	LC		X							
Moraceae	*Ficus rubiginosa*	Rock fig	LC		X	X	X				X	
Moraceae	*Ficus virens*	White fig	LC		X							
Moraceae	*Trophis scandens* subsp. *scandens*	Burny vine	LC		X							
Myrtaceae	*Corymbia clarksoniana*	Clarkson's bloodwood	LC	X		X					X	
Myrtaceae	*Corymbia dallachiana*	Ghost gum	LC			X				X		
Myrtaceae	*Corymbia intermedia*	Pink bloodwood	LC	X		X					X	
Myrtaceae	*Corymbia tessellaris*	Moreton Bay ash	LC	X		X		X			X	
Myrtaceae	*Corymbia torelliana*	Cadaghi	LC									X
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved ironbark	LC			X				X	X	
Myrtaceae	*Eucalyptus platyphylla*	Poplar gum	LC	X		X	X				X	
Myrtaceae	*Eucalyptus tereticornis*	Forest red gum	LC			X		X				
Myrtaceae	*Gossia bidwillii*	Python tree	LC		X	X		X				
Myrtaceae	*Lophostemon confertus*	Brush box	LC			X		X				
Myrtaceae	*Melaleuca viridiflora*	Broad leaf tea-tree	LC	X		X	X				X	
Nyctaginaceae	*Bougainvillea sp.*	Bougainvillea	*									X
Oleaceae	*Jasminum didymum* subsp. *didymum*		LC		X			X				
Onagraceae	*Ludwigia octovalvis*	Willow primrose	LC			X					X	
Orchidaceae	*Dendrobium discolor*	Golden orchid	LC		X	X			X		X	
Orchidaceae	*Geodorum densiflorum*	Nodding swamp orchid	LC			X						
Pandanaceae	*Pandanus tectorius*	Beach pandanus	LC	X	X	X	X				X	
Passifloraceae	*Passiflora suberosa*	Corky passionflower	*		X	X	X	X		X	X	

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS[1]	8.3.2	8.12.11	8.12.12	8.12.13	8.12.14	C[2]	NNG[3]	RG[4]	RES[5]
Passifloraceae	*Passiflora foetida*	Stinking passion	*			X	X					
Phyllanthaceae	*Breynia oblongifolia*	Coffee bush	LC		X			X			X	
Phyllanthaceae	*Cleistanthus dallachyanus*		LC		X			X				
Piperaceae	*Peperomia blanda* var. *floribunda*		LC		X							
Pittosporaceae	*Bursaria tenuifolia*	Sweet blackthorn	LC		X	X						
Pittosporaceae	*Pittosporum ferrugineum*	Rusty pittosporum	LC		X	X	X	X		X	X	
Poaceae	*Aristida holathera*	Erect kerosene grass	LC			X						
Poaceae	*Aristida queenslandica*	Queensland wire grass	LC			X						
Poaceae	*Chrysopogon fallax*	Golden beardgrass	LC	X			X					
Poaceae	*Digitaria didactyla*	Couch grass	LC				X				X	
Poaceae	*Eragrostis* sp.	Lovegrass	LC			X						
Poaceae	*Heteropogon contortus*	Black speargrass	LC			X	X			X	X	
Poaceae	*Heteropogon triticeus*	Giant speargrass	LC	X		X						
Poaceae	*Imperata cylindrica*	Blady grass	LC	X		X	X	X		X	X	
Poaceae	*Megathyrsus maximus*	Guinea grass	*			X	X			X	X	
Poaceae	*Melinis repens*	Red natal	*			X	X					
Poaceae	*Oplismenus compositus*	Running mountain grass	LC		X	X		X				
Poaceae	*Panicum effusum*	Hairy panic	LC			X		X				
Poaceae	*Paspalidium distans*	Spreading panic grass	LC			X				X		
Poaceae	*Setaria australiensis*	Scrub pigeon grass	LC		X							
Poaceae	*Sporobolus sp.*	Rat-tail grass	*			X						
Poaceae	*Sporobolus virginicus*	Coastal rat-tail grass	LC						X			

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS[1]	8.3.2	8.12.11	8.12.12	8.12.13	8.12.14	C[2]	NNG[3]	RG[4]	RES[5]
Poaceae	*Themeda quadrivalvis*	Grader grass	*		X	X					X	
Poaceae	*Themeda trianda*	Kangaroo grass	LC	X		X	X				X	
Polypodiaceae	*Drynaria rigidula*	Basket fern	LC		X	X		X				
Polypodiaceae	*Drynaria sparsisora*	Basket fern	LC		X							
Putranjivaceae	*Drypetes deplanchei*	Yellow tulipwood	LC		X			X				
Rhamnaceae	*Alphitonia excelsa*	Soap tree	LC	X		X	X	X			X	
Rubiaceae	*Psydrax odorata* subsp. *australiana*	Shiny-leaved canthium	LC		X							
Rubiaceae	*Timonius timon*	Tim tim	LC		X	X	X			X	X	
Rutaceae	*Acronychia laevis*	Hard aspen	LC		X			X				
Rutaceae	*Murraya paniculata*	Mock orange										X
Santalaceae	*Exocarpos latifolius*	Native cherry	LC		X							
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo	LC		X	X		X			X	
Sapindaceae	*Dodonaea lanceolata* var *subsessilifolia*	Hopbush	LC			X					X	
Sapindaceae	*Ganophyllum falcatum*	Scaly ash	LC		X							
Sapindaceae	*Jagera pseudorhus*	Foam bark	LC			X		X				
Sapotaceae	*Planchonella pohlmaniana*	Yellow boxwood	LC		X							
Sapotaceae	*Sersalisia sericea*	Wild prune	LC		X	X					X	
Smilacaceae	*Smilax australis*	Barbed wire vine	LC			X		X			X	
Sterculiaceae	*Argyrodendron polyandrum*	Stave wood	LC		X							
Sterculiaceae	*Sterculia quadrifida*	Peanut tree	LC						X			
Thymelaeaceae	*Wikstroemia indica*	Tie bush	LC			X						
Verbenaceae	*Lantana camara*	Lantana	*	X	X	X	X			X	X	

FAMILY	SCIENTIFIC NAME	COMMON NAME	STATUS[1]	8.3.2	8.12.11	8.12.12	8.12.13	8.12.14	C[2]	NNG[3]	RG[4]	RES[5]
Verbenaceae	*Stachytarpheta cayennensis*	Snake weed	*			X	X			X	X	
Vitaceae	*Cissus hastata*		LC		X							
Vitaceae	*Clematocissus opaca*	Small-leaved water vine	LC		X	X						
Xanthorrhoeaceae	*Dianella longifolia*	Flax lily	LC	X		X	X			X	X	

1. Status: LC = Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered, * = Species not native to Australia
2. C = Coastal dune areas
3. NNG = Non-native grassland
4. RG = Native regrowth areas
5. RES = Resort grounds and gardens

Appendix F

Fauna Species List

Table F1: Fauna species recorded within the study area

STATUS[1] NCA	STATUS[1] EPBC	FAMILY	COMMON NAME	SCIENTIFIC NAME	S1	S2	S3	S4	S5	S6	T1	T2	T3	T4	B1	I
		BIRDS														
LC	-	Megapodidae	Australian Brushturkey	*Alectura lathami*					X							X
LC	-	Megapodidae	Orange-footed Scrubfowl	*Megapodius reinwardt*			X		X	X					X	X
LC	-	Anatidae	Pacific Black Duck	*Anas superciliosa*					X						X	
LC	-	Anatidae	Hardhead	*Aythya australis*											X	
LC	-	Columbidae	Bar-shouldered Dove	*Geopelia humeralis*		X	X	X	X	X						X
SLC	M	Sulidae	Brown Booby	*Sula leucogaster*												X
LC	-	Anhingidae	Australasian Darter	*Anhinga novaehollandiae*											X	
LC	-	Phalacrocoracidae	Little Pied Cormorant	*Microcarbo melanoleucos*											X	
LC	-	Phalacrocoracidae	Great Cormorant	*Phalacrocorax carbo*												X
LC	-	Phalacrocoracidae	Little Black Cormorant	*Phalacrocorax sulcirostris*											X	
LC	-	Ardeidae	White-faced Heron	*Egretta novaehollandiae*											X	X
LC	-	Ardeidae	Nankeen Night Heron	*Nycticorax caledonicus*											X	
SLC	M	Accipitridae	White-bellied Sea Eagle	*Haliaeetus leucogaster*												X
LC	-	Accipitridae	Brown Goshawk	*Accipiter fasciatus*												X
LC	-	Accipitridae	Wedge-tailed Eagle	*Aquila audax*												X
SLC	M	Pandionidae	Eastern Osprey	*Pandion haliaetus*											X	
LC	-	Falconidae	Nankeen Kestrel	*Falco enchroides*												
LC	-	Rallidae	Purple Swamphen	*Pophyrio porphyrio*				X	X					X	X	X

STATUS[1]		FAMILY	COMMON NAME	SCIENTIFIC NAME	S1	S2	S3	S4	S5	S6	T1	T2	T3	T4	B1	I
NCA	EPBC															
LC	-	Rallidae	Buff-banded Rail	*Gallirallus philippensis*				X								
LC	-	Rallidae	Eurasian Coot	*Fulica atra*											X	
LC	-	Burhinidae	Bush Stone-curlew	*Burhinus grallarius*		X	X	X						X		X
LC	-	Haematopodidae	Sooty Oystercatcher	*Haematopus fuliginosus*												X
LC	-	Charadriidae	Masked Lapwing	*Vanellus miles*			X								X	X
SLC	-	Laridae	Crested Tern	*Thalasseus bergii*												X
LC	-	Laridae	Silver Gull	*Chroicocephalus novaehollandiae*												X
LC	-	Cacatuidae	Sulphur-crested Cockatoo	*Cacatua galerita*	X		X	X	X	X	X		X	X	X	X
LC	-	Psittaculidae	Rainbow Lorikeet	*Trichoglossus haematodus*	X	X	X		X	X					X	X
LC	-	Cuculidae	Pheasant Coucal	*Centropus phasianinus*		X		X	X						X	X
LC	-	Strigidae	Southern Boobook	*Ninox novaeseelandiae*			X		X			X				X
LC	-	Halcyonidae	Laughing Kookaburra	*Dacelo novaeguineae*	X											X
LC	-	Halcyonidae	Forest Kingfisher	*Todiramphus macleayii*												X
LC	-	Meliphagidae	Dusky Honeyeater	*Myzomela obscura*											X	X
LC	-	Campephagidae	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*												X
LC	-	Campephagidae	Varied Triller	*Lalage leucomela*												X
LC	-	Oriolidae	Australasian Figbird	*Sphecotheres vieilloti*												X
LC	-	Artamidae	White-breasted Woodswallow	*Artamus leucorynchus*											X	X
LC	-	Artamidae	Pied Currawong	*Strepera graculina*	X	X	X	X	X	X	X				X	X
LC	-	Dicruridae	Spangled Drongo	*Dicrurus bracteatus*			X	X			X					X

STATUS[1]		FAMILY	COMMON NAME	SCIENTIFIC NAME	S1	S2	S3	S4	S5	S6	T1	T2	T3	T4	B1	I
NCA	EPBC															
LC	-	Rhipiduridae	Grey Fantail	*Rhipidura albiscapa*												X
LC	-	Rhipiduridae	Willie Wagtail	*Rhipidura leucophrys*			X									X
LC	-	Corvidae	Torresian Crow	*Corvus orru*			X		X						X	X
LC	-	Monarchidae	Leaden Flycatcher	*Myiagra rubecula*	X	X										X
SLC	M	Monarchidae	Spectacled Monarch	*Monarcha trivirgatus*			X									
LC	-	Monarchidae	Magpie-lark	*Grallina cyanoleuca*												X
LC	-	Hirundinidae	Welcome Swallow	*Hirundo neoxena*		X	X	X							X	X
LC	-	Nectariniidae	Mistletoe bird	*Dicaeum hirundinaceum*							X	X				
LC	-	Nectariniidae	Olive-backed sunbird	*Nectarinia jugularis*	X		X		X		X				X	X
		REPTILES														
LC	-	Colubridae	Brown Tree Snake	*Boiga irregularis*		X										X
LC	-	Elapidae	Lesser Black Whip Snake	*Demansia vestigiata*				X								
LC	-	Gekkonidae	Dubious Dtella	*Gehyra dubia*	X	X										X
*	-	Gekkonidae	Asian House Gecko	*Hemidactylus frenatus**												X
LC	-	Gekkonidae	Bynoe's Gecko	*Heteronotia binoei*	X					X		X				X
LC	-	Scincidae	Major Skink	*Bellatorias frerei*								X				X
LC	-	Scincidae	Schmeltz's Rainbow Skink	*Carlia schmeltzii*	X	X		X	X	X	X					X
LC	-	Scincidae	Lively Rainbow Skink	*Carlia vivax*				X	X	X	X					X
LC	-	Scincidae	Northern Bar-sided Skink	*Concinnia brachyscoma*	X	X										X
LC	-	Scincidae	Coastal Snake-eyed Skink	*Cryptoblepharus litoralis*												X
LC	-	Scincidae	Eastern Striped Skink	*Ctenotus robusta*				X					X			
LC	-	Scincidae	Fine Spotted Mulch Skink	*Glaphyromorphus punctulatus*			X	X								

STATUS[1]		FAMILY	COMMON NAME	SCIENTIFIC NAME	S1	S2	S3	S4	S5	S6	T1	T2	T3	T4	B1	I
NCA	EPBC															
LC	-	Scincidae	Grass Skink	*Lampropholis delicata*	X		X	X	X	X		X				X
LC	-	Scincidae	Tree-base Litter-skink	*Lygisaurus foliorum*				X	X							X
		AMPHIBIANS														
LC	-	Hylidae	Green Tree Frog	*Litoria caerulea*		X										X
*	*	Bufonidae	Cane Toad	*Rhinella marina**	X	X	X		X		X	X	X		X	X
		MAMMALS														
*	*	Muridae	Black Rat	*Rattus rattus**		X	X		X	X						X
LC	-	Pteropodidae	Black Flying Fox	*Pteropus alecto*												X
LC	-	Emballonuridae	Sheathtail Bat	*Taphozous sp.*	X											
LC	-	Molossidae	Northern Mastiff Bat	*Chaerephon jobensis*			X									
LC	-	Molossidae	Northern Freetail Bat	*Mormopterus lumsdenae*				X				X	X		X	
LC	-	Molossidae	Eastern Freetail Bat	*Mormopterus ridei*		X		P							P	
LC	-	Rhinolophidae	Eastern Horseshoe Bat	*Rhinolophus megaphyllus*			X	X				X				
LC	-	Vespertilionidae	Gould's Wattled Bat	*Chalinolobus gouldii*	X		X	X					X		X	
LC	-	Vespertilionidae	Chocolate Wattled Bat	*Chalinolobus morio*									P		P	
LC	-	Vespertilionidae	Little Bent-wing Bat	*Miniopterus australis*	X			X				X	X		X	
LC	-	Vespertilionidae	Northern Bent-wing Bat	*Miniopterus orianae oceanensis*	X	X	X	X					X		X	
LC	-	Vespertilionidae	Long-eared Bat	*Nyctophilus sp.*									X			
LC	-	Vespertilionidae	Eastern Cave Bat	*Vespadelus troughtoni*	X	X	X	X					X	X	X	

1. Status: LC = Least Concern, SLC= Special Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered, M = Migratory
* Species not native to Australia
P Possible call data for this microbat species collected (calls similar to this species recorded, but not reliably identified)

Appendix G

Microbat Call Interpretation Reports

Microbat Call Interpretation Report

Prepared for ("Client"):	Northern Resource Consultants
Survey location/project name:	Whitsundays
Survey dates:	11-14 May 2015
Client project reference:	
Job no.:	NRC-1503
Report date:	15 June 2015

Methods

Data receipt and processing

Bat calls were recorded over four nights using an Anabat detector (Titley Scientific, Brisbane). Data were downloaded from the detector and converted to Anabat sequence files (zero-crossing analysis format) by the client. Balance! Environmental received a total of 1045 sequence files for analysis.

Call identification

All Anabat sequence files were viewed using *AnalookW* (Corben 2015) and a subset of representative calls for each survey night was selected for identification. Species were identified manually by comparing the representative call spectrograms with those of reference calls from southern and central Queensland and/or with published call descriptions (e.g. Reinhold et al. 2001; Pennay et al. 2004).

Species' identities were refined by considering probability of occurrence based on general distribution information (e.g. Churchill 2008; van Dyck & Strahan 2008) and/or records obtained from Wildlife Online (http://www.ehp.qld.gov.au/wildlife/wildlife-online) and/or the Atlas of Living Australia (www.ala.org.au).

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at http://www.ausbats.org.au/.

Species nomenclature follows Reardon *et al.* (2015).

Results & Discussion

Recording quality was good over the first three nights (11th, 12th 13th May), with most files containing long-duration calls with clearly defined pulses; however only a few low quality 'noise' files were generated on the 14th May. The majority of calls observed were from just a few species, so only a relatively small proportion (68/1045) of the files were required to provide species identification.

Eight distinctive call types were recorded during the Whitsundays survey, with seven of those being reliably attributed to individual species and the other only identified to genus level (see Table 1). The unresolved call type was attributed to *Taphozous* sp., two of which potentially occur in the study area. One of those species *T. australis* (coastal sheath-tailed bat) is listed as 'near threatened' under the Queensland Government's *Nature Conservation (Wildlife) Regulation 2006*; whereas the other *T. troughtoni* (Troughton's sheath-tailed bat) is widespread and relatively common.

Table 1. Microbat species recorded during the Whitsundays survey, 11-14 May 2015.

♦ = at least one call was attributed unequivocally to the species for the date/site

□ = calls similar to those of the species were recorded, but could not be reliably identified

- = species not recorded

Date:	11-May	12-May	13-May	14-May
Number of sequence files:	687	323	26	9
Number of calls identified:	36	26	6	0
Rhinolophus megaphyllus	-	♦	-	-
Chalinolobus gouldii	♦	♦	-	-
Vespadelus troughtoni	♦	♦	♦	-
Miniopterus australis	♦	-	-	-
Miniopterus orianae oceanensis	♦	♦	♦	-
Chaerephon jobensis	-	♦	-	-
Mormopterus ridei	-	-	♦	-
Taphozous species	♦	-	-	-

References

Churchill, S. (2008). *Australian Bats*. Jacana Books, Allen & Unwin; Sydney.

Corben, C. (2015). *AnalookW for bat call analysis using ZCA.* Version 4.1j.

Pennay, M., Law, B. and Reinhold, L. (2004). *Bat Calls of New South Wales*. Department of Environment and Conservation, Hurstville.

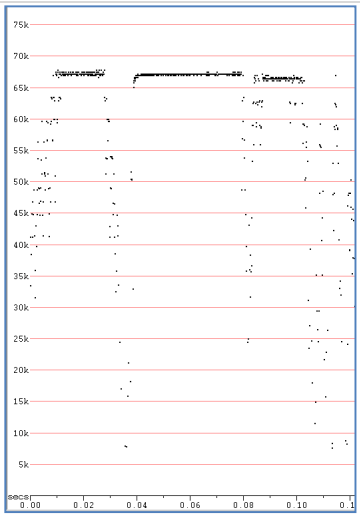
Reardon, T.B., Armstrong, K.N. and Jackson, S.M. (2015). A current taxonomic list of Australian Chiroptera. Australasian Bat Society. Version 2015-05-15. Downloaded from: http://ausbats.org.au/taxonomic-list/4589345107

Reardon, T. (2003). Standards in bat detector based surveys. *Australasian Bat Society Newsletter* **20**, 41-43.

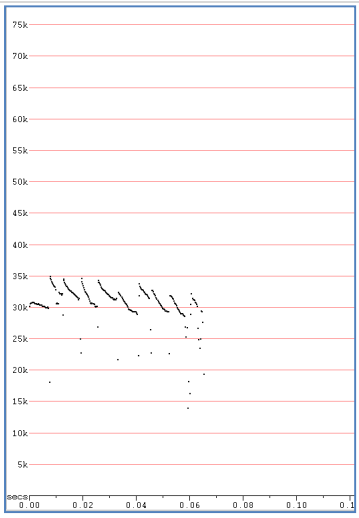
Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001). *Key to the bat calls of south-east Queensland and north-east New South Wales*. Department of Natural Resources and Mines, Brisbane.

van Dyck, S. and Strahan, R. (ed.) (2008). *The Mammals of Australia* (Third Edition). New Holland; Sydney.

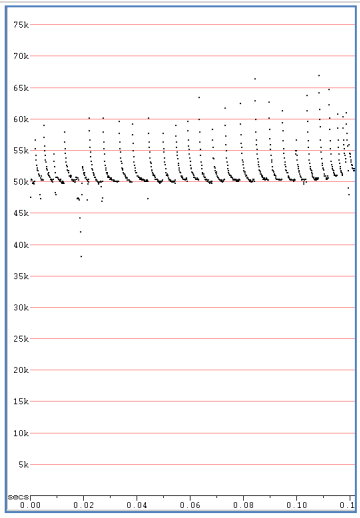
Appendix 1 Representative call sequences recorded during the Whitsundays survey, May 2015. (Scale: 10msec per tick; time between pulses removed)



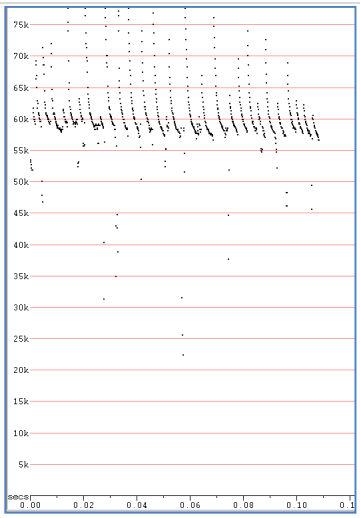
Rhinolophus megaphyllus



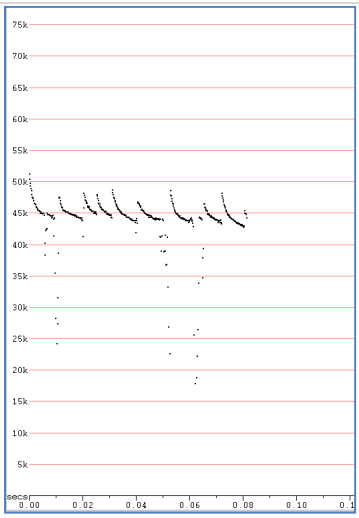
Chalinolobus gouldii



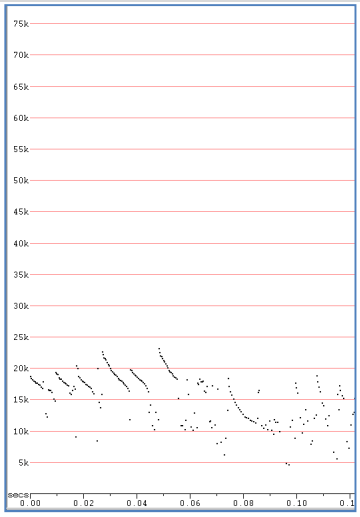
Vespadelus troughtoni



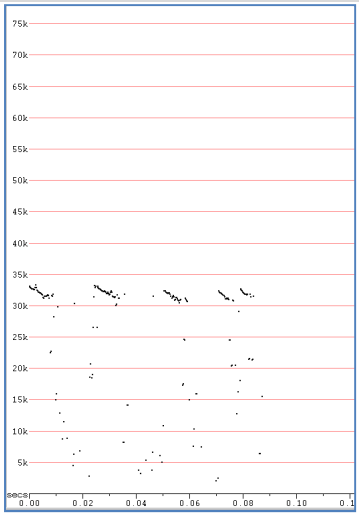
Miniopterus australis



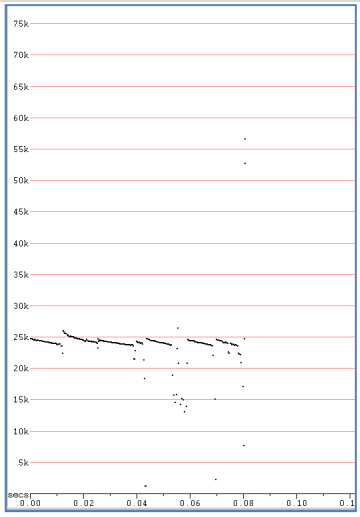
Miniopterus orianae oceanensis



Chaerephon jobensis



Mormopterus ridei



Taphozous species

Microbat Call Interpretation Report

Prepared for ("Client"):	Northern Resource Consultants
Survey location/project name:	Whitsundays
Survey dates:	30 November – 5 December 2015
Client project reference:	
Job no.:	NRC-1507
Report date:	6 January 2016

Methods

Data receipt and processing

Bat calls were recorded over six nights using an Anabat detector (Titley Scientific, Brisbane). Data were downloaded from the detector and converted to Anabat sequence files (zero-crossing analysis format) by Faunalink, on behalf of the client. Balance! Environmental received 650 sequence files for analysis.

Call identification

All Anabat sequence files were viewed using *AnalookW* (Corben 2015), with species identified manually by comparing the call spectrograms with those of reference calls from southern and central Queensland and/or with published call descriptions (e.g. Reinhold et al. 2001; Pennay et al. 2004).

Species' identities were refined by considering probability of occurrence based on general distribution information (e.g. Churchill 2008; van Dyck & Strahan 2008) and/or online database records (www.ehp.qld.gov.au/wetlandmaps; www.ala.org.au).

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at http://www.ausbats.org.au/.

Species nomenclature follows Reardon *et al.* (2015).

Results & Discussion

Recording quality was good overall: most files contained long-duration calls with clearly defined pulses, which improved reliability of identification. Numerous calls were recorded throughout the night on 30/11, 3/12, 4/12 and 5/12; however, only three files were recorded on 1/12 and five files on 2/12. Each of these two nights yielded only one bat call (at 8:30pm on 1/12 and 12:30am on night of 2/12).

Six species were positively identified from their distinctive calls (see Table 1), with one additional call type reliably identified to *Nyctophilus*, the species of which cannot be differentiated on call characteristics. A number of calls were unresolved due to similarities between several species. These included calls with characteristics intermediate between the following species:

- *Chalinolobus gouldii* and *Mormopterus ridei*
    - most calls reliably attributed to *C. gouldii* due to steep curvilinear pulses with evidence of alternating frequency
    - some lower-quality recordings had mixed shapes and could have been either species.
- *Vespadelus troughtoni*, *Miniopterus orianae oceanensis* and *Chalinolobus morio*
    - *V. troughtoni* and *M. o. oceanensis* were positively identified from uniform, high band-width, steep pulses with distinctive hooked body (*V.t.*) or low band-width pulses with broad, diagonal-to-flat body (*M.o.o*).
    - several poor-quality calls had frequency in overlap zone between all three species (48-50 kHz) and included some pulses with down-swept tail similar to that of *C. morio*.

Where a call was not resolved to species levels, all potential candidates were listed as possibly present.

Table 1. Microbat species recorded during the Whitsundays survey, 30/11/2015 – 5/12/2015.

♦ = at least one call was attributed unequivocally to the species for the date/site

□ = calls similar to those of the species were recorded, but could not be reliably identified

\- = species not recorded

Date:	30/11	1/12	2/12	3/12	4/12	5/12
Number of calls identified:	130	1	1	205	8	109
Rhinolophus megaphyllus	♦	-	-	-	♦	-
Chalinolobus gouldii	♦	-	-	♦	-	♦
Chalinolobus morio	-	-	-	□	-	□
Nyctophilus species	-	-	-	♦	-	-
Vespadelus troughtoni	♦	-	♦	♦	-	♦
Miniopterus australis	♦	-	-	♦	♦	♦
Miniopterus orianae oceanensis	♦	-	-	♦	-	♦
Mormopterus lumsdenae	♦	♦	-	♦	♦	♦
Mormopterus ridei	□	-	-	-	-	□

References

Churchill, S. (2008). *Australian Bats*. Jacana Books, Allen & Unwin; Sydney.

Corben, C. (2015). *AnalookW for bat call analysis using ZCA.* Version 4.1j.

Pennay, M., Law, B. and Reinhold, L. (2004). *Bat Calls of New South Wales*. Department of Environment and Conservation, Hurstville.

Reardon, T.B., Armstrong, K.N. and Jackson, S.M. (2015). A current taxonomic list of Australian Chiroptera. Australasian Bat Society. Version 2015-05-15. Downloaded from: http://ausbats.org.au/taxonomic-list/4589345107

Reardon, T. (2003). Standards in bat detector based surveys. *Australasian Bat Society Newsletter* **20**, 41-43.

Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001). *Key to the bat calls of south-east Queensland and north-east New South Wales*. Department of Natural Resources and Mines, Brisbane.

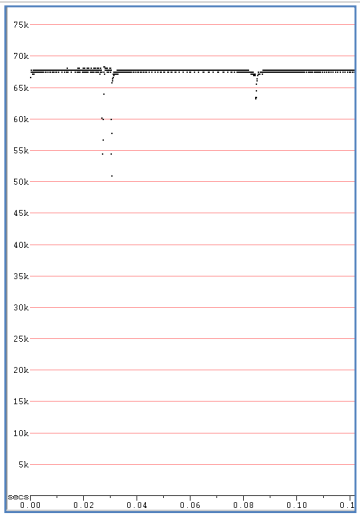
van Dyck, S. and Strahan, R. (ed.) (2008). *The Mammals of Australia* (Third Edition). New Holland; Sydney.

Glossary

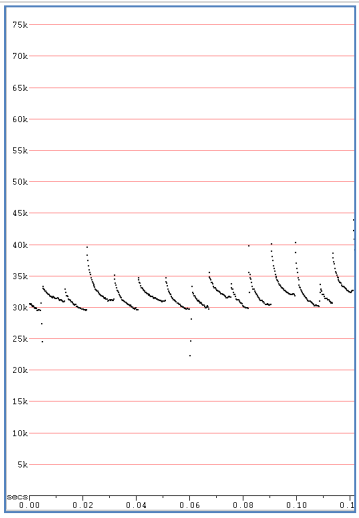
Technical terms used in this report are described in the following table.

Approach phase	The part of a bat *call* emitted as the bat starts to home in on a detected prey item; a transitional series of *pulses* between the *search phase* and *feeding buzz*, that become progressively steeper and shorter in duration.
Call	Refers to a single bat call, made up of a series of individual sound *pulses* in one or more *phases* (*search, approach, feeding buzz*).
CF (=Constant Frequency)	A type of *pulse* in which the dominant component consists of a more-or-less 'pure tone' of sound at a Constant Frequency; with *shape* appearing flat on the sonogram. Often also contains a brief *FM* component at the beginning and/or end of the CF component (*viz.* FM-CF-FM).
Characteristic frequency (Fc)	The frequency of the flattest part of a *pulse*; usually the lowest frequency reached in the *qCF* component of a pulse. This is often the primary diagnostic feature for species identification.
Duration	The time period from the beginning of a *pulse* to the end of the pulse.
Feeding buzz	The terminal part of a *call*, following the *approach phase*, emitted as the bat catches a prey item; a distinctive, rapid series of very steep, very short-duration pulses.
FM (=Frequency Modulated)	A type of *pulse* in which there is substantial change in frequency from beginning to end; *shape* ranges from almost vertical and linear through varying degrees of curvature.
FC range	Refers to the range of frequencies occupied by the *characteristic frequency* section of *pulses* within a call or set of calls.
Frequency sweep or "band-width"	The range of frequencies through which a *pulse* sweeps from beginning to end; Maximum frequency (Fmax) – minimum frequency (Fmin).
Knee	The transitional part of a *pulse* between the initial (usually steeper) frequency sweep and the *characteristic frequency* section (usually flatter); time to knee (Tk) and frequency of knee (Fk) can be diagnostic for some species.
Pulse	An individual pulse of sound within a bat *call*; the *shape*, *duration* and *characteristic frequency* of a pulse are the key diagnostic features used to differentiate species.
Pulse body	The part of the *pulse* between the *knee* and *tail* and containing the *characteristic frequency* section.
Pulse shape	The general appearance of a *pulse* on the sonogram, described using relative terms related to features such as slope and degree of curvature. See also *CF, qCF* and *FM*.
qCF (=quasi Constant Frequency)	A type of *pulse* in which there is very little change in frequency from beginning to end; *shape* appears to be almost flat. Some pulses also contain an *FM* component at the beginning and/or end of the qCF component (*viz.* FM-qCF).
Search phase	The part of a bat *call* generally required for reliable species diagnosis. A consistent series of *pulses* emitted by a bat that is searching for prey or and/or navigating through its habitat. Search phase pulses generally have longer duration, flatter slope and more consistent shape than *approach phase* and *feeding buzz* pulses.
Sequence	Literally, a sequence of *pulses* that may be from one or more bats; but generally refers to a *call* or part (e.g. *phase*) of a call.
Tail	The final component of a *pulse*, following the *characteristic frequency* section; may consist of a short or long sweep of frequencies either upward or downward from the Fc; or may be absent.

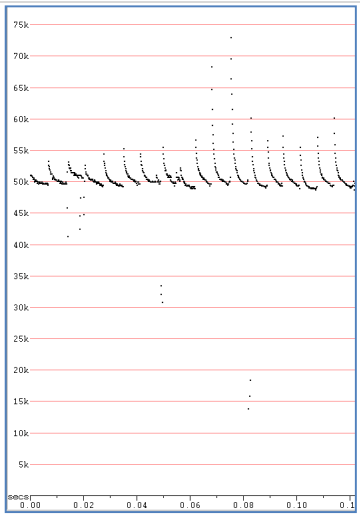
Appendix 1 Representative call sequences from the Whitsundays survey, December 2015.
(Scale: 10msec per tick; time between pulses removed)



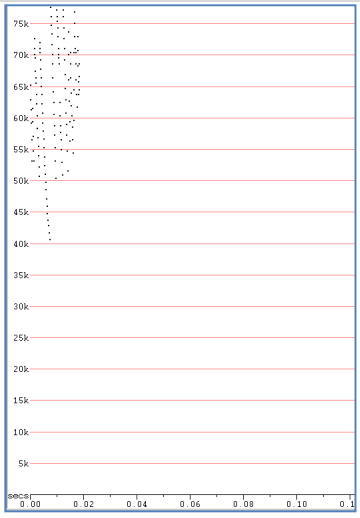
Rhinolophus megaphyllus



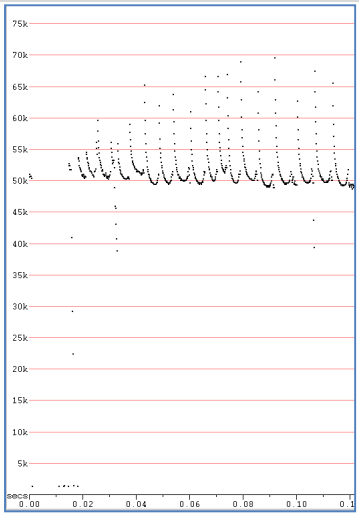
Chalinolobus gouldii



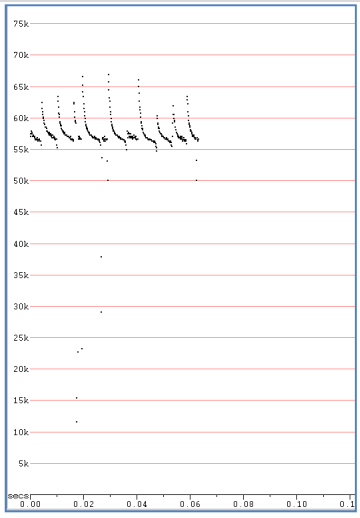
Possibly *Chalinolobus morio*



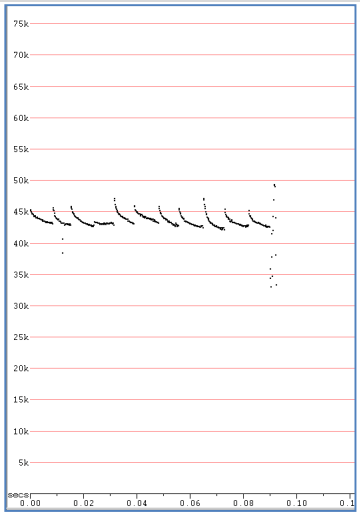
Nyctophilus species



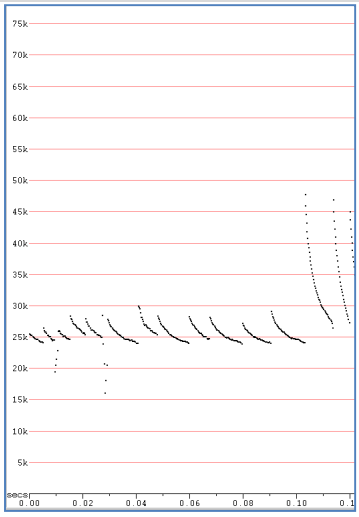
Vespadelus troughtoni



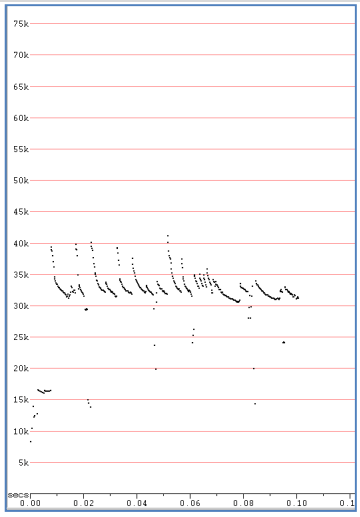
Miniopterus australis



Miniopterus orianae oceanensis



Mormopterus lumsdenae



Possibly *Mormopterus ridei*