Phosphate Resources Limited

Christmas Island Mountain Bike Track
Clearing Application and Supporting Documentation

Christmas Island
Indian Ocean

22 December 2022

63023/146,176 (Rev 2)

JBS&G Australia Pty Ltd T/A Strategen-JBS&G

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1. Introduction

Phosphate Resources Limited (PRL), in conjunction with Adventure Freak, are facilitating the establishment of a mountain bike trail network across Christmas Island as a tourism venture. Bikes are available for hire from the Christmas Island Visitor Centre and the Christmas Island Recreation Centre. Some sections of the trail are already sign-posted for use. The Christmas Island Mountain Bike Association (CIMBA) is an incorporated body that has applied for Commonwealth grant funding to facilitate the construction, signposting and interpretation facilities along the network. The proposed network covers many different tenures and CIMBA plays a key role in promoting the development of mountain biking as a key future ecotourism activity for the Island, and coordinating the network amongst the various land managers (e.g. Parks Australia) and other stakeholders.

The proposed mountain bike trail network traverses 30 km across various tenures including Mining Lease, Unallocated Crown Land and National Park. Approximately two thirds of the network is on existing roads or tracks which will require no new clearing. Clearing in the National Park is approved under a separate process through the Christmas Island National Park Management Plan 2014-2024 (Director of National Parks, 2014a). Most of the proposed trail will utilise the historic rail formation which previously transported phosphate from the south of the island to Settlement.

JBS&G Pty Ltd (JBS&G) was commissioned by Envirobiz Pty Ltd, on behalf of PRL to undertake a flora and vegetation survey and prepare a clearing permit application to facilitate development works on specific parts of the trail network (2.495 km) that require clearing to establish a suitable track surface. This varies from entirely new tracks through the forest, to works on the old railway line formation which will be cleared where necessary to establish a 2 m wide path.

1.1 Scope of Works

The Scope of Works for the projects to:

- Prepare a clearing permit application to facilitate development works on specific parts of the trail network (~9 km) that require clearing and earthworks to establish a suitable track surface.
- Undertake a site visit to review sections of the mountain bike trail which require works to support the permit application and to consult with key stakeholders.
- Undertake ground-truthing of previous vegetation mapping, a targeted flora survey and assessment of vegetation condition.

To accomplish this, JBS&G have undertaken a Reconnaissance survey of the proposed clearing areas and have prepared an application for an “purpose permit” using the Department of Water and Environmental Regulation’s (DWER) ‘Application for new permit/Referral to clear native vegetation’ and relevant and supporting documentation describing the environmental values of the proposed clearing area, inclusive of a desktop assessment of fauna values, and an assessment against the ten clearing principles.

1.1.1 Survey Area

The flora and vegetation survey assessed a 5 m buffer surrounding the proposed 2.495 km of track, totalling 2.48 ha (the ‘Survey Area,’ Figure 2.2).

1.2 Proposed Action

PRL proposes to clear sufficient understorey vegetation to enable the establishment of a 2 m path trafficable by bikes. A maximum of 0.5 hectares would need to be disturbed to purposes of developing a mountain bike trail. The path will be located within the 2.48 ha clearing envelope shown to enable flexibility to move the path where necessary to avoid vegetation clearing, protect

environmental and cultural features (Figure 2.2 and Table 1.1) and provide an enjoyable riding experience The 2 m clearing corridor will be aligned to avoid trees and provide an interesting ride with sweeping corners, berms and association erosion mitigation works.

The wider clearing envelope will provide flexibility to:

- Select a pathway that minimises clearing of vegetation and to deliver a very low impact operation;
- Minimise any disturbance to environmental features, trees and historical relics;
- Provide an enjoyable and visually attractive riding path that weaves through the forest and maximises opportunities to view and learn about the Christmas Island natural and cultural heritage; and
- Maintain the overstorey canopy.

Figure 1.1 below depicts how the path would be located in relation to the forest structure.

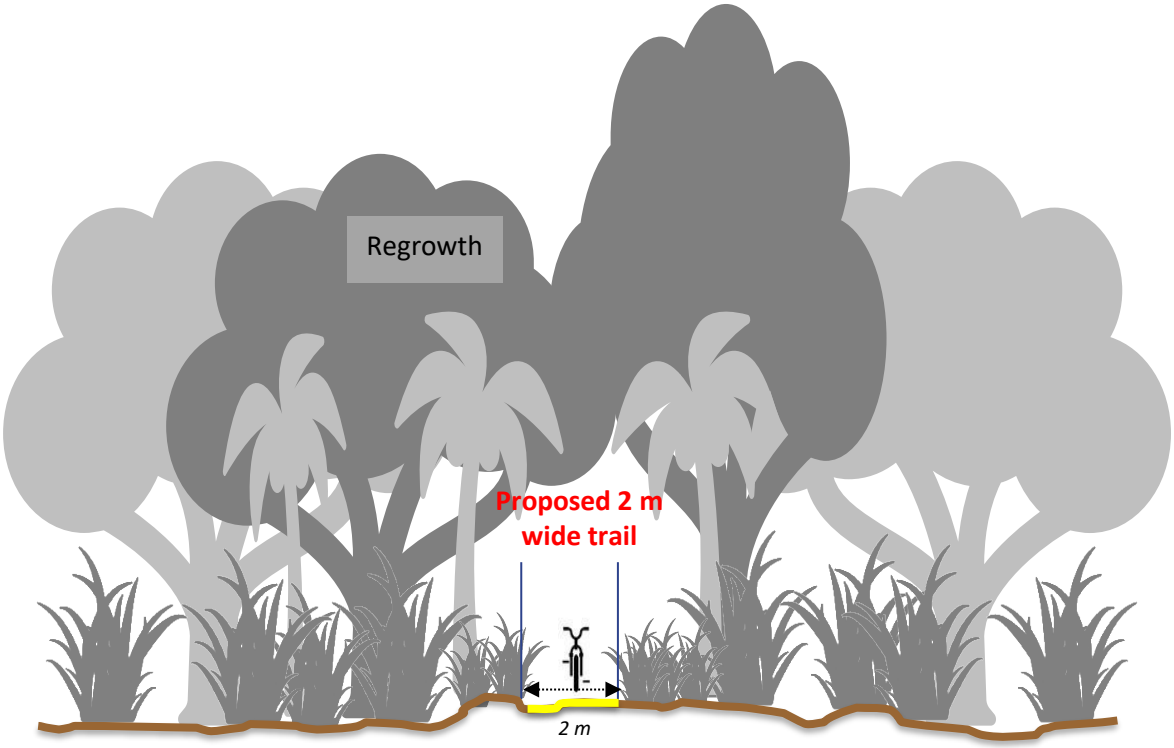


Figure 1.1: Conceptual track design* (not to scale)

*Note that the profile varies depending on natural contours and surface geology so alignment may be wider or slightly narrower. This figure is intended to depict a typical or average profile.

1.2.1 Applicant

Phosphate Resources Limited, trading as *Christmas Island Phosphates*
Registered Address: 6 Thorogood Street, Burswood, WA 6100

1.2.2 Clearing Area

Approximately 0.5 ha is proposed for clearing over three clearing envelopes totalling 2.48 ha, presented in Figure 2.2 and Table 1.1.

Table 1.1: Proposed Clearing Envelopes

Area	Tenure	Location	Size of envelope (ha)	Maximum actual clearing required for path (ha)
1 "NT1 Linxs"	Lot 0 and Lot 523 (P220459) Mining Lease MCI 70/1A, held by Phosphate Resources Limited (Vacant Crown Land)	This section connects an existing track south of the Christmas Island Recreation Centre to another pre-existing track which connects to Irving Hill Road.	1.36	**0.28 (2,774 m²)**
2 "NT2 Switchbacks detour"	Lot 0, Mining Lease MCI 70/1A, held by Phosphate Resources Limited (Vacant Crown Land)	This section connects from the intersection of the old rail formation and East-west Baseline Road to the Temple located off Blow Holes Road. It is located on an old track adjacent to the main rail formation.	0.69	**0.14 (1,362 m²)**
3 "NT3 Formation Gully"	Lot 0, Exploration Lease ECI 70/2, held by Phosphate Resources Limited (Vacant Crown Land)	This section diverges from Blow Holes Road before re-joining it, and passes entirely along the historic rail formation.	0.43	**0.08 (854 m²)**
Total			**2.48**	**0.5**

1.2.3 Clearing Method

'Clearing' would generally consist of removal of understorey vegetation and will avoid large trees, with the objective of preserving vegetation and ensuring the track remains visually attractive. Clearing will be accomplished by mechanical removal using a mulcher and/or bobcat.

Construction operations will be timed to avoid the red crab migration and times of high crab activity.

1.2.4 Required Permit Duration

The clearing is proposed to be undertaken from March 2023 to December 2025.

2. Context

2.1 Legislative Context

The legislative framework for Christmas Island is complex. The *Christmas Island Act 1958* outlines the governance arrangements for the island. Section 8E of the Act makes provision for all laws of Western Australia and the Commonwealth to apply in Christmas Island. The Minister lists selected Western Australian laws to be excluded or amended in the *Applied Laws (Implementation) Ordinance 1992*. The island is governed under Commonwealth legislation and administered by the Department of Infrastructure, Regional Development and Cities (DIRDC). Applied Western Australian laws are administered by the relevant Commonwealth Minister, by Commonwealth officers acting under ministerial delegations, or by State officers exercising delegated power and acting pursuant to inter-government service agreements under Section 8h of the Act. The community is represented in the Federal Parliament by the Member for Lingiari in the House of Representatives and the two Senators for the Northern Territory in the Senate with local Government (i.e. Shire of Christmas Island) utilising Western Australia legislation.

Flora and fauna on Christmas Island are protected formally and informally by various legislative measures, which are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – Australian Government, and *Environment Protection and Biodiversity Conservation Regulations 2000*;
- *Biodiversity Conservation Act 2016* (BC Act) – State, and *Biodiversity Conservation Regulations 2018*;
- *Environmental Protection Act 1986* (EP Act) – State, and *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*; and
- *Biosecurity and Agriculture Management Act 2007* (BAM Act) – State, and *Biosecurity and Agriculture Management (Declared Pest Account) Regulations 2014*.

A short description of each legislative measure is given below. Other definitions, including species conservation categories, are provided in Appendix A.

2.1.1 EPBC Act

The EPBC Act aims to protect matters of national environmental significance. Under the EPBC Act, the Commonwealth Department of Climate Change, Energy the Environment and Water (DCCEEW) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are conservation significant if they are listed as Threatened (i.e. Critically Endangered, Endangered and Vulnerable) or Migratory.

2.1.2 BC Act

The Department of Biodiversity, Conservation and Attractions (DBCA) lists taxa (flora and fauna) under the provisions of the BC Act as protected and are classified as according to their need for protection. The BC Act makes it an offence to 'take' threatened species without an appropriate licence. There are financial penalties for contravening the BC Act.

2.1.3 EP Act

Threatened flora, fauna (and significant habitat necessary for the maintenance of indigenous fauna) and Threatened Ecological Communities (TECs) are given special consideration in environmental impact assessments and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Most exemptions for a clearing permit do not apply in an ESA.

Clearing of Native Vegetation

Clearing of native vegetation on Christmas Island is regulated under provisions in s.51 of the *Environmental Protection Act 1986* (WA) (CI) (EP Act).

2.1.4 BAM Act

The BAM Act provides for management and control of listed organisms, including introduced flora species (weeds). Species listed as declared pests under the BAM Act are classified under three categories:

- C1 Exclusion: Pests assigned under this category are not established in Western Australia, and control measures are to be taken to prevent them entering and establishing in the State;
- C2 Eradication: Pests assigned under this category are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility; and
- C3 Management: Pests assigned under this category are established in Western Australia, but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area that is currently free of that pest.

Under the BAM Act, land managers are required to manage populations of declared pests as outlined under the relevant category.

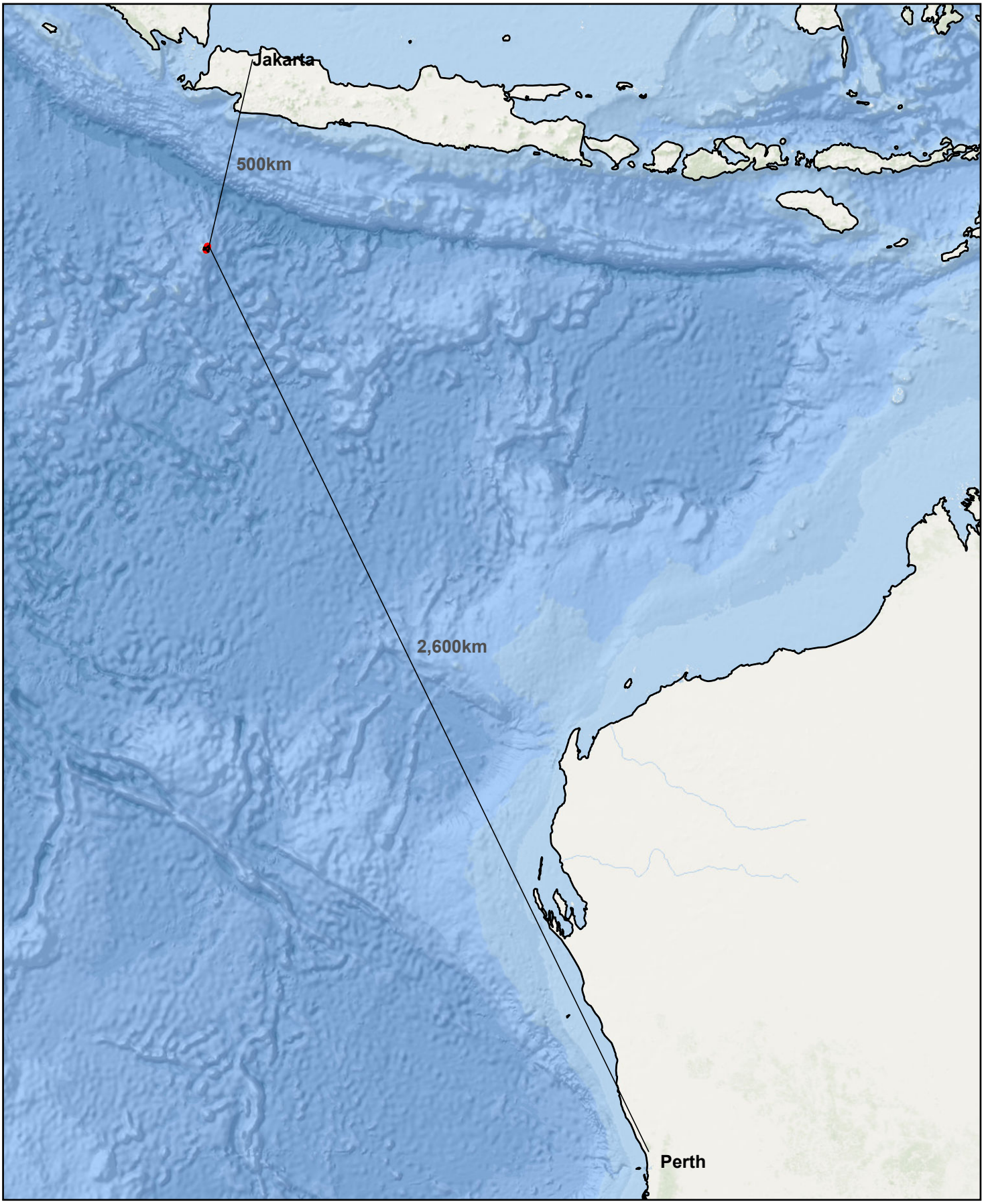
2.2 Environmental Setting

2.2.1 Location and Land Use

Christmas Island is located in the Indian Ocean, 10°30’ South, 105°40’ East, and approximately 2,600 km north-west of Perth, Western Australia and 500 km south of the Indonesian capital Jakarta (see Figure 2.1). The majority (63%) of the Island is set aside as National Park. The remaining third is a mix of Mining Lease, Crown Reserves and Unallocated Crown Lands which have no current land uses or activities.

2.2.2 Climate

Christmas Island lies on the southern edge of the inter-tropical convergence zone and the climate is dominated by a low-pressure trough that seasonally circles the equator. The Island has a tropical monsoonal climate with distinct wet and dry seasons and little seasonal variation in temperature. The dry season (May to November) is dominated by low and sporadic rainfall (see Figure 2.3) with consistent south-east trade winds (BOM, 2022). The wet season generally occurs from December to April with the Island receiving most of its rainfall during this period.



Legend

Site location

Scale: 1:13,000,000 at A4

0 100 200
Kilometres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A

Date: 11-Nov-2022

Drawn By: cthatcher

Checked By: RP

Christmas Island
Indian Ocean

LOCATION OF CHRISTMAS ISLAND

FIGURE 2.1

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Image Reference: World Ocean Base: Esri, GEBCO, DeLorme, NaturalVue



Legend

- NT1 Linx
- NT2 Switchbacks Detour
- NT3 Formation Gully
- Tenements
- Christmas Island National Park
- Proposed mountain bike tracks
- Historic rail
- Major roads

Scale: 1:50,000 at A4 (0, 0.5, 1 Kilometres)		**Christmas Island Indian Ocean**
Coord. Sys. GDA2020 MGA Zone 50		**SURVEY AREA**
Job Number: 63023		
Client: Phosphate Resources Limited		**FIGURE 2.1**
Version: A	Date: 11-Nov-2022	strategen JBS&G
Drawn By: cthatcher	Checked By: RP	

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Image Reference: World Imagery: Earthstar Geographics Client imagery

The Christmas Island Aero weather station (Station Number 200790) has operated from 1972 to the current date. Christmas Island's average annual rainfall since 1973 is 2,117 mm but may vary considerably from year to year. The Island's lowest recorded annual rainfall was 1,066.9 mm in 1987 and the highest 5,121 mm in 2016 when rainfall exceeded previous annual records by 1,406 mm (BOM, 2022).

Temperatures remain relatively uniform throughout the year, with an average daily maximum of 28°C in March/April and average daily minimum of 22°C in August/September (BOM, 2022). The Island has high humidity (80-90%) throughout the year and frequent dews and heavy mists may occur during the wet season.

During the wet season, Christmas Island is subject to the influence of north-west monsoons, which typically cause high swells and high winds, with gusts of over 100 km/h. Many cyclones have passed nearby the Island, resulting in strong winds and heavy rainfall on the Island. Cyclone Gillian caused significant damage to rainforest communities in March 2014, with trees blown over and foliage stripped from many areas.

The Island does have distinct microclimates due to the Island's geography, with rainfall measurements indicating that there are significant variations in rainfall (Falkland, 1999). Average rainfall at Rocky Point (Settlement), Jedda Cave and South Point (1,931, 2,375 & 1,907 mm respectively) for example shows the significant variation across the Island (Puhalovich et al., 2003). Daily evaporation typically exceeds rainfall between July and October.

In the six-month period preceding the survey (December 2021 to May 2022), Christmas Island received slightly over the long-term average for rainfall.

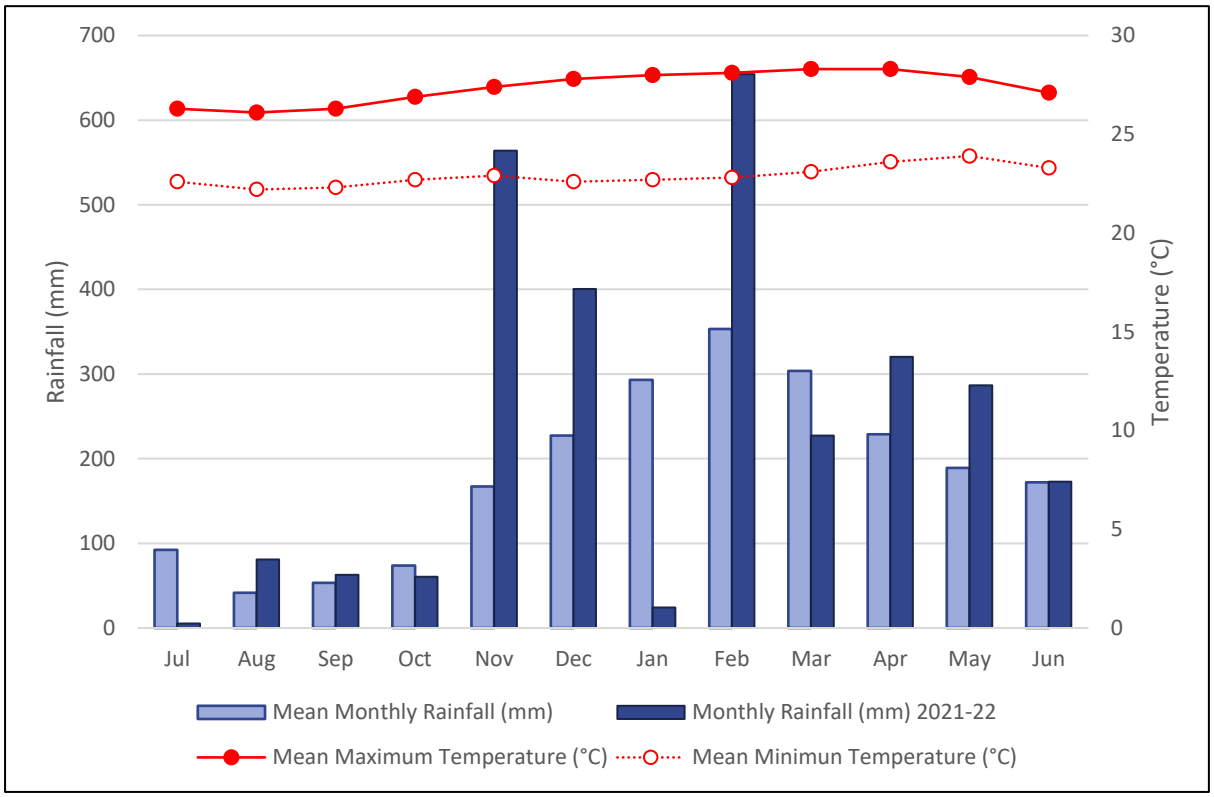


Figure 2.3: Monthly rainfall and temperature at Christmas Island Airport (Station 200790)

Source: BOM (2022)

2.2.3 Biogeography

Christmas Island is included in the Interim Biogeographic Regionalisation of Australia (IBRA v. 7) as the Indian Tropical Islands Bioregion (DEE, 2012).

2.2.4 Soils and Landforms

Christmas Island is one of a series of submarine seamounts that rise above the 5,500 m deep abyssal areas of the West Australian Basin. At the core of the Island are volcanic rocks, mainly composed of basalt with a layer of limestone generally covering these volcanic rocks (Figure 2.5), which occasionally outcrops, particularly along the present coastline (Grimes, 2001).

The Island is characterised by sea cliffs that rise via a series of terraces to a central plateau (Figure 2.6) which peaks at approximately 361 m above sea level (Grimes, 2001). The shoreline is dominated by cliffs and extensive shore platforms with a few small beaches and Flying Fish Cove, which has a relatively large beach and shallow platform, being the only safe harbour for much of the year. The Island's natural landscape is dominated by karstic surface landforms and cave systems (Grimes, 2001).

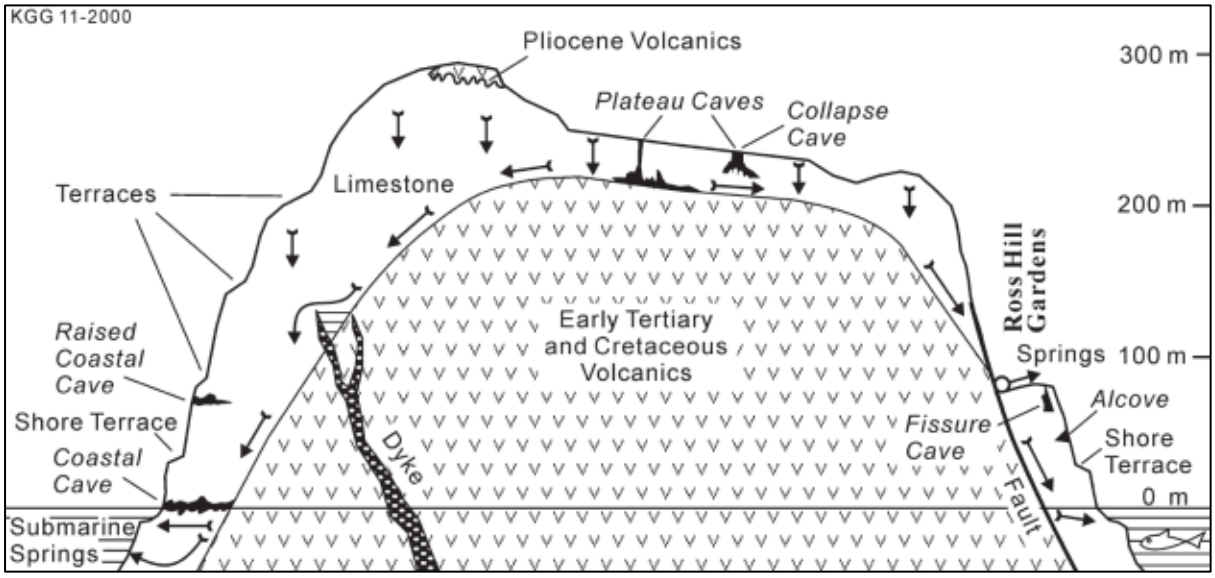


Figure 2.4. Diagrammatic cross-section of Christmas Island[1]

Terrace areas on the Island reflect the height above sea level in different geologic periods. Renewed vulcanism and a series of geological uplifts at different periods have resulted in a tiered effect. The oldest limestones near the peak of the Island formed during the Eocene period (Grimes, 2001). Most the Island's limestone deposits were formed during the Tertiary (late Oligocene to mid Miocene age), with the youngest limestones deposited on the lowest terrace in the late Quaternary (Grimes, 2001).

The limestone is mixed with dolomite sediments, basalts and tuffs. A layer of phosphate-rich soil material covers the limestone over about half of the Island. Marine sediments and guano deposition have formed the Island's phosphatic soils. A breakdown of the surface geology of the Survey Areas is presented in Table 2.1 and Figure 2.5 (Geoscience Australia, 2003).

The red crab (*Gecarcoidea natalis*) is the principle agent of organic matter turnover and incorporation into the soil. Crab activity is a key feature of water and nutrient availability in the

[1] *Source: Grimes* (2001): (Figure shows volcanic core, limestone capping, water flow lines (arrows) and typical cave development. Vertical scale is exaggerated x10).

subsoil, with burrows also providing a preferred pathway for water drainage into the soil (Hollingsworth, 2003).

The proposed clearing area occurs predominantly on and near the old rail formation established by historic phosphate operations. In places this is cut out of elevated areas ("Formation Gully"), while in other areas, The formations were fully cleared and built up with chalk ballast. The trains utlised this railway until the 1980's. The NT1 Linxs section of the proposed track falls within Mining Lease MCI 70/1A where it passes over old stockpiles, past clearing areas and old mining excavations. This section has been chosen to link other existing tracks to facilitate a continuous loop trail, plus provide some more adventurous tracks for more skilled mountain bikers. This link track is close to the recreational centre where bikes are now being hired out for visitors.

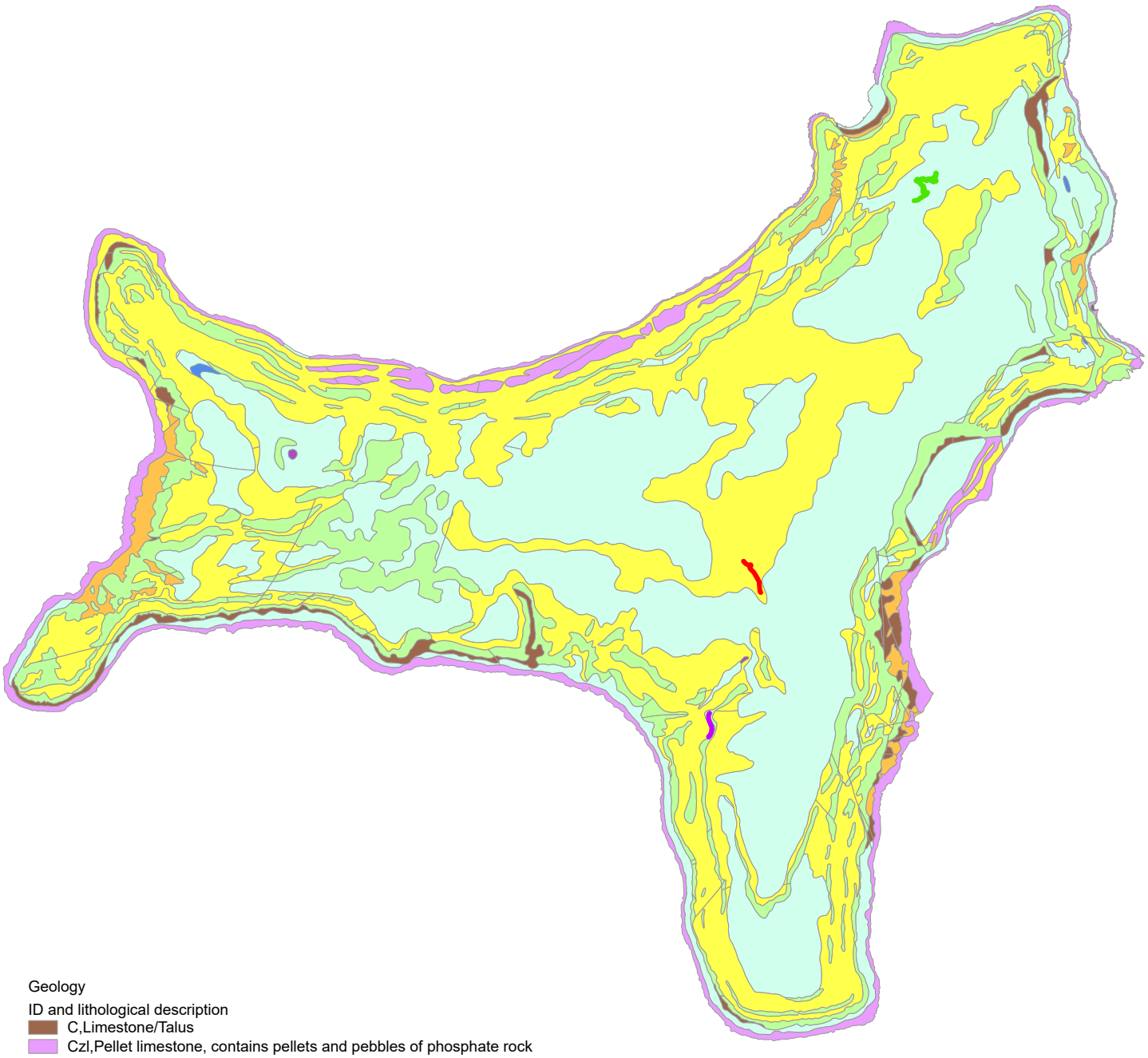
Table 2.1: Geological units within the Survey Area (Geoscience Australia, 2003)

Row Labels	Area 1	Area 2	Area 3	Total
Czp: Unconsolidated material – mostly phosphatic soil containing >20% P_2O_5	1.36 ha			**1.36 ha**
Tz: Limestone - undifferentiated			0.16 ha	**0.16 ha**
Tzp: Pinnacles of limestone with variable amounts of unconsolidated material (Czp)		0.69 ha	0.28 ha	**0.96 ha**
Total	**1.36 ha**	**0.69 ha**	**0.43 ha**	**2.48 ha**

Christmas island is not included in Western Australian soil-landscape mapping.



Plate 1. Chalk ballast substrate along the rail formation.



Geology

ID and lithological description

- C,Limestone/Talus
- Czl,Pellet limestone, contains pellets and pebbles of phosphate rock
- Czp,Unconsolidated material - mostly phosphatic soil containing >20% P2O5
- P,Phosphate rock - massive, boulder, and pebble deposits
- Pv,Phosphatised "volcanics"
- Tb,Volcanics - mostly basalt, some tuff, scoria - undifferentiated
- Tel,Limestone
- Tz,Limestone - undifferentiated
- Tzp,Pinnacles of limestone with variable amounts of unconsolidated material (Czp)

Legend

- NT1 Linx
- NT2 Switchbacks Detour
- NT3 Formation Gully

Scale: 1:105,000 at A4

0 1 2

Kilometres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A | Date: 11-Nov-2022

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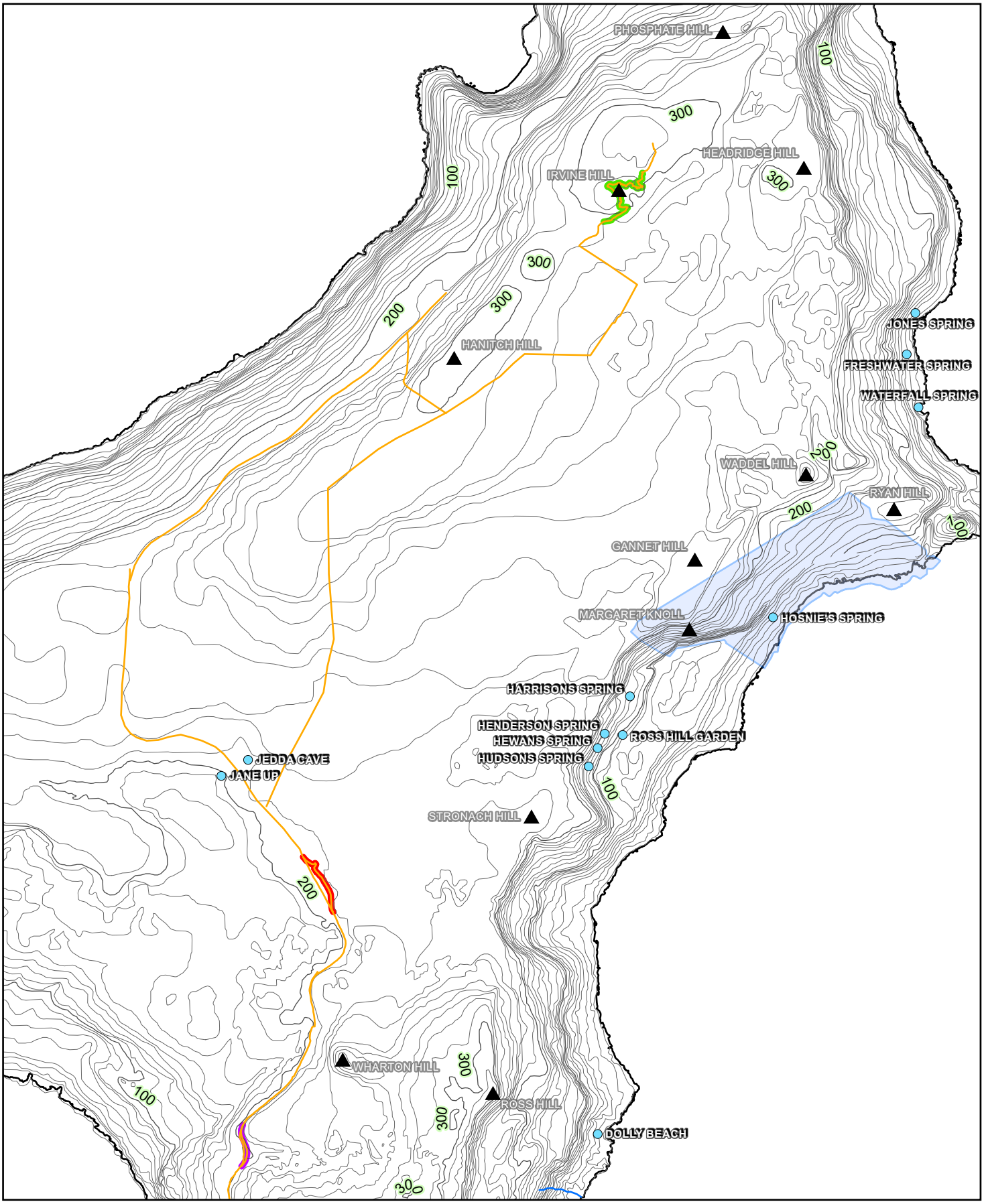
Christmas Island
Indian Ocean

GEOLOGY

FIGURE 2.5

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Legend

- NT1 Linx
- NT2 Switchbacks Detour
- NT3 Formation Gully
- Ramsar wetlands
- Proposed mountain bike tracks
- Streams

Topographic contours (mAHD)

- 100
- 200
- 300
- Contours 10 m
- Hill points
- Springs

Scale: 1:50,000 at A4 (0, 0.5, 1 Kilometres)		**Christmas Island Indian Ocean**
Coord. Sys. GDA2020 MGA Zone 50		**LANDFORMS AND HYDROLOGY**
Job Number: 63023		
Client: Phosphate Resources Limited		**FIGURE 2.6**
Version: A	Date: 11-Nov-2022	strategen JBS&G
Drawn By: cthatcher	Checked By: RP	

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2.2.5 Surface Water and Regional Hydrology

A major feature of the Christmas Island geomorphology is the lack of surface drainage. Rainfall mostly infiltrates the land surface and is utilised by plants, contributes to soil water stores or recharges to groundwater. There is therefore no significant surface drainage network except down gradient of springs that arise at the interface between limestone and basalt formations.

Christmas Island's soils are generally highly permeable and there is consequently little runoff or erosion (Hollingsworth, 2003). In the Wet Season when the soils are saturated, runoff can occur during heavy rainfall providing some risk of erosion and sedimentation. However, given the high natural infiltration rates the risk of erosion and sedimentation is generally localised to compacted areas such as roads and stockpile pads. Infiltration tests by Puhalovich et al. (2003) indicate that soil infiltration rates are typically substantially higher than hourly rainfall intensities.

There are three key hydrogeological units on the Island; shallow, residual soils, which overlie fractured, unconfined – semi-confined aquifers within the karstic limestone rocks, which in turn overlie relatively impermeable volcanic basement rocks (Puhalovich et al., 2003). Groundwater levels on the Island are reflected by the location of the unconfined water table within the karst limestone aquifers. Limestone aquifers can be recharged when rainfall permeates through the soil zone into the underlying aquifers or by direct runoff of rainfall into karst features such as dolines and sinkholes that occur across the Island (Puhalovich et al., 2003). Assessments suggest that approximately half of all incident rainfall passes through the soil zone and recharges the underlying limestone aquifers (Hollingsworth, 2003; Falkland, 1999). Groundwater discharge occurs at surface springs such as Hosnie's Spring and offshore springs such as those found at Flying Fish Cove (Puhalovich et al., 2003). The complex behaviour and extent of weathered/fractured rock aquifers on the Island are not well understood.

Perennial (permanent) surface aquatic habitats (freshwater) on Christmas Island are limited to a number of spring-fed streams found along coastal or sloping areas of the Island (Figure 2.6). Hosnie's Spring and The Dales are both listed as a Wetland of International Importance under the Convention on Wetlands of International Importance, Water Fowl Habitat 1971 (known as the 'Ramsar Convention') and are listed in the Directory of Important Wetlands in Australia.

2.2.6 Regional Vegetation

The Christmas Island National Park, which covers 63% of the Island, is assigned to IUCN reserve category II, most of which is uncleared primary rainforest (Director of National Parks, 2014a). Some 25% of the Island's original vegetation has been cleared for mining and infrastructure (Director of National Parks, 2014a).

Three features of the ecology of the Island's native vegetation are notable (Environment Australia, 2014):

- The occurrence of many of the widespread Indo-Malesian species in habitats that would be considered extremely atypical elsewhere in their natural ranges, and associated with this, the exceptionally large stature of some of these species;
- The low diversity of canopy and sub-canopy species and the lack of structural complexity (e.g. relatively poor development of robust woody vines and rattans, the absence of aroids and of gingers in the understorey) in the Island's rainforests; and
- The very low diversity and lack of speciation amongst plant genera that elsewhere in the region is characteristic of early successional, and frequently disturbed, rainforest environments (e.g. *Macaranga*, *Claoxylon* and *Pipturus*).

The geology, geomorphology and climate on Christmas Island create the biophysical environment and constraints for the vegetation communities. These factors determine the soil nutrient status, the seasonal availability of moisture and the degree of exposure to wind, which in turn control the distribution, structure and functioning of the natural vegetation (Director of National Parks, 2014a).

Vegetation mapping of the Island was initially undertaken by Mitchell (1985) for the Australian Nature Conservation Agency. This mapping had limited use due to its broad scale and spatial inaccuracy. Flora of Australia Volume 50 (Du Puy, 1993a) listed eight vegetation types for the Island.

A vegetation mapping project was undertaken from 2011 to 2014 to attempt to map vegetation with better spatial accuracy, to determine height categories and to apply these consistently across the Island. The process included a Light Detection and Ranging (LiDAR) survey, review of historic aerial photography which captured past clearing, and ground truthing. Additional categories were added to include wetland vegetation and regrowth in cleared areas. The Christmas Island Vegetation and Clearing Map was developed through a collaborative project by Geoscience Australia, Christmas Island Phosphates, Christmas Island National Park and the Commonwealth Department of the Environment (Geoscience Australia, 2014). The map classified the full extent of Christmas Island into vegetation and land cover classes (Figure 2.8 and Table 2.3), though boundaries are not always perfectly geographically accurate. Flora of Australia's vegetation types, which are still referred to in some documents, were recategorized thus:

- 'Primary rainforest' became closed canopy evergreen forest;
- 'Marginal rainforest' became *semi-deciduous forest*;
- 'Areas with surface water' became *perennial wetland forest*;
- 'Open forest, scrubby forest and vine forest' and 'inland cliffs' became *semi-deciduous scrub*;
- 'Coastal fringe' and 'shore cliffs and spray zone' became *coastal fringe vegetation*; and
- 'Mined areas' became rehabilitation, regrowth and weed dominated veg and pioneer regrowth.

Table 2.2. Vegetation of Christmas Island

Level 1	Level 2	Description
Closed canopy evergreen forest	Closed canopy evergreen forest (tall or moderate)	Generally found on the plateau and terraces, with a closed uneven canopy up to 40 m in height. Some trees emerge up to 10 m above the canopy. Often supports ferns and orchids, young palms and lilies in the understorey. **Indicator species:** *Bolbitis heteroclita, Syzygium nervosum, Hernandia ovigera, Planchonella nitida, Pisonia umbellifera, Corymborkis veratrifolia, Ehretia javanica*
Semi-deciduous forest	Semi-deciduous forest	Generally found on the slopes and terraces down to the coast - and some plateau areas. Higher occurrence of semi-deciduous trees compared to Closed Canopy Evergreen, which lose a portion of leaves during the dry season. Tree height generally 10-25 m. **Indicator species:** *Terminalia, Gyrocarpus, Erythrina variegata, Premna serratifolia, Pisonia grandis, Ochrosia ackeringae*
Semi-deciduous scrub	Semi-deciduous scrub	Found on the terraces, steep slopes and inland cliffs. Semi-deciduous canopy with vines and shrub understorey Tree height generally <10 m. **Indicator species:** §*Colubrina pedunculata, Canavalia cathartica, Carmona retusa*, Cycads
Perennial wetland forest	*Inocarpus fagifer* dominant	Areas of fresh water runoff on the lower terraces dominated by *Inocarpus fagifer*. **Indicator species:** *Inocarpus fagifer*
	Hibiscus tiliaceus dominant	Areas of fresh water runoff on the shore terrace dominated by *Hibiscus tiliaceus*. **Indicator species:** *Hibiscus tiliaceus*
	Bruguiera dominant	A single patch of vegetation dominated by *Bruguiera* at Hosnie's Spring. Occurring in an area of fresh water runoff on the shore terrace. **Indicator species:** *Bruguiera gymnorhiza*

Level 1	Level 2	Description
Coastal fringe vegetation	Coastal herbland	Found between the coastal scrub and coastal cliffs in exposed areas. Class is dominated by low-lying herbs, sedges and grasses. **Indicator species:** *Portulaca tuberosa,* §*Ischaemum nativitatis, Oplismenus compositus, Sporobolus virginicus*
	Coastal shrubland	Dense salt-tolerant vegetation growing between the coastal herbland and the terrace cliffs. **Indicator species:** §*Pandanus christmatensis, Scaevola, Pemphis, Argusia argentea, Cordia cordata, Guettarda*
Rehabilitation	Rehabilitation	Areas where forest rehabilitation has taken place. The standard of forest varies depending on the type of rehabilitation completed, species planted and management regime. **Indicator species:** A mix of up to 30 native tree species when initially planted, dependent on characteristic of the site and year of rehabilitation. *Macaranga, Dysoxylum, Calophyllum, Tristiropsis*
Regrowth	Regrowth	Generally well-developed regrowth vegetation over 5 m mean tree height. May include some introduced or weed species. **Indicator species:** Various species – dependent on adjacent vegetation
Weed dominated veg and pioneer regrowth	**Leucaena leucocephala*	Monoculture of **Leucaena leucocephala*. Often occurring as regrowth in previously cleared areas. **Indicator species:** **Leucaena leucocephala*
	Fern field	Expanse of low-lying ferns often growing on limestone pinnacles. **Indicator species:** *Nephrolepis biserrata*, *Microsorum scolopendria, Psilotum nudum*
	Mixed weed and pioneer regrowth	Regrowth vegetation with a mean tree height of <5 m. Can vary between native and introduced species depending on the location and time since clearing. Tends to have a higher occurrence of weed species compared to the 'Regrowth' category. **Indicator species:** **Muntingia calabura, *Psidium* sp. (guava), **Mimosa*, Passionfruit, *Macaranga*

(Sources: Du Puy, 1993a and Geoscience Australia (2014)

There are seven major structural types of secondary vegetation (i.e. vegetation that has established in areas that have been cleared of the original natural forest) on Christmas Island (Figure 2.7). The occurrence of these secondary vegetation types in specific disturbed areas on Christmas Island reflects the influence of four main factors:

- The areal extent and the severity/intensity of the original disturbance (especially whether the soil profile has been disrupted or removed);
- Proximity to the nearest forest boundaries and/or to weed-infested areas;
- The subsequent disturbance or management history of the area (especially the frequency and intensity of further disturbances including fire); and
- The time since the last major disturbance occurred.

Whether or not the soil profile has been removed or disturbed, the proximity to forest and/or to weed infested areas and the occurrence of further disturbance are the major environmental determinants of secondary vegetation type and successional pathways. There are four main successional pathways:

- Arrested successions dominated by ferns;
- Stagnant successions dominated by thickets of exotic shrubs and vines;
- Reconstructive successions dominated by *Macaranga tanarius*; and
- Retrogressive successions leading to fernlands.

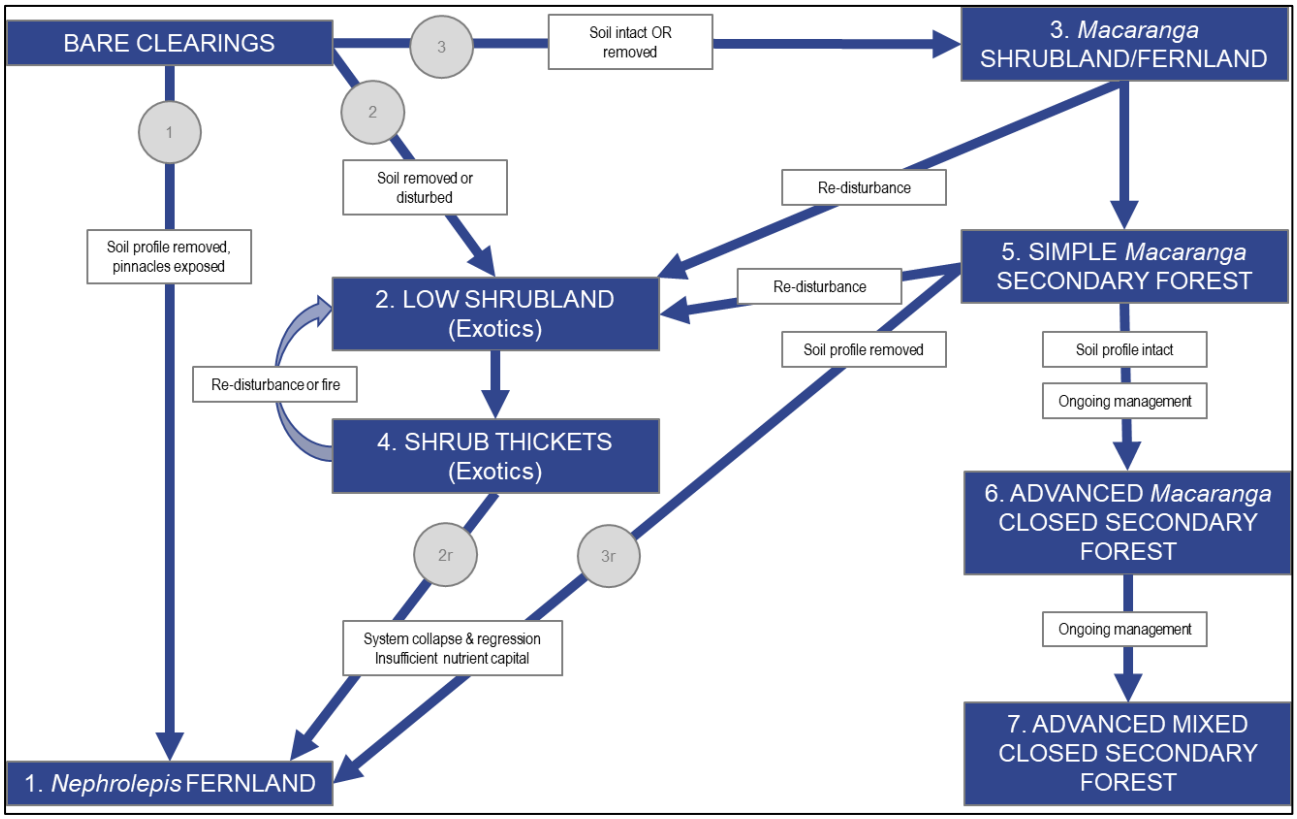


Figure 2.7: The seven major secondary (regrowth) structural types occurring on Christmas Island, adapted from Bennett (2010)

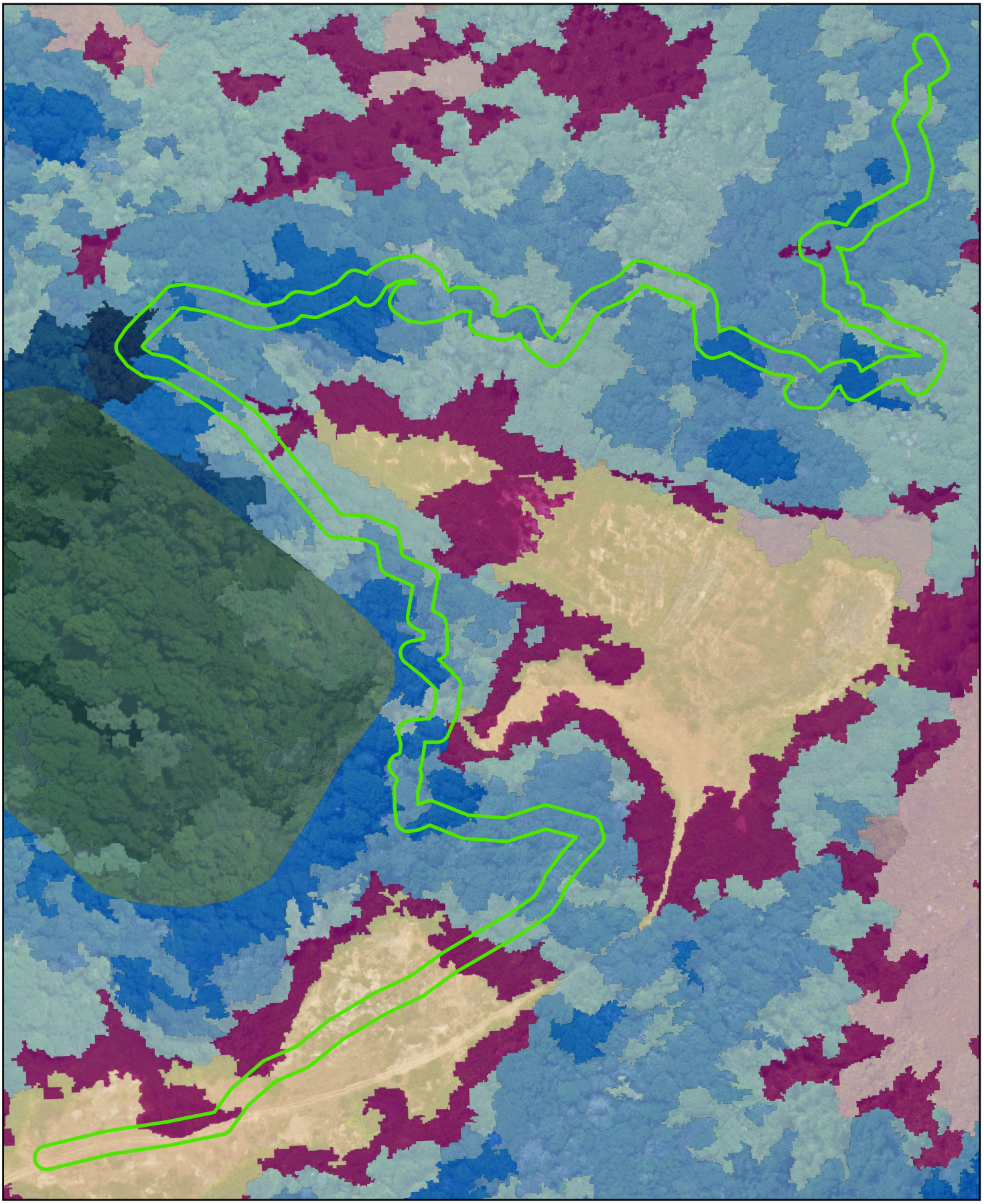
From the 2.48 ha proposed clearing envelope, 1.92 ha is mapped as regrowth vegetation, 0.05 ha has been mapped as closed canopy evergreen forest and the remainder is degraded land mapped as bare ground, fern field, infrastructure, **Leucaena leucocephala* dominant, mining or mixed weed & pioneer species (Geoscience Australia, 2014). Nearly all regrowth was below 20 m height, with the majority being below 15 m height.

Area 3 skims the edge of Geoscience Australia's (2014) mapped area[2] for closed canopy evergreen forest, however there is sufficient space within the proposed clearing envelope to avoid clearing primary rainforest and the modified substrate (chalk ballast) makes obvious the historic disturbance area.

Table 2.3: The vegetation in the Survey Area as mapped by Geoscience Australia (2014)

Area	Not vegetated	Weed dominated vegetation & pioneer regrowth	Regrowth	Closed canopy evergreen forest	Total (ha)	Maximum clearing area (ha)
1 "NT1 Linxs"	0.17	0.06	1.14	-	**1.36**	**0.28 (2,774 m²)**
2 "NT2 Switchbacks detour"	0.15	0.12	0.42	-	**0.69**	**0.14 (1,362 m²)**
3 "NT3 Formation Gully"	-	0.02	0.36	0.05 (This vegetation will be avoided)	**0.43**	**0.08 (854 m²)**
Total (ha)	**0.32**	**0.20**	**1.92**	**0.05**	**2.48**	**0.50**

[2] Refer also to Section 2.2.6 for additional information regarding Geoscience Australia's (2014) vegetation mapping process and its accuracy.



Legend

NT1 Linx

Vegetation types (Geoscience Australia)

Fern field
- 5-10 m
- <5 m

Regrowth
- 25-30 m
- 20-25 m
- 15-20 m
- 10-15 m
- 5-10 m
- Mixed weed and pioneer species, <5m

Closed Canopy Evergreen Forest
- 25-30 m (tall)
- 20-25 m
- 15-20 m
- 10-15 m

Other
- Bare ground

Scale: 1:2,200 at A4

0 25 50
Metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A | Date: 11-Nov-2022

Drawn By: cthatcher | Checked By: RP

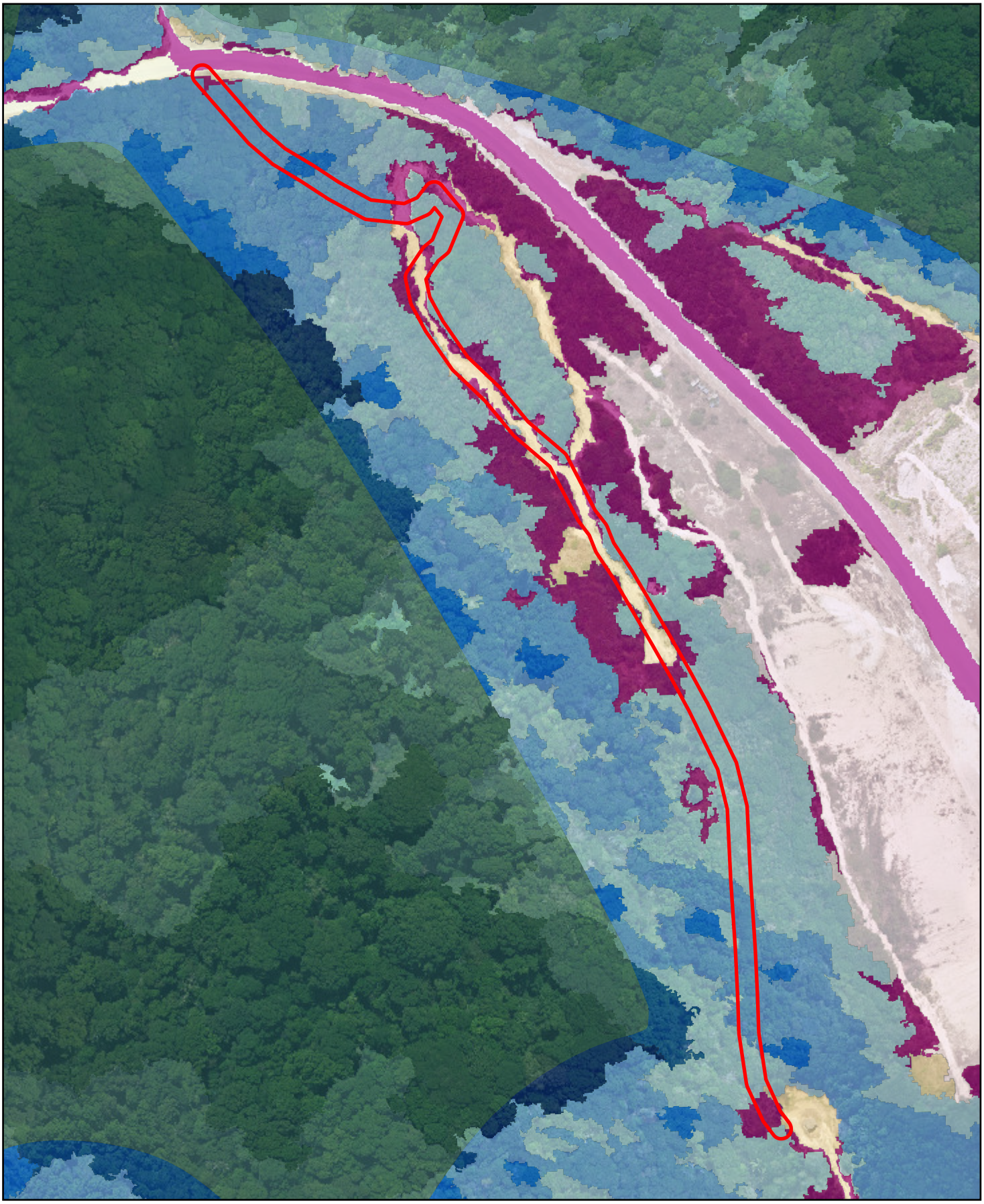
Christmas Island
Indian Ocean

GEOSCIENCE AUSTRALIA VEGETATION NT1 LINX

FIGURE 2.8

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery October 2011.



Legend

NT2 Switchbacks Detour

Vegetation types (Geoscience Australia)

Regrowth
- 25-30 m
- 20-25 m
- 15-20 m
- 10-15 m
- 5-10 m
- Mixed weed and pioneer species, <5m

Closed Canopy Evergreen Forest
- 25-30 m (tall)
- 20-25 m
- 15-20 m
- 10-15 m
- 5-10 m

Other
- Bare ground
- Mining
- Infrastructure

Scale: 1:2,600 at A4

0 25 50
Metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A | Date: 11-Nov-2022

Drawn By: cthatcher | Checked By: RP

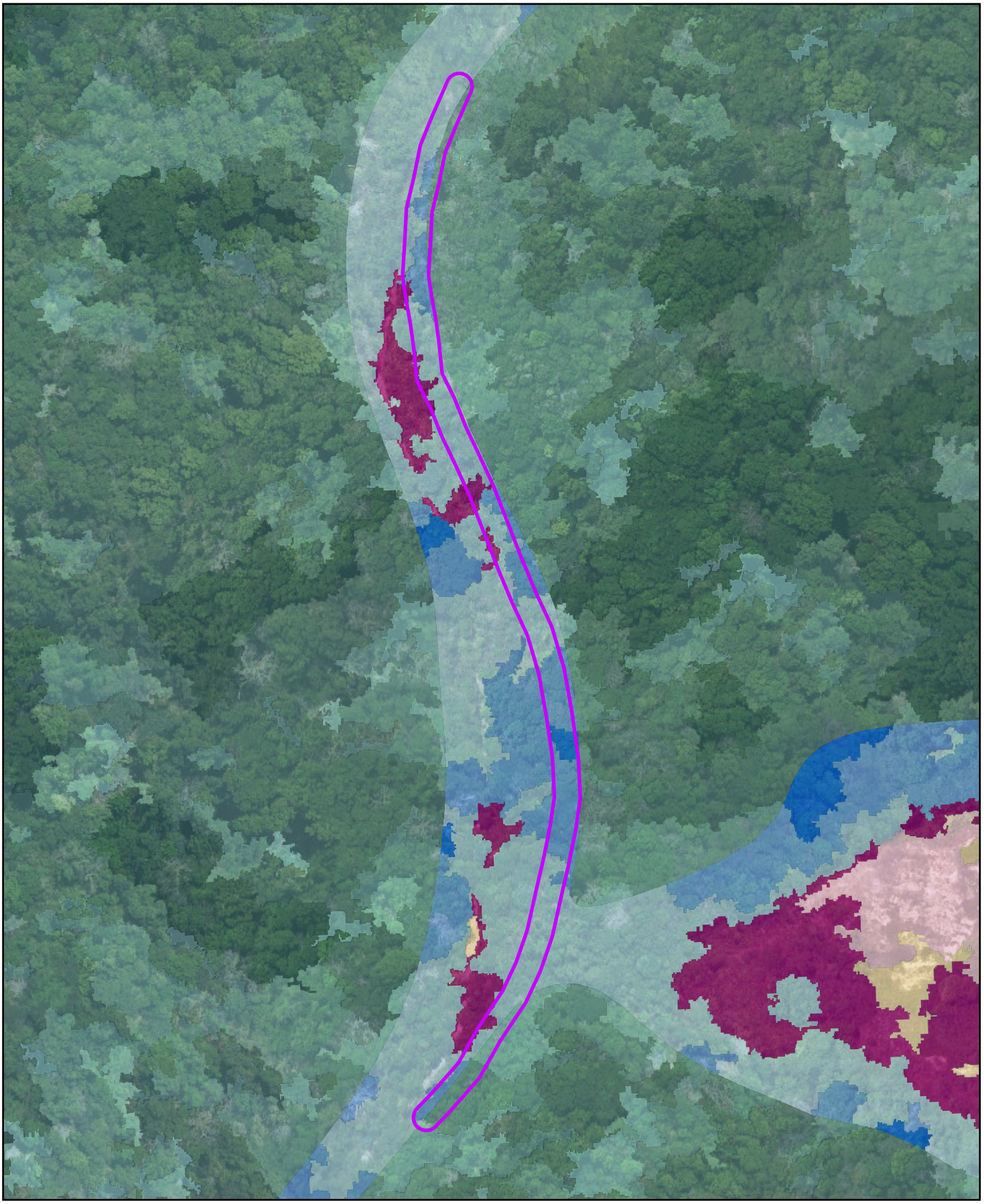
Christmas Island
Indian Ocean

GEOSCIENCE AUSTRALIA VEGETATION
NT2 SWITCHBACKS DETOUR

FIGURE 2.8 **Page 2 of 3**

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Image Reference: Client Imagery October 2011.



Legend

NT3 Formation Gully

Vegetation types (Geoscience Australia)

Fern field
- <5 m

Regrowth
- 15-20 m
- 10-15 m
- 5-10 m

Mixed weed and pioneer species, <5m

Closed Canopy Evergreen Forest
- 20-25 m
- 15-20 m
- 10-15 m
- 5-10 m

Other
- Bare ground

Scale: 1:2,000 at A4

0 25 50
Metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A | Date: 11-Nov-2022

Drawn By: cthatcher | Checked By: RP

Christmas Island
Indian Ocean

GEOSCIENCE AUSTRALIA VEGETATION
NT3 FORMATION GULLY

FIGURE 2.8 **Page 3 of 3**

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery October 2011.

3. Methods

3.1 Flora and Vegetation

3.1.1 Desktop Assessment

DBCA's Threatened and Priority Flora and WA Herbarium specimen databases do not contain records of conservation significant flora taxa on Christmas Island.

Three EPBC Act listed Threatened flora taxa are known to occur on the Island (Appendix E). Records of these are maintained by Christmas Island Phosphates and Parks Australia.

Reports, articles, books and mapping that document regional flora and vegetation within the surrounds of the Survey Area were also reviewed prior to the field assessment:

- *Conservation status of the flora of Christmas Island, Indian Ocean* (Holmes & Holmes, 2002);
- *Taxonomic status and distribution of the critically endangered Christmas Island spleenwort (Asplenium listeri, Aspleniaceae): it is not as rare as we thought* (Ohlsen, et al., 2015);
- *Endemic species of Christmas Island, Indian Ocean* (James, et al., 2019);
- *Flora of Australia Volume 50: Oceanic Islands 2* (Flora of Australia Volume 50, Oceanic islands 2, 1993);
- *Native Plants of Christmas Island* (Claussen, 2005); and
- *Christmas Island Vegetation and Clearing Map* (Geoscience Australia, 2014).

3.1.2 Field Assessment

The field assessment of the Survey was conducted by Senior Botanist Rachael Pratt from Strategen-JBS&G from 8-9 June 2022. Rachael Pratt has undertaken surveys on Christmas Island since 2014.

Table 3.1: Personnel

Name	Role	Flora collection permit
Rachael Pratt Senior Botanist Strategen-JBS&G	Planning, fieldwork, plant identification, data interpretation and report preparation	FB62000141 (19 Aug 2019-18 Aug 2022) TFL 49-1920 (4 Sep 2019-15 Dec 2022)

The survey was conducted in accordance with guidelines provided in *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016), with some allowances and modifications made to accommodate the unique tropical environment on Christmas Island. This included the use of relevés instead of quadrats, the undertaking of a single season of sampling and the use of a modified vegetation condition scale. The justification behind these changes are outlined below.

Data collection

Christmas Island has been comprehensively surveyed in the past. In the late 1800s, Christmas Island was the subject of one of the world's first baseline environmental surveys, later published as *A monograph of Christmas Island* (Andrews, 1900). Parks Australia North undertakes an island-wide survey on a 300 m grid biennially, and from 2013-2014 Geoscience Australia teamed with Parks Australia North and Phosphate Resources to produce an island-wide vegetation map. In consideration of the survey history, DWER has historically accepted Reconnaissance survey data in combination with Targeted surveys as adequate information for clearing permit applications. There is no established optimum survey season on Christmas Island because the island's flora do not have a peak flowering season. Surveys are instead limited by the red crab migration and the monsoon.

Data was collected from eight relevés. Indicative site locations were identified prior to commencement of the field survey using aerial photography, topographic maps and existing vegetation maps, to ensure that all broad vegetation types and landforms within the Survey area would be sampled.

At each sample site, data collected included:

- site identifier;
- location, with GPS coordinates and datum;
- sample site type, size and marking method;
- a photograph from the centre of the relevé facing along the clearing alignment;
- landform and soil description;
- a vegetation description compatible with the National Vegetation Information System (NVIS Technical Working Group, 2017);
- any other location information that might be useful in vegetation classification including slope, aspect, litter, fire history, vegetation/landform/soil correlations;
- assessment of vegetation condition in accordance with a modified vegetation condition scale adapted for Christmas Island, and description of disturbances; and
- a comprehensive inventory of vascular terrestrial flora and an average height and percentage foliage cover for each taxon.

Any additional flora taxa observed opportunistically around sample sites or while traversing on foot within the Survey Area were recorded.

Targeted flora survey

Prior to the field survey, conservation significant flora taxa identified by the desktop assessment as potentially occurring within the Survey Area were reviewed by field staff to ensure familiarity with these taxa. Three species of EPBC Act listed Threatened flora occur on Christmas Island. All three are ferns which do not have a flowering period, so targeted surveys can be undertaken at any time of year.

A five-metre strip either side of the proposed mountain bike track alignment was examined for potential conservation significant flora.

For any populations of taxa thought to be conservation significant, a photograph, GPS location and a count of the individuals present, or percentage foliar cover for a given area for the species, were recorded. Where possible, population boundaries were mapped using aerial photography and GPS records.

Flora identification and nomenclature

All plant specimens collected during the field surveys were identified on site, with reference to *Flora of Australia Volume 50: Oceanic Islands 2* (1993) and *Native Plants of Christmas Island* (Claussen, 2005), due to quarantine requirements and an absence of reference specimens in Western Australia. Nomenclature of the species recorded is in accordance with Western Australian Herbarium (1998-).

Vegetation condition

Vegetation condition was recorded at all sample sites, and opportunistically within the Survey Area during the field assessment where required. Vegetation condition polygon boundaries were developed using this information in conjunction with aerial photography interpretation and were digitised as for vegetation type mapping polygon boundaries.

Vegetation condition was assessed using an adapted scale developed for Christmas Island's rainforest vegetation, based on condition rating scales developed by Keighery (1994). The adapted scale examines regrowth development, retention of structural features present in undisturbed rainforest, weediness and landform disturbance. The vegetation condition rating scale is provided in **Table 3.2**.

Table 3.2: Vegetation Condition Scale (adapted from Keighery 1994)

Condition Rating	Keighery (1994)	Adapted scale
Pristine	Pristine or nearly so, no obvious signs of disturbance.	Mature, undisturbed rainforest or very advanced secondary regrowth. Disturbance is limited to cyclone damage. Climax species dominate and full structural complexity is present with epiphytic orchids and ferns, terrestrial orchids and ferns, *Pandanus*, palms, buttressing and woody lianes. 
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.	Little to no weed species and a largely intact landform with few signs of disturbance. The vegetation structure is beginning to develop the full complexity and diversity expected in rainforest, with climax species present and a range of features included such as buttressing, palms, ferns, epiphytes and orchids, but the canopy is likely to be more open than in undisturbed rainforest. 
Very Good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	Low diversity vegetation with few signs of disturbance or moderately diverse vegetation on a disturbed landform, a canopy dominated by pioneer species, though recruitment of climax species may be evident, an open canopy or poor structural complexity. Few weeds present or weeds are limited to less aggressive species. 
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate. For example, disturbance to vegetation structure caused by very frequent fires, the	Multiple signs of disturbance or with low diversity and no structural complexity. Typically displays little to no recruitment of climax tree species. Numerous weeds present or a dense understorey dominated by one or two native fern species.

Condition Rating	Keighery (1994)	Adapted scale
	presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.	
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	Vegetation at very early successional stages with a canopy of one to two species and an understorey dominated by ferns or weeds, typically adjacent to completely degraded land. May have the potential to develop into better quality vegetation as the canopy develops if weeds are managed. 
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often referred to as parkland cleared with the flora composing weed or crop species with isolated native trees or shrubs.	The structures of primary rainforest are no longer present and native species are limited to only a few species, for example, weed dominated shrubland with sparse emergent *Macaranga* or a near monoculture *Nephrolepis biserrata* fernland. The landscape may be highly disturbed, often with significantly reduced soil and pinnacles exposed. Predominantly lacking a native canopy and with little to no potential to develop one due to dense groundcover or shallow soil. 

3.1.3 Data Analysis and Vegetation Mapping

Vegetation units

Vegetation units were delineated using a combination of sample site data and site observations. Aerial photography interpretation and field notes taken during the survey were then used to develop vegetation mapping polygon boundaries over the Survey Area. These polygon boundaries were then digitised using Geographic Information System (GIS) software.

Vegetation descriptions (through floristic in origin) have been adapted from the National Vegetation Information System (NVIS) Australian Vegetation Attribute Manual Version 7.0 (NVIS Technical Working Group 2017), a system of describing structural vegetation units (based on dominant taxa). This model follows nationally-agreed guidelines to describe and represent vegetation types, so that comparable and consistent data is produced nation-wide.

3.1.4 Survey Constraints and Limitations

There are possible limitations and constraints that can impinge on the adequacy of vegetation, flora and fauna surveys. The flora and vegetation assessment has been evaluated against a range of potential limitations (Table 3.3). Based on this evaluation, the assessment has been subject to minor limitations or constraints that have affected the thoroughness of the assessment and the conclusions reached.

Table 3.3: Flora and Vegetation Survey Potential Limitations and Constraints

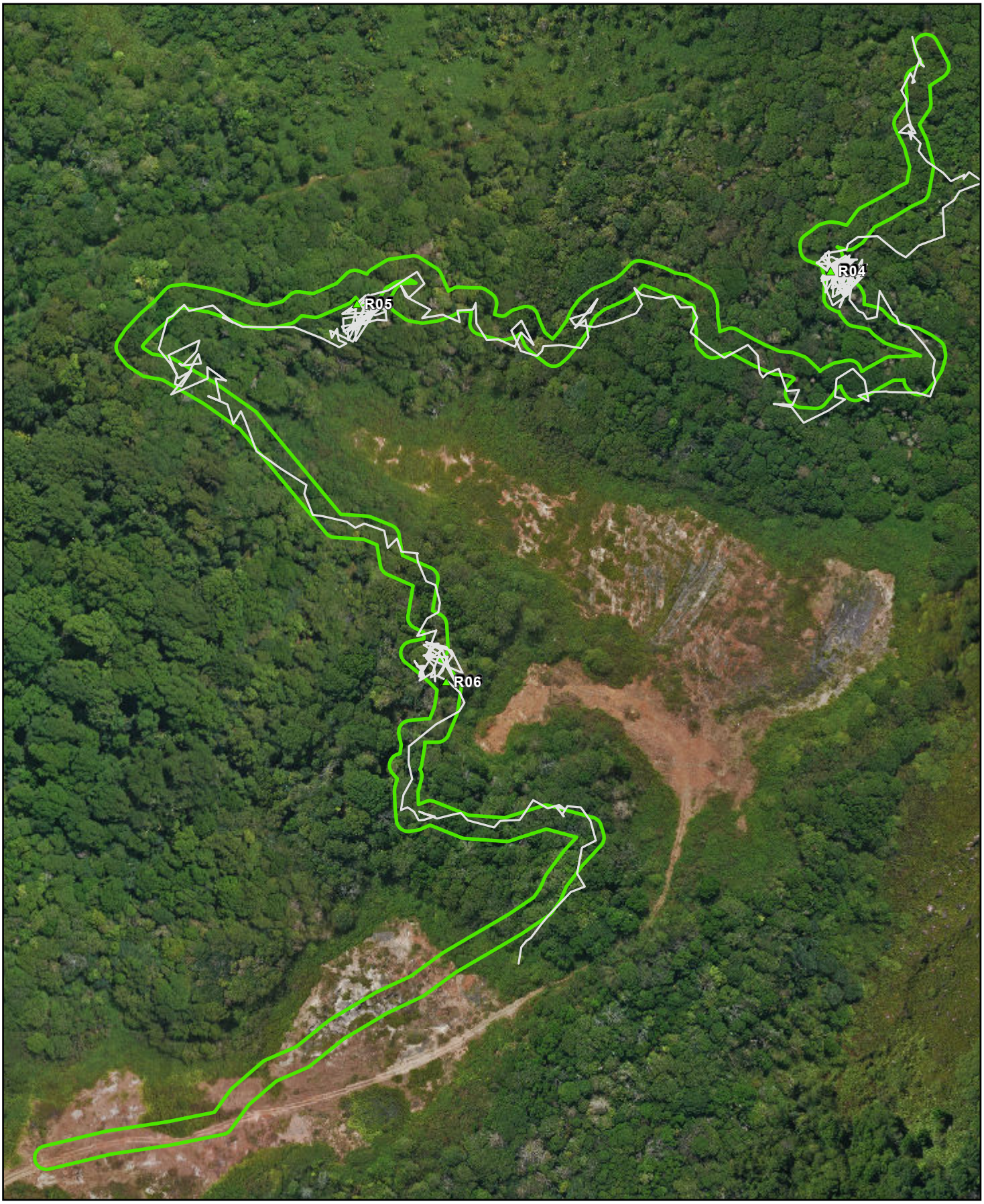
Potential Limitation	Impact on Assessment	Comment
Availability of contextual information at a regional and local scale	**Not a constraint.**	Contextual information for the site is readily available, and was utilised were necessary during the preparation of this report. This includes review of previous flora survey reports and island wide vegetation mapping.
Proportion of flora Recorded and/or collected, any identification issues	**Minor constraint.**	The upper canopy on Christmas Island reaches above 40 m and includes vines and epiphytes which cannot be easily identified from the ground. Where possible binoculars are used as an aid to identification of canopy species, and fruits and leaves present on the ground are examined.
Was the appropriate area fully surveyed (extent and effort)	**Not a constraint.**	The entire proposal area was surveyed.
Survey timing, rainfall, season of survey	**Not a constraint.**	In the six months preceding the Survey, Christmas Island received above average rainfall. There is no specific flowering season on Christmas Island.
Disturbance that may have affected the results of the survey such as fire, flood or clearing	**Not a constraint.**	The Survey Area was not subject to recent disturbances that would impact the outcomes of the survey.
Access restrictions within the survey area	**Not a constraint.**	Existing tracks enabled adequate access to survey the vegetation within the Survey Area.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	**Not a constraint.**	Survey personnel have the appropriate training in sampling and identifying the flora of the region.

3.2 Fauna

3.2.1 Desktop Assessment

A desktop assessment was undertaken to compile a list of fauna species and fauna habitat types likely to be present within the proposed clearing area. This included a review of existing contextual data, reports or surveys undertaken in the vicinity of the proposed clearing area. Key sources of information consulted included:

- Parks Australia species data (Department of National Parks, 2016)
- Geoscience Australia Vegetation and Clearing Map (Geoscience Australia, 2014)
- Draft Christmas Island Biodiversity Conservation Plan (Director of National Parks, 2014)
- Clearing Permit Application Supporting Documentation (Range to Reef Environmental, 2014)
- Supporting Documentation for Clearing Permit Application Proposed Exploration Mining Lease MCI 70/10 (Range to Reef Environmental, 2015)
- Supporting Documentation for Clearing Permit Application Exploration Licence ECI 70/2 (Range to Reef Environmental, 2016)
- Environmental Investigations on Unallocated Crown Lands: Final Report (Range to Reef Environmental, 2017)
- Part B – Flora Survey and Fauna Assessment 'Case-by-Case' Areas 2018 (Range to Reef Environmental, 2018)



Legend

- NT1 Linx
- Sampling tracks
- Relevé

Scale: 1:2,200 at A4

0 25 50
Metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A | Date: 11-Nov-2022

Drawn By: cthatcher | Checked By: RP

Christmas Island
Indian Ocean

3.1 SURVEY EFFORT
NT1 LINX

FIGURE 3.1

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery.



Legend

- NT2 Switchbacks Detour
- Sampling tracks
- Relevé

Scale: 1:2,600 at A4 (0 25 50 Metres)		**Christmas Island Indian Ocean**
Coord. Sys. GDA2020 MGA Zone 50		**3.1 SURVEY EFFORT NT2 SWITCHBACKS DETOUR**
Job Number: 63023		
Client: Phosphate Resources Limited		**FIGURE 3.1** **Page 2 of 3**
Version: A	Date: 11-Nov-2022	strategen JBS&G
Drawn By: cthatcher	Checked By: RP	

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery.



Legend

- NT3 Formation Gully
- Sampling tracks
- Relevé

Scale: 1:2,000 at A4

0 25 50
Metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A | Date: 11-Nov-2022

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Christmas Island
Indian Ocean

3.1 SURVEY EFFORT
NT3 FORMATION GULLY

FIGURE 3.1 **Page 3 of 3**

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery.

4. Results

4.1 Flora and Vegetation

4.1.1 Database Searches

4.1.1.1 Conservation-Significant Flora

Three conservation-significant vascular terrestrial flora taxa were identified by database searches as potentially occurring within the Survey Area (Table 4.1). The likelihood of these taxa occurring within the Survey Area was assessed against their habitat preferences and regional distribution. Of the three, one was considered as possibly occurring within the Survey Area.

Table 4.1: Conservation significant flora likelihood of occurrence

Genus (& Family)	Conservation Status		Description	Likelihood of Occurrence
	EPBC Act	BC Act		
Asplenium listeri (Aspleniaceae)	CR	Not listed	A lithophytic fern with short erect fronds, 3.5–9 cm long, which grow in a crown. Occurs in Limestone rock crevices in dry, exposed areas.	**Possible** – preferred habitat occurs within the Survey Area
Tectaria devexa var. *minor* (Dryopteridaceae)	EN	Not listed	A small, tufted, terrestrial fern with pale green fronds. Occurs in Primary rainforest (tall and largely undisturbed), above 80 metres elevation; both in deeper soils and as a lithophyte (on mossy pinnacles at the base of a slope, a wet site).	**Unlikely** – preferred habitat does not occur within the Survey Area
Pneumatopteris truncata (Thelypteridaceae)	CR	Not listed	A large terrestrial fern with an erect rhizome and fronds growing in a crown to 120 cm long. The fronds have aerophores (respiratory structures) at the base of the pinnae. Occurs in permanently moist sites in semi-deciduous closed forest.	**Unlikely** – preferred habitat does not occur within the Survey Area

(Where CR is Critically Endangered, EN is Endangered).

Christmas Island Spleenwort is listed as Critically Endangered under the EPBC Act and is endemic to Christmas Island. *Tectaria devexa* var. *minor* is listed as Endangered under the EPBC Act and occurs in Sri Lanka as well as Christmas Island. *Pneumatopteris truncata*, which is listed as Critically Endangered under the EPBC Act, has a fragmented distribution over Asia and Malaysia as well as being known from two sites on Christmas Island.



Figure 4.1. Christmas Island Spleenwort (*Asplenium listeri*), *Tectaria devexa* var. *minor* and *Pneumatopteris truncata* (from left to right[3])

4.1.1.2 Conservation-Significant Ecological Communities

There are no Threatened Ecological Communities listed under the EPBC Act or BC Act occurring on Christmas Island.

[3] *Sources: Khaliesha Amin, Butz* (2004), http://www.phytoimages.siu.edu/



Legend

- NT1 Linx
- NT2 Switchbacks Detour
- NT3 Formation Gully
- Christmas Island National Park

Conservation taxa

- *Asplenium listeri*
- *Pneumatopteris truncata*
- *Tectaria devexa* var. minor

Scale: 1:105,000 at A4

0 1 2
Kilometres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A | Date: 11-Nov-2022

Drawn By: cthatcher | Checked By: RP

Christmas Island
Indian Ocean

HISTORICAL CONSERVATION SIGNIFICANT FLORA RECORDS

FIGURE 4.2

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: World Imagery: Earthstar Geographics and client imagery.

4.1.2 Field Survey

4.1.2.1 Flora

JBS&G recorded a total of 39 flora taxa from 39 genera and 32 families during the 8-9 June 2022 flora survey, including six introduced flora taxa and four endemic flora taxa.

Relevés had a mean species richness of 9.4 taxa.

4.1.2.2 Introduced (exotic) taxa

JBS&G recorded a total of six introduced flora taxa during the 8-9 June 2022 flora survey:

- **Aleurites moluccana*;
- **Capsicum* sp.;
- **Clausena excavata*;
- **Leucaena leucocephala*;
- **Stachys arvensis*; and
- **Turnera ulmifolia.*

Of these, **Leucaena leucocephala* was the most abundant, occurring at four of eight relevés.

4.1.2.3 Conservation significant flora

None of the three conservation significant flora taxa known to occur on Christmas Island were identified during the June 2022 field survey.

4.1.2.4 Vegetation

The field survey generally confirmed Geoscience Australia's (2014) vegetation mapping, with the vegetation present within the Survey Area being consistent with regrowth vegetation. Two broad vegetation types were defined and mapped within the Survey Area (Table 4.2).

4.1.2.5 Conservation significant vegetation

No conservation significant vegetation was identified during the June 2022 field survey.

4.1.2.6 Vegetation condition

Vegetation condition within the Survey Area (Table 4.3) ranged from Excellent to Completely Degraded. The main causes of degradation were:

- Presence of weeds; and
- Previous clearing for mining and the establishment of the rail formation and access tracks.

Aerial photography in Area 2 (Switchbacks detour) shows completely unvegetated tracks, however by the time of the survey, these areas contained regrowth vegetation.

Table 4.2: Vegetation types

Vegetation Type	Description	Area (ha)	Percentage of the Survey Area	Photo
VT1 (R01-R08)	Regrowth dominated by pioneer species including *Dysoxylum gaudichaudianum, Tristiropsis acutangula, Macaranga tanarius, Claoxylon indicum, Pandanus elatus* and *Arenga listeri*	2.26	91%	
VT2 (No relevés. These areas are treated as Completely Degraded)	Mixed weed and pioneer species/fern field dominated by *Nephrolepis* spp., *Macaranga tanarius* and/or *Leucaena leucocephala*	0.23	9%	
Total		**2.48**	**100%**	

Table 4.3: Vegetation Condition in the Survey Area

Area Area	Condition	Size (ha)	Maximum clearing area (ha)
1 "NT1 Linxs"	Excellent	1.14	0.23
	Completely Degraded	0.23	0.04
2 "NT2 Switchbacks detour"	Very Good	0.69	0.14
3 "NT3 Formation Gully"	Degraded	0.43	0.09
Total		**2.48**	**0.50**



Plate 2. Area 1 “Linx” regrowth on areas previously cleared for mining



Plate 3. Area 2 “Switchbacks detour” regrowth on previously cleared tracks



Plate 4. Area 3 “Formation Gully” cutting, dominated by ferns.



Legend

NT1 Linx

Vegetation type

Mixed weed and pioneer species/fernfield

Regrowth

Relevé

Scale: 1:2,200 at A4 (0, 25, 50 Metres)		**Christmas Island Indian Ocean**
Coord. Sys. GDA2020 MGA Zone 50		**VEGETATION TYPES NT1 LINX**
Job Number: 63023		
Client: Phosphate Resources Limited		**FIGURE 4.3** **Page 1 of 3**
Version: A	Date: 11-Nov-2022	strategen JBS&G
Drawn By: cthatcher	Checked By: RP	

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery October 2011.



Legend

NT2 Switchbacks Detour

Vegetation type

Mixed weed and pioneer species/fernfield

Regrowth

Relevé

Scale: 1:2,600 at A4 (0, 25, 50 Metres)		**Christmas Island Indian Ocean**
Coord. Sys. GDA2020 MGA Zone 50		**VEGETATION TYPES NT2 SWITCHBACKS DETOUR**
Job Number: 63023		
Client: Phosphate Resources Limited		**FIGURE 4.3** **Page 2 of 3**
Version: A	Date: 11-Nov-2022	strategen JBS&G
Drawn By: cthatcher	Checked By: RP	

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery October 2011.



Legend

NT3 Formation Gully

Vegetation type

Mixed weed and pioneer species/fernfield

Regrowth

Relevé

Scale: 1:2,000 at A4

0 25 50

Metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A

Date: 11-Nov-2022

Drawn By: cthatcher

Checked By: RP

Christmas Island
Indian Ocean

VEGETATION TYPES
NT3 FORMATION GULLY

FIGURE 4.3

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx

Image Reference: Client Imagery October 2011.



Legend

- NT1 Linx

Vegetation condition

- Excellent
- Very Good
- Degraded
- Completely Degraded
- Relevé

Scale: 1:2,200 at A4 (0, 25, 50 Metres)		**Christmas Island Indian Ocean**
Coord. Sys. GDA2020 MGA Zone 50		**VEGETATION CONDITION NT1 LINX**
Job Number: 63023		
Client: Phosphate Resources Limited		**FIGURE 4.4** **Page 1 of 3**
Version: A	Date: 11-Nov-2022	strategen JBS&G
Drawn By: cthatcher	Checked By: RP	

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery October 2011.



Legend

- NT2 Switchbacks Detour

Vegetation condition

- Excellent
- Very Good
- Degraded
- Completely Degraded
- Relevé

Scale: 1:2,600 at A4 (0, 25, 50 Metres)	**Christmas Island Indian Ocean**
Coord. Sys. GDA2020 MGA Zone 50	**VEGETATION CONDITION NT2 SWITCHBACKS DETOUR**
Job Number: 63023	
Client: Phosphate Resources Limited	**FIGURE 4.4** **Page 2 of 3**
Version: A — Date: 11-Nov-2022	strategen JBS&G
Drawn By: cthatcher — Checked By: RP	

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery October 2011.



Legend

- NT3 Formation Gully

Vegetation condition

- Excellent
- Very Good
- Degraded
- Completely Degraded
- Relevé

Scale: 1:2,000 at A4

0 25 50
Metres

Coord. Sys. GDA2020 MGA Zone 50

Job Number: 63023

Client: Phosphate Resources Limited

Version: A | Date: 11-Nov-2022

Drawn By: cthatcher | Checked By: RP

Christmas Island
Indian Ocean

VEGETATION CONDITION
NT3 FORMATION GULLY

FIGURE 4.4 **Page 3 of 3**

strategen JBS&G

File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)Open\EnviroBiz (Christmas Island Phosphates)\63023 Mountain Bike Track Clearing Permit\GIS\02_MapProjects\63023_ClearingPermit_Flora_v1\63023_ClearingPermit_Flora_v1.aprx
Image Reference: Client Imagery October 2011.

4.2 Fauna

A desktop assessment of the likelihood of EPBC listed fauna species occurring in the Survey Area, either resident or transient, was made on the basis of their breeding ecology, habitat preferences and known location records held by Parks Australia and Range to Reef Environmental (Table 4.4). An assessment of the impact of the proposed clearing has been made against the clearing principles in Section 7.2, with further notes on impact and mitigation presented in Section 6.

Table 4.4: EPBC Listed fauna species and likelihood of occurrence in proposed clearing area

Species	Conservation Status		Distribution & Comments	Likelihood of occurrence[4]
	BC Act	EPBC Act		
BIRDS				
Abbott's booby (*Papasula abbottii*)	No listed	EN, Listed Marine	A sea bird, which does not utilise the understory as habitat. The only known extant nesting colony of this species is on Christmas Island. Nest sites for Abbott's booby have been mapped in island wide surveys. Mature, usually emergent, trees are essential for nesting. No nest trees are located in or adjacent to the clearing envelope.	Unlikely
CI emerald dove (*Chalcophaps indica*)	No listed	EN	Endemic to Christmas Island. Nests in trees, shrubs and vines. Highly mobile species and unlikely to be significantly affected by small-scale clearing of understory.	Likely
CI frigatebird (*Fregata andrewsi*)	P3	EN; Marine; Migratory (EPBC Act, CAMBA)	Confined to island cliffs and shore terraces where it breeds in the canopy. No suitable habitat within proposed clearing area.	Unlikely
CI goshawk (*Accipiter hiogaster natalis*)	No listed	EN	Endemic to Christmas Island. Nests in forks of forest trees. Widespread but uncommon. Highly mobile and will not be affected by clearing of understory.	Likely
CI hawk-owl (*Ninox natalis*)	No listed	VU	Nests in hollows in large, mature trees. Nocturnal. May forage in the area. Unlikely to be affected by clearing of understory.	Possible
CI thrush (*Turdus poliocephalus erythropleurus*)	No listed	EN	Widespread and common species on the Island and is a habitat generalist being prolific in disturbed areas. Little information on breeding ecology is available. Highly mobile species.	Present
White-tailed tropicbird/golden bosunbird (*Phaethon lepturus fulvus*)	Migratory	EN; Marine	Nests in large mature trees and limestone cliffs. No potential breeding trees will be affected by clearing of understory.	Unlikely
MAMMALS				
CI shrew (*Crocidura attenuata trichura*)	Not listed	CR	Considered extinct	Absent

[4] Likelihood of Occurrence:
Present – Observed within the Survey Area.
Likely – Suitable habitat present, species recently recorded in the region.
Possible – Suitable habitat present, limited species records in the region.
Unlikely – Absence of suitable habitat, known distribution outside the Survey Area.
Absent – Species recognised as Extinct (Ex/S2) or habitat completely incompatible (e.g. land vs sea).

Species	Conservation Status		Distribution & Comments	Likelihood of occurrence[4]
	BC Act	EPBC Act		
CI Pipistrelle (*Pipistrellus murrayi*)	Not listed	EX	Considered extinct	Absent
CI flying fox (*Pteropus melanotus natalis*)	Not listed	CR	Endemic to Christmas Island. All recorded roosts have been located on the coastal terrace or around the first land cliff and semi-deciduous forest. Highly mobile and forages through the forest canopy so is unlikely to be impacted by understorey vegetation clearing.	Possible
REPTILES				
CI blind snake (*Ramphotyphlops exocoeti*)	Not listed	VU	No specimen has been found since 2009.	Unlikely
Lister's gecko (*Lepidodactylus listeri*)	Not listed	CR	Considered extinct in the wild.	Absent
CI forest skink (*Emoia nativitatis*)	Not listed	EX	Considered extinct.	Absent
CI blue-tailed skink (*Cryptoblepharus egeriae*)	Not listed	CR	Considered extinct in the wild prior to recent releases of captive-bred individuals.	Absent
CI giant gecko (*Cyrtodactylus sadleiri*)	Not listed	EN	Endemic to Christmas Island. Found in all island habitats, except areas lacking trees and shrubs. Evergreen tall, closed forest is considered critical habitat for this species (Director of National Parks, 2014b).	Possible
LISTED MIGRATORY SPECIES				
Great frigatebird (*Fregata minor*)	Migratory	CAMBA, JAMBA, Listed Marine	No suitable habitat within proposed clearing area.	Unlikely
Red-tailed tropicbird (*Phaethon rubricauda*)	Migratory	CAMBA, JAMBA, Listed Marine	No suitable habitat within proposed clearing area.	Unlikely
Brown booby (*Sula leucogaster*)	Migratory	CAMBA, JAMBA, ROKAMBA, Listed Marine	No suitable habitat within proposed clearing area.	Unlikely
Red-footed booby (*Sula sula*)	Migratory	CAMBA, JAMBA, Listed Marine	No suitable habitat within proposed clearing area.	Unlikely

5. Discussion

5.1 Flora

The primary rainforest which occurs on the plateau is known for its low species richness, a consequence of the phosphatic soils and the difficulty of taxa surviving red crab herbivory. There are approximately 11 native canopy species and five subcanopy species, 11 native shrub species, 13 ground cover species and several climbers and epiphytes (DuPuy, 1993). Regrowth vegetation usually contains pioneer species which are absent from primary rainforest unless a falling tree opens a canopy gap.

As outlined in section 4 (Results), no conservation significant flora species or other flora species of taxonomic interest/uncertainty were recorded in the proposed clearing area during JBS&G's June 2022 field survey.

The flora species sampled within the proposed clearing area are not unique or geographically restricted to the proposed mountain bike trail area.

Two introduced flora taxa recorded by the survey are weeds of concern on Christmas Island; *Clausena excavata* (false curry-leaf) and *Aleurites moluccana* (candlenut). Both taxa are capable of recruiting in low light situations so are at risk of invading undisturbed rainforest.

5.2 Vegetation

The species occurring within the clearing areas were typical of regrowth vegetation, with pioneer species being common and few climax species, other than at relevés R05 and R06 in Area 1, where regrowth was well-established and climax species had begun to proliferate. Understorey vegetation at these locations was sparse and would require little removal of vegetation to provide sufficient width for a mountain bike track. This location also contained much outcropping limestone and a winding, tortuous track is proposed for this location to provide variation in the track conditions.

As outlined in Section 4.1.2, no conservation significant vegetation communities occur within the proposed clearing area.

5.3 Fauna

5.3.1 EPBC Act listed species

Further discussion, with reference to (DER, 2016) is provided below on those fauna species identified in Table 4.4 as possible or likely to occur in the proposed clearing area.

Abbott's booby

Most nests for this species are situated on the central and western areas of the Island (Department of National Parks, 2016), in tall plateau forest. This species prefers to nest on the lee side of slopes and gullies, with a clear area below and immediately downwind to facilitate take-off and landing. Given the proposed clearing area has not been subject to a fauna survey, the presence of Abbott's booby is unknown. However, the applicant's project design of the mountain bike trail to utilise existing cleared areas and limit clearing to understorey vegetation means impacts to this species are unlikely to be significant.

Christmas Island emerald dove

Whilst confined to Christmas Island, this species is widespread and common in areas of rainforest (Director of National Parks, 2014b). Given the minor scale and nature of the proposed clearing, any impacts to this species are unlikely to be significant.

Christmas Island goshawk

Whilst confined to Christmas Island, this species is widespread and has been recorded in all major Island habitats from primary and marginal rainforests and areas of regrowth vegetation (Hill, 2004b). Given the minor scale and nature of the proposed clearing, any impacts to this species are unlikely to be significant.

Christmas Island thrush

Whilst confined to Christmas Island, this species is widespread on Christmas Island (Director of National Parks, 2014b). It is therefore unlikely to be dependent on habitat within the proposed clearing area.

White-tailed tropicbird

Although this migratory species historically was not known to breed on Christmas Island, it has been found using nest boxes installed for the Christmas Island Hawk-owl as part of a collaboration between Christmas Island Phosphates and Christmas Island District High School (pers. comm. Andrew Hill). Given that the proposal is to avoid large trees and predominantly clear understorey vegetation, this species is unlikely to be significantly impacted.

Christmas Island Flying Fox

This species is endemic to Christmas Island and only three known breeding colonies occur (Director of National Parks, 2014b). Roost sites predominantly occur close to the coast. Foraging occurs in rainforests, gardens and post-mining revegetation (where trees and shrubs are present). The proposed clearing is not likely to encroach near roost sites, given their coastal location away from the proposed clearing areas. The minor scale of clearing is unlikely to have a significant impact on the foraging ability of this species.

Giant Gecko

The giant gecko is endemic to Christmas Island and is widespread across the Island, occurring in all habitats except areas lacking in tree or shrub cover (Cogger, et al., 1983; TSSC, 2013). Whilst the small and linear nature of the proposed clearing area is unlikely to constitute significant habitat for this species, the conservation advice for this species notes that no disturbance should occur in areas where the Giant gecko is known to occur. Notwithstanding this, maintenance clearing is undertaken regularly by Parks Australia and Shire of Christmas Island within known giant gecko habitat, as rapid vegetation growth in the tropical conditions would quickly render existing tracks and road shoulders unusable without frequent maintenance.

The impacts to this species will be minimal. The degree of clearing is very low and direct or indirect impacts are unlikely.

5.3.2 Other fauna species of interest

Robber Crab (*Birgus latro*)

Robber crabs were previously listed as vulnerable under the International Union for Nature Conservation (IUCN) Red List. In 1996 their status was changed to 'data deficient' and remains so today. This species continues to experience population declines due to harvesting for food, habitat loss, interaction with humans and the impact of introduced predators.

Robber crabs are habitat generalists and the species can be found in most parts of the island, from shore terraces to the highest plateau areas.

It is proposed that an observer moves robber crabs ahead of clearing.

Red Crab (*Gecarcoidea natalis*)

The red crab population on Christmas Island was estimated at 190 million by 2021 surveys, a four-fold increase on previous surveys (Birch, 2022). This species is most common in moist rainforest environments, however it also inhabits a wide variety of habitats including limestone coastal terraces and domestic gardens. The only habitat where red crabs don't occur is areas cleared of rainforest and stripped of soil for mining.

Clearing and construction of the proposed mountain bike trail will take place during the dry season which will minimise impacts to the red crab, as this species is most active and migrating during the wet season. Red crabs may leave their burrow to feed during heavy rain even in the dry season. If this occurs and there is a high level of red crab activity, the clearing will stop until red crabs activity reduces to minimise potential impacts to red crabs.

6. Impacts and Mitigation

6.1 Potential Impacts

The proposal has the potential to affect flora and vegetation values through:

- Clearing of vegetation for the establishment of the mountain bike trail;
- Introduction and spread of weeds due to edge effects and spread of propagules by machinery. Opening the forest up can cause germination from the soil seedbank, with many weed species already having abundant propagules in regrowth forest. Propagules of these can then spread into surrounding forest;
- Edge drying effects caused by microclimate changes; and
- Fragmentation could be increased minimally by the proposal, though these areas are already cleared and abut cleared areas.

The proposal may affect fauna and fauna habitat through:

- Minor reduction in habitat (predominantly understorey) due to clearing;
- Degradation of surrounding habitat caused by weed introduction;
- Land crab deaths caused by clearing and machinery movements.

The proposal will not intercept ground water, so no drawdown impacts could occur. Soils on Christmas Island are highly permeable, so surface flows rarely occur on the island and erosion should not be significantly impacted. Tracks design experts will be utlised to ensure the track is designed to properly drain and not cause erosion to the track or surrounding landforms.

6.2 Likely Direct and Indirect Impacts

Clearing will remove up to 0.5 ha of vegetation. The majority of the vegetation to be removed is understorey vegetation within regrowth areas. No flora species of conservation significance are known to occur in the proposed clearing area and all species identified within the proposal area are well represented within the Christmas Island National Park.

The Island's rainforest is remarkably resistant to weed invasion (Green, et al., 2004) so minimal impacts are anticipated as a consequence of the proposal, impacting only the immediate edge of surrounding vegetation, with little likelihood of weeds spreading further into the forest or pushing back the edge of the forest.

Some red crabs may be impacted by localised removal of their burrows and compaction along the track..

Highly mobile conservation significant bird species such the Christmas Island Thrush may utilise the proposal area for foraging or even nesting, however, these species are habitat generalists and do not rely solely upon the habitats in the proposed clearing areas and can relocate into nearby rainforests and other habitats.

6.3 Mitigation Applied

To address potential impacts identified, the following mitigation has been applied in developing this proposal or will be applied during clearing:

- No machinery activities during crab migration or times with high crab activity
- Minimise clearing to the minimum required for the access track;

- Overstorey cover to be maintained. Every attempt will be to avoid any tree removal unless it is absolutely unavoidable.
- All trees greater than 150 mm DBH to be protected and any other features (e.g. buttress roots) to be avoided;
- Construction to be timed to avoid high red crab activity in liaison with national parks staff;
- Appropriate weed management measures including cleaning of machinery to avoid ingress of weeds, use of clean road base, and follow up weed control on priority species; and
- Cultural features and relics to be identified, protected and preserved for the trail.

Additional mitigation measures are proposed in Section 8 (recommendations).

7. Policy Considerations

7.1 Planning Instruments

7.1.1 Christmas Island Strategic Assessment

In 2019, the Minister for the Environment and the Assistant Minister for Regional Development and Territories entered into a statutory agreement under s.146 of the EPBC Act to commit to undertake a strategic assessment, *"to protect and conserve Christmas Island's unique and valuable natural environment while also supporting economic development."* Community consultation was undertaken in February 2022. The strategic assessment will streamline approvals processes and remove the need for individual assessments under the EPBC Act. At the time this report was prepared the Strategic Assessment had not been completed.

7.1.2 Indian Ocean Territories Regional Plan

The Indian Ocean Territories (IOT) Regional Plan Summary (Regional Development Australia, 2012) was published in October 2012. Building the capacity of the community and business to transition from a mining-based economy to a diverse and broad-based economy is a focus of the Regional Plan. The sectors identified for growth are tourism, food production and education and research. The care and management of the natural environment is also critical because if the natural environment is not well managed and protected, it also puts a risk the possibility of establishing a new tourism-based economy.

7.1.3 Town Planning Scheme

The Shire of Christmas Island *Local Planning Strategy* was endorsed in May 2015. Local Planning Scheme No. 2 received approval in accordance with the requirements of the *Planning and Development Act 2005* (WA) (CI) in February 2016. The new scheme includes a stated objective "*to enhance and diversify the island's economic base through the provision of land for a range of economic activities,*" (Shire of Christmas Island, 2016).

Under Local Planning Scheme No. 2 (LPS 2), much of the land proposed for clearing is zoned Rural (Table 7.1), with the remainder zoned Urban Development and Crown Reserve.

Table 7.1: Survey Area zoning under Local Planning Scheme No. 2

Area	Zoning (LPS 2)	Area (ha)
1 "NT1 Linxs"	Rural	1.03
1 "NT1 Linxs"	Urban development	0.33
2 "NT2 Switchbacks detour"	Rural	0.69
3 "NT3 Formation Gully"	Crown reserve	0.43

7.2 Assessment against the ten clearing principles

An assessment against the ten clearing principles is shown in Table 7.1.

Table 7.2: Assessment against the Ten Clearing Principles

Clearing Principle	Justification of Variance	References	Variance
Principle (a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	Christmas Island is home to approximately 420 species of vascular plants, including approximately 178 introduced species and approximately 242 species thought to be indigenous to the island. Approximately eighteen species are known to be endemic to Christmas Island, with the other flora being more widely distributed through the Indo-Malayan and Malesian regions, or throughout the tropical Indo-Pacific. No Priority Flora species are listed for Christmas Island. Areas of the island which are previously uncleared and retain high biodiversity have been reserved as National Park, including the island's two Ramsar wetlands. A majority of the areas proposed for clearing have been previously cleared, though some of these have regrowth vegetation that is up to 30 years old. Condition of regrowth was generally in Very Good to Excellent condition, with condition rated as Degraded in some areas due to high abundance of weeds and/or loss of structure resulting from the previous clearing activities. Given that most of the clearing will be of regrowth vegetation and that the clearing comprises approximately 0.5 ha of a vegetation type that is well represented on the island, the proposal is not likely to impact on biological diversity of flora or fauna on the Island.	Sections 2.2.6 and 4.1	Not likely to be at variance.

Clearing Principle	Justification of Variance	References	Variance
Principle (b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna.	Christmas Island provides necessary habitat for fauna indigenous to the island including fourteen native bird species and nine species of seabird which use the island for breeding. Three seabird taxa and nine land bird taxa are endemic to the island. A further 104 migratory or vagrant bird species have been recorded on the island. Six of the island's endemic birds are listed as threatened under the EPBC Act. Five endemic native mammals have been recorded on Christmas Island with only one, the Christmas Island flying-fox, now known to remain. Christmas Island has six species of native terrestrial reptiles, five of them endemic. Crustaceans are the most conspicuous invertebrate fauna of Christmas Island, with the island supporting over 20 terrestrial and intertidal crab species of which 14 are regarded as true land crabs, depending on the ocean only for their larval development. Three land-crab species have been identified as conservation significant; the Red Crab, Blue Crab and Robber Crab. Red crabs are common throughout the island but are a keystone species in the island's ecology. Robber crabs have a wide distribution across many Indian and Pacific oceanic islands but in most of their range they are now scarce due to human's hunting them for food. Although abundant on Christmas Island their exact conservation status is unknown. Blue Crabs have a restricted distribution and do not occur within the areas proposed for clearing. Mammal and reptile species indigenous to the island have undergone a catastrophic decline since human settlement. This decline is attributed to a combination of threatening processes including the introduction of exotic fauna such as yellow crazy ant, giant centipedes, cats and black rats. These threatening processes are also believed to have impacted to some degree on the avian and crustacean fauna. The proposed clearing area may contain suitable foraging and dispersal habitat for a number of conservation significant fauna species listed in Table 4.4, however most of these species are wide ranging, mobile and not specifically dependent on habitat within the area applied to clear and their habitat is well represented across the island and within conservation reserve. The proposed clearing will be limited to understorey species, no nesting habitat is likely to be impacted.	Section 3.2	Not likely to be at variance.

Clearing Principle	Justification of Variance	References	Variance
Principle (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.	Three Threatened flora species are known to occur on Christmas Island: *Asplenium listeri, Tectaria devexa* var. *minor* and *Pneumatopteris truncata.* The initial desktop assessment identified *Asplenium listeri* as possibly occurring within the proposed clearing area, based on the presence of suitable habitat. However, no Threatened flora species were identified by Strategen-JBS&G during the June 2022 field survey. The proposed clearing area is unlikely to be necessary for the continued existence of Threatened flora taxa.	Figure 4.1	Not likely to be at variance.
Principle (d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.	There are no known Threatened Ecological Communities (TECs) on Christmas Island. The proposed clearing area does not contain vegetation associated with a TEC listed under the *BC Act 2016*.	DBCA (2018)	Not at variance.
Principle (e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Approximately 75% of Christmas Island has never been cleared and 83% of this (63% of total island area) is protected within National Park (Geoscience Australia, 2014). The proposed clearing mostly occurs on land that was previously cleared around 1915 for a rail formation (since decommissioned in the 1980's) and consists of regrowth vegetation with native species common on the island. The vegetation under application is not part of the island's original forests and the vegetation for some of the application areas is in a degraded condition and no longer representative of rainforest structural values. The vegetation within the application area is not considered to be a significant remnant of vegetation as it is not located in an extensively cleared landscape.	Geoscience Australia (2014)	Not at variance.
Principle (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The proposed clearing area does not intersect either of the Island's two Ramsar Wetlands (Hosnie's Spring on the east coast and the Dales on the west coast). The minor clearing associated with this proposal will not impact vegetation associated with a watercourse or wetland.	Figure 2.6	Not at variance
Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Christmas Island's soils are generally highly permeable and there is consequently little runoff or erosion (Hollingsworth, 2003). In the Wet Season when the soils are saturated, runoff can occur during heavy rainfall providing some risk of erosion and sedimentation. However, given the high natural infiltration rates the risk of erosion and sedimentation is generally localised to compacted areas such as roads and stockpile pads. Infiltration tests by Puhalovich et al. (2003) indicate that soil infiltration rates are typically substantially higher than hourly rainfall intensities. Clearing and construction of the mountain bike trail will occur during the dry season to minimise the risk of erosion. The track will be built with appropriate drainage controls to manage surface water runoff and minimise erosion.	Hollingsworth (2003) Puhalovich et al. (2003)	Not likely to be at variance.

Clearing Principle	Justification of Variance	References	Variance
Principle (h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The proposed clearing area occurs near the Christmas Island National Park, which covers approximately 63% of the island. The National Park is assigned to IUCN reserve category II, most of which is uncleared primary rainforest (Environment Australia, 2014). Some 25% of the island's original vegetation has been cleared for mining and infrastructure (Environment Australia, 2014). This proposal does not involve clearing within the National Park. Other sections of mountain bike track development within the National Park are being negotiated with Parks Australia through the Christmas Island National Park Management Plan. All clearing in the National Park is within the previously cleared, disused rail alignment and is consistent with the aims, policies and actions outlined in the Christmas Island National Park Management Plan (2014-2024). The Plan states the following aims for tourism within the park: • Provide opportunities for high quality, safe, rewarding, educational and diverse nature-based recreational experiences; • Contribute to the island's socio-economic and environmental sustainability; and • Ensure nature-based tourism activities have minimal impact on the park's natural values. The Plan also states that Park Management will "consult and work with tourism stakeholders with the aim of increasing the number, diversity and quality of sustainable nature-based visitor experience opportunities in the park, and to facilitate commercial tourism operations in the park". Conservation values of the Island's two Ramsar Wetlands will not be impacted by the proposed clearing, as no works are proposed in close proximity to these areas. The mitigation measures outlined in section 6.3 will ensure the proposed clearing does not adversely impact the environmental values of the National Park.	Director of National Parks (2014a)	Not likely to be at variance.
Principle (i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	Christmas Island is characterised by a lack of surface water drainage (Puhalovich et al. 2003). There are no surface water features in the proposed clearing area. The proposal to construct a mountain bike trail will not intercept groundwater, and minor clearing of understorey vegetation for track construction is unlikely to cause changes to groundwater levels or quality.	Puhalovich et al. (2003) Figure 2.6	Not likely to be at variance.

Clearing Principle	Justification of Variance	References	Variance
Principle (j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	A major feature of the Christmas Island geomorphology is the lack of surface drainage. Rainfall mostly infiltrates the land surface and is utilised by plants, contributes to soil water stores or recharges to groundwater. Infiltration tests by Puhalovich et al. (2003) indicate that soil infiltration rates are typically substantially higher than hourly rainfall intensities. The minor scale of clearing is unlikely to cause or exacerbate the incidence or intensity of flooding.	Puhalovich et al. (2003) Figure 2.6	Not likely to be at variance.

7.3 Matters of National Environmental Significance

A search of the DCCEEW Protected Matters Search Tool (Appendix E) identified several matters of National Environmental Significance which the proposed clearing may impact upon:

- Commonwealth Lands;
- Commonwealth Heritage Places;
- Commonwealth Reserves (terrestrial); and
- Listed Threatened Species (Table 4.1 and Table 4.4).

7.4 Other Relevant Matters

7.4.1 Land Use Impacts

The economy of Christmas Island has historically been almost solely dependent on phosphate mining. The historic reliance on a single economic driver has meant that the island's economic outlook lacked flexibility to change (Shire of Christmas Island, 2012). Notwithstanding a brief diversification of activities on the island with the construction of the Immigration Detention Centre (IDC), the economy is still heavily reliant on phosphate mining. Tourism on the island is hampered by a lack of reliable flights and all industries are impacted by a lack of safe harbourage for shipping.

This clearing permit application will not impact negatively on other land uses, it will facilitate diversification away from mining and promote tourism.

7.4.2 Previous Decisions

1. EPBC Act referral for proposed phosphate mining in South Point, Christmas Island (Ref: 2012/6653);
2. Previous clearing permit decisions:

- CPS2090/1 (CIP) refused;
- CPS2132/2 (CIP) exp. 11 November 2022;
- CPS2373/1 (CIP Exploration Permit) permit surrendered;
- CPS2376/1 (CIP Exploration Permit) permit surrendered;
- CPS2870/1 (CIP) permit surrendered;
- CPS3290/3 (CIP) exp. 31 August 2025;
- CPS3472/6 (CIP) exp. 11 January 2025;
- CPS4506/2 (CIP) exp. 16 March 2025;
- CPS6124/1 (Parks Australia) exp. 21 July 2019;
- CPS6104/1 (Hidden Garden Sustainable Farms) exp. 3 January 2017;
- CPS6323/1 (CIP) exp. 31 December 2024;
- CPS6662/1 (CIP Exploration Permit) exp. 31 December 2018;
- CPS6920/1 (CIP Exploration Permit) exp. 3 June 2021;
- CPS7040/1 (CIP Exploration Permit) exp. 13 August 2021; and

3. EPBC Act referral for proposed exploration drilling in Unallocated Crown Land Areas (Ref: 2016/7779) refused

7.4.3 Legislative Requirements

There are no specific legislative requirements relevant to the application.

7.4.5 Necessity

In 2021, the Christmas Island Mountain Bike Association (CIMBA) submitted a proposal for Commonwealth funding under the Building Better Regions Grant program. CIMBA is a not-for-profit organisation setup exclusively for the development of mountain bike trails on the Island and to promote the tourism activity for the Island.

This proposal aims to provide a new and exciting ecotourism activity for the Island which will draw new visitors and widen the Island's tourism appeal. This aim is in line with the Australian Government's strategic objectives for the Island to develop its tourism potential to provide a viable economy when phosphate mining finishes.

7.5 Environmental Protection Policies

There are no Environmental Protection Policies developed under Part III of the EP Act that apply to Christmas Island.

7.6 Agreements to reserve, conservation covenants and soil conservation notices

There are no agreements to reserve, conservation covenants or soil conservation notices under the *Soil and Land Conservation Act 1945* applicable to the proposal.

8. Conclusions and Recommendations

An assessment of the proposed clearing of approximately 0.5 ha of regrowth native vegetation against each of the ten clearing principles outlined in Schedule 5 of the *Environmental Protection Act 1986* has identified that the proposal is unlikely to be at variance to the clearing principles. The proposed clearing is a small area and will be predominantly in regrowth vegetation along the previously cleared rail formation, tracks and old mining areas. Clearing will avoid trees. The ultimate aim is to maximise the riders' experience of the natural environment through minimising disturbance to an absolute minimum necessary to develop a trafficable mountain bike track. The end result should be a trafficable path through the forest with full overstorey left in place. The specific alignment will be chosen to avoid trees and therefore mainly understorey species will be cleared along the 2 m wide alignment. Significant trees or environmental features are considered key elements and attractions of the track and sensitive clearing activities will be utilised to prevent disturbance to trees and any significant features. Clearing is to allow for the establishment of a 2 m wide bike track and in the tropical environment vegetation recovery of these tracks is expected to be rapid. The proposal will have a temporary minor impact. Though conservation significant native fauna may sometimes utilise the area, the proposal will not impact on significant habitats and these species noted are widespread across the island. No Threatened flora species have been found within the proposal area.

It is recommended that;

- A permit is approved for areas proposed for clearing in this application subject to the mitigation measures proposed in this report; and
- Implementation of the weed management actions for priority species utilising the species prioritisation and approach as outlined approved CIP Weed Management Plan to this area following the clearing operation;

9. Limitations

Scope of services

This report ("the report") has been prepared by Strategen-JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Strategen-JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This report is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

Reliance on data

In preparing the report, Strategen-JBS&G has relied upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise expressly stated in the report, Strategen-JBS&G has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Strategen-JBS&G has also not attempted to determine whether any material matter has been omitted from the data. Strategen-JBS&G will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to Strategen-JBS&G. The making of any assumption does not imply that Strategen-JBS&G has made any enquiry to verify the correctness of that assumption.

The report is based on conditions encountered and information received at the time of preparation of this report or the time that site investigations were carried out. Strategen-JBS&G disclaims responsibility for any changes that may have occurred after this time. This report and any legal issues arising from it are governed by and construed in accordance with the law of Western Australia as at the date of this report.

Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

Strategen-JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by Strategen-JBS&G, and should not be relied upon by other parties, who should make their own enquiries.

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Appendix A Conservation Significant Flora and Ecological Community Definitions

A1. *Biodiversity Conservation Act 2016* (Western Australia)

Threatened, Extinct and Specially Protected Fauna and Flora

Under the Western Australian *Biodiversity Conservation Act 2016,* Threatened, Extinct and Specially Protected fauna or flora[5] are species[6] which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Table A.1: Western Australian Threatened, Extinct and Specially Protected fauna and flora categories

Code	Conservation Category
Threatened Species (T) Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act). Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna. Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.	
CR	**Critically Endangered Species** Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.
EN	**Endangered Species** Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
VU	**Vulnerable Species** Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.
Extinct species (EX) Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	**Extinct Species** Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

[5] The definition of flora includes algae, fungi and lichens

[6] Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Code	Conservation Category
EW	**Extinct in the Wild Species** Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially Protected Species Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.	
MI	**Migratory Species** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*
CD	**Species of special conservation interest (conservation dependent fauna)** Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*
OS	**Other specially protected species** Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
Priority species (P) Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations	
P1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

Code	Conservation Category
P2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3: Poorly-known species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** a. Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. b. Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. c. Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Threatened and Priority Ecological Communities

Division 2 of the *Biodiversity Conservation Act 2016* (BC Act) provides for the statutory listing of threatened ecological communities (TECs) by the Minister.

Table A.2: Western Australian listed Threatened Ecological Community categories

Code	Conservation Category
PD	**Presumed Totally Destroyed (PD)** An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (a or b) a. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or b. All occurrences recorded within the last 50 years have since been destroyed.

Code	Conservation Category
CR	**Critically Endangered Communities** An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (a, b or c): a. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii. there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. c. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).
EN	**Endangered Communities** An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b, or c): a. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii. modification throughout its range is continuing such that in the short-term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. c. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Code	Conservation Category
VU	**Vulnerable Communities** An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b or c): a. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. b. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. c. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long-term future because of existing or impending threatening processes.

Priority Ecological Communities

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Table A.3: Western Australian listed Priority Ecological Community categories

Code	Conservation Category
P1	**Priority One: Poorly-known ecological communities** Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2	**Priority Two: Poorly-known ecological communities** Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	**Priority Three: Poorly known ecological communities** a. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: b. communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; c. communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Code	Conservation Category
P4	**Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list.** These communities require regular monitoring. a. Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. b. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. c. Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	**Priority Five: Conservation Dependent ecological communities** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

A2. *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

Threatened Species

Threatened fauna and flora may be listed under Section 178 of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) in any one of the following categories.

Table A.4: Commonwealth listed Threatened Species categories

Code	Conservation Category
EX	**Extinct Species** A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
EW	**Extinct in the Wild Species** A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: a. it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or b. it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, d
CR	**Critically Endangered Species** A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered Species** A native species is eligible to be included in the endangered category at a particular time if, at that time: a. it is not critically endangered; and b. it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable Species** A native species is eligible to be included in the vulnerable category at a particular time if, at that time: a. it is not critically endangered or endangered; and b. it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

Code	Conservation Category
CD	**Conservation Dependent Species** A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: a. the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or b. the following subparagraphs are satisfied: i. the species is a species of fish; ii. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; iii. the plan of management is in force under a law of the Commonwealth or of a State or Territory; iv. cessation of the plan of management would adversely affect the conservation status of the species.

Threatened Ecological Communities

Threatened Ecological Communities may be listed under Section 181 of the EPBC Act in any one of the following categories.

Table A.5: Commonwealth listed Threatened Ecological Community categories

Code	Conservation Category
CR	**Critically Endangered Communities** An ecological community is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered Communities** An ecological community is eligible to be included in the endangered category at a particular time if, at that time: a. it is not critically endangered; and b. it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable Communities** An ecological community is eligible to be included in the vulnerable category at a particular time if, at that time: a. it is not critically endangered nor endangered; and b. it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

Appendix B Species List

Family	Taxon
APOCYNACEAE	§ *Hoya aldrichii*
	Ochrosia ackeringae
ARALIACEAE	*Schefflera elliptica*
ARECACEAE	§ *Arenga listeri*
ASPLENIACEAE	*Asplenium nidus*
COMBRETACEAE	*Combretum acuminatum*
DAVALLIACEAE	*Davallia denticulata*
DENNSTAEDTIACEAE	*Microlepia speluncae*
EUPHORBIACEAE	* *Aleurites molluccana*
	Claoxylon indicum
	Macaranga tanarius
FABACEAE	*Inocarpus fagifer*
	* *Leucaena leucocephala*
LAMIACEAE	* *Stachys arvensis*
LAURACEAE	*Cryptocarya nitens*
LECYTHIDACEAE	*Barringtonia racemosa*
LEEACEAE	*Leea angulata*
LOMARIOPSIDACEAE	*Nephrolepis biserrata*
MALVACEAE	*Melochia umbellata*
MELIACEAE	*Dysoxylum gaudichaudianum*
MENISPERMACEAE	*Pachygone ovata*
MORACEAE	*Maclura cochinchinensis var. cochinchinensis*
MYRSINACEAE	§ *Ardisia colorata*
MYRTACEAE	*Psidium guajava*
	Syzygium nervosum
NYCTAGINACEAE	*Pisonia umbellifera*
ORCHIDACEAE	*Corymborkis veratrifolia*
PANDANACEAE	§ *Pandanus elatus*
PITTOSPORACEAE	*Pittosporum ferrugineum*
POLYPODIACEAE	*Microsorum scolopendria*
	Pyrrosia lanceolata
RUBIACEAE	*Aidia sp. aff. racemosa*
	Guettarda speciosa
RUTACEAE	* *Clausena excavata*
SAPINDACEAE	*Tristiropsis acutangula*
SAPOTACEAE	*Planchonella nitida*
SOLANACEAE	* *Capsicum sp.*
THELYPTERIDACEAE	*Pneumatopteris truncata*
TURNERACEAE	* *Turnera ulmifolia*

§ Denotes endemic taxa
* Denotes introduced taxa

Appendix C Site-Species Matrix

Table C.1: Site-species matrix

	Taxon	R01	R02	R03	R04	R05	R06	R07	R08	Opp
	Aidia sp. aff. racemosa									+
*	*Aleurites molluccana*	+								
§	*Ardisia colorata*									+
§	*Arenga listeri*	+			+	+	+	+	+	
	Asplenium nidus	+	+	+	+			+		
	Barringtonia racemosa					+	+			
*	*Capsicum sp.*									+
	Claoxylon indicum				+		+	+	+	
*	*Clausena excavata*				+					
	Combretum acuminatum						+			
	Corymborkis veratrifolia					+	+			
	Cryptocarya nitens									+
	Davallia denticulata									+
	Dysoxylum gaudichaudianum	+			+			+	+	
	Guettarda speciosa	+								
§	*Hoya aldrichii*	+		+	+					
	Inocarpus fagifer					+	+			
	Leea angulata									+
*	*Leucaena leucocephala*	+	+					+	+	
	Macaranga tanarius				+			+	+	
	Maclura cochinchinensis var. cochinchinensis		+	+	+			+	+	
	Melochia umbellata									+
	Microlepia speluncae									+
	Microsorum scolopendria	+								
	Nephrolepis biserrata	+					+			
	Ochrosia ackeringae	+								
	Pachygone ovata							+		
§	*Pandanus elatus*	+	+	+		+	+		+	
	Pisonia umbellifera				+					
	Pittosporum ferrugineum	+								
	Planchonella nitida		+							
	Pneumatopteris truncata		+							
	Psidium guajava	+		+						
	Pyrrosia lanceolata	+	+	+						
	Schefflera elliptica					+				
*	*Stachys arvensis*								+	
	Syzygium nervosum				+	+	+			
	Tristiropsis acutangula	+		+				+	+	
*	*Turnera ulmifolia*							+	+	

Appendix D Relevé Data

Project: 63023 **Date:** 6/8/2022

Site: R01 **Coordinates:** -10.5204866, 105.6429101 **Datum:** **Site Type:** Releve

Site Size: 5x10 **Site Marker:** Nil **Photo Location:** Central

Landform: gully **Aspect:** N **Slope:** 1

Outcropping: yes **Rock Type:** Limestone

Soil Type: gravely loam **Soil Notes:** Compact rail surface

Surface: 20% bare ground, 30% outcropping, 70% litter

Large Trees Present (>500 mm DBH): no

Condition: Degraded **Disturbance Notes:** Old rail cutting

Vegetation Description: Regrowth *Pandanus elatus, Tristiropsis* and saplings of *Dysoxylon* over *Nephrolepis.*





TAXA

Stratum	Taxon		Height (m)	Cover (%)	Dead Cover (%)	Basal Area Tally	Comment
		Hoya aldrichii		0			Epiphyte/Climber
		Pyrrosia lanceolata		0			Epiphyte
		Microsorum scolopendria		0			Epiphyte
		Asplenium nidus		0			Epiphyte
E		*Dysoxylum gaudichaudianum*	2000	1		1	taller tree on cutaway
U1		*Tristiropsis acutangula*	1500	30		1	
U2		*Pandanus elatus*	700	25		3	
U2		*Aleurites molluccana*	600	1			
U2		*Pittosporum ferrugineum*	500	0.01			
U3		*Ochrosia ackeringae*	450	5			
U3		*Guettarda speciosa*	450	0.2			
U3	*	*Leucaena leucocephala*	400	0.1			
M1		*Psidium guajava*	230	0.1			

Stratum	Taxon		Height (m)	Cover (%)	Dead Cover (%)	Basal Area Tally	Comment
G		*Nephrolepis biserrata*	110	30			
G		*Arenga listeri*	40	0.01			

Project: 63023 **Date:** 6/8/2022

Site: R02 **Coordinates:** -10.5211399, 105.6431956 **Datum:** **Site Type:** Releve

Site Size: 5x10 **Site Marker:** Nil **Photo Location:** Central

Landform: rail mound **Aspect:** W **Slope:** 30

Outcropping: no **Rock Type:** Limestone

Soil Type: gravely loam **Soil Notes:** Compact rail surface

Surface: 20% bare ground, % outcropping, 70% litter

Large Trees Present (>500 mm DBH): no

Condition: Degraded **Disturbance Notes:** Old rail cutting, pipe

Vegetation Description: Regrowth *Pandanus elatus, Tristiropsis* and saplings of *Dysoxylon* over *Pneumatopteris truncata.*



TAXA

Stratum	Taxon		Height (m)	Cover (%)	Dead Cover (%)	Basal Area Tally	Comment
		Pyrrosia lanceolata		0			Epiphyte
		Asplenium nidus		0			Epiphyte
U1		*Pandanus elatus*	1000	90		10	
U2		*Planchonella nitida*	800	0.5			
M1		*Maclura cochinchinensis var. cochinchinensis*	270	0.5			
M1	*	*Leucaena leucocephala*	200	0.05			
G		*Pneumatopteris truncata*	100	3			

Project: 63023 **Date:** 6/8/2022

Site: R03 **Coordinates:** -10.5223847, 105.6433103 **Datum:** **Site Type:** Releve

Site Size: 5x10 **Site Marker:** Nil **Photo Location:** Central

Landform: rail mound **Aspect:** **Slope:**

Outcropping: no **Rock Type:** Limestone

Soil Type: gravely loam **Soil Notes:**

Surface: 30% bare ground, % outcropping, 50% litter

Large Trees Present (>500 mm DBH): no

Condition: Degraded **Disturbance Notes:** Pipe, rail mound

Vegetation Description: Regrowth *Pandanus elatus* thicket.



TAXA

Stratum	Taxon		Height (m)	Cover (%)	Dead Cover (%)	Basal Area Tally	Comment
		Hoya aldrichii		0			Epiphyte/Climber
		Pyrrosia lanceolata		0			Epiphyte
		Maclura cochinchinensis var. cochinchinensis		0.1			Climber
U1		*Tristiropsis acutangula*	1200	1			
U1, M1		*Pandanus elatus*	1200	90		8	Also understory
M1		*Psidium guajava*	250	0.2			
G		*Asplenium nidus*	75	0.5			

Project: 63023 **Date:** 6/9/2022

Site: R04 **Coordinates:** -10.4384909, 105.6810375 **Datum:** **Site Type:** Releve

Site Size: 5x10 **Site Marker:** Nil **Photo Location:** Central

Landform: old stockpile? **Aspect:** NE **Slope:** 2

Outcropping: yes **Rock Type:** Limestone

Soil Type: loam **Soil Notes:** Brown

Surface: 70% bare ground, 1% outcropping, 15% litter

Large Trees Present (>500 mm DBH): yes

Condition: Excellent,Very Good structural features **Disturbance Notes:** No mature trees and missing some climax

Vegetation Description: Regrowth forest dominated by subcanopy species including *Claoxylon indicum, Arenga listeri* and *Dysoxylum gaudichaudianum*. Some pioneer species present and few climax structural features.



TAXA

Stratum	Taxon		Height (m)	Cover (%)	Dead Cover (%)	Basal Area Tally	Comment
		Hoya aldrichii		0.1			Epiphyte/Climber
		Maclura cochinchinensis var. cochinchinensis		5			Climber
U1		*Syzygium nervosum*	1500	5		3	
U1		*Pisonia umbellifera*	1500	1			
U1		*Macaranga tanarius*	1500	1			
U1		*Claoxylon indicum*	1500	10		2	
U1		*Arenga listeri*	1200	10		2	
U1		*Dysoxylum gaudichaudianum*	1000	10			
M1	*	*Clausena excavata*	150	0.2			
G		*Asplenium nidus*	60	0.05			

Project: 63023 **Date:** 6/9/2022

Site: R05 **Coordinates:** -10.4385508, 105.6791913 **Datum:** **Site Type:** Releve

Site Size: 5x10 **Site Marker:** Nil **Photo Location:** Central

Landform: slope **Aspect:** SE **Slope:** 1

Outcropping: yes **Rock Type:** Limestone

Soil Type: gravely loam,loam **Soil Notes:** Brown

Surface: 30% bare ground, 50% outcropping, 10% litter

Large Trees Present (>500 mm DBH): yes

Condition: Excellent **Disturbance Notes:**

Vegetation Description: Closed canopy evergreen forest dominated by *Inocarpus fagifer* with emergent *Syzygium nervosum* and an understory dominated by *Arenga* and *Barringtonia racemosa* with some climax structural features such as lianes and ground orchids.





TAXA

Stratum	Taxon	Height (m)	Cover (%)	Dead Cover (%)	Basal Area Tally	Comment
	Schefflera elliptica		10			Climber to canopy
E	*Syzygium nervosum*	3000	10		3	
U1	*Inocarpus fagifer*	2500	70			
U1	*Barringtonia racemosa*	1000	50		3	
U2	*Arenga listeri*	500	10		1	
M1	*Pandanus elatus*	200	1			
G	*Corymborkis veratrifolia*	50	0.001			

Project: 63023 **Date:** 6/9/2022

Site: R06 **Coordinates:** -10.4400179, 105.6794849 **Datum:** **Site Type:** Releve

Site Size: 5x10 **Site Marker:** Nil **Photo Location:** Central

Landform: slope **Aspect:** SE **Slope:** 5

Outcropping: yes **Rock Type:** Limestone

Soil Type: gravely loam,loam **Soil Notes:** Brown

Surface: 60% bare ground, 0.01% outcropping, 40% litter

Large Trees Present (>500 mm DBH): yes

Condition: Excellent **Disturbance Notes:** Lacks some climax features

Vegetation Description: Late regrowth forest dominated by *Barringtonia racemosa* and *Pandanus elatus*. Few pioneer species and some climax structural features such as lianes and ground orchids beginning to appear.



TAXA

Stratum	Taxon	Height (m)	Cover (%)	Dead Cover (%)	Basal Area Tally	Comment
	Combretum acuminatum		0.001			Climber
U1	*Syzygium nervosum*	2000	5			
U1	*Inocarpus fagifer*	1500	10		1	
U1	*Barringtonia racemosa*	1500	80	2		
U2	*Arenga listeri*	900	1			
U2	*Pandanus elatus*	500	25			
G	*Corymborkis veratrifolia*	100	1			
M1	*Claoxylon indicum*	100	1			
G	*Nephrolepis biserrata*	80	15			

Project: 63023 **Date:** 6/9/2022

Site: R07 **Coordinates:** -10.4998987, 105.6515727 **Datum:** **Site Type:** Releve

Site Size: 5x10 **Site Marker:** Nil **Photo Location:** Central

Landform: slope **Aspect:** NW **Slope:** 2

Outcropping: yes **Rock Type:** Limestone

Soil Type: gravely loam **Soil Notes:**

Surface: 80% bare ground, 15% outcropping, 15% litter

Large Trees Present (>500 mm DBH): no

Condition: Very Good **Disturbance Notes:** Lack of climax structural features, immature trees

Vegetation Description: Regrowth forest dominated by *Macaranga, Dysoxylum* and a subcanopy of *Claoxylon indicum*.



TAXA

Stratum	Taxon		Height (m)	Cover (%)	Dead Cover (%)	Basal Area Tally	Comment
		Asplenium nidus		0			Epiphyte
		Maclura cochinchinensis var. cochinchinensis		1			Climber
U1		*Macaranga tanarius*	1800	15		7	
U1		*Dysoxylum gaudichaudianum*	1500	10		2	
U2		*Claoxylon indicum*	700	90		1	
U2	*	*Leucaena leucocephala*	500	0.1			
U2		*Arenga listeri*	400	2			
M1		*Tristiropsis acutangula*	200	1			
M2	*	*Turnera ulmifolia*	65	0.001			
G		*Pachygone ovata*	30	0.01			

Project: 63023 **Date:** 6/9/2022

Site: R08 **Coordinates:** -10.4976570, 105.6503176 **Datum:** **Site Type:** Releve

Site Size: 5x10 **Site Marker:** Nil **Photo Location:** Central

Landform: plain **Aspect:** **Slope:**

Outcropping: yes **Rock Type:** Limestone

Soil Type: gravely loam,loam **Soil Notes:**

Surface: 30% bare ground, 0.1% outcropping, 50% litter

Large Trees Present (>500 mm DBH): no

Condition: Excellent,Very Good **Disturbance Notes:** Weeds, lack of cl

Vegetation Description: Regrowth forest dominated by early pioneer species, especially *Macaranga* with a weedy understory of *Claoxylon indicum* and **Leucaena leucocephala.*





TAXA

Stratum	Taxon		Height (m)	Cover (%)	Dead Cover (%)	Basal Area Tally	Comment
		Maclura cochinchinensis var. cochinchinensis		0.5			Climber
U1		*Macaranga tanarius*	1500	40		2	
U1		*Dysoxylum gaudichaudianum*	1200	5		1	
U1		*Tristiropsis acutangula*	1000	0.5			
U2	*	*Leucaena leucocephala*	800	5			
U2		*Claoxylon indicum*	800	30		1	
M1		*Pandanus elatus*	300	1			
M1		*Arenga listeri*	250	2			
M2		*Turnera ulmifolia*	60	0.1			
M2	*	*Stachys arvensis*	50	0.1			

Appendix E Database Search Results

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. Please see the caveat for interpretation of information provided here.

Report created: 04-Nov-2022

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment 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:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	31
Listed Migratory Species:	34

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 https://www.dcceew.gov.au/parks-heritage/heritage

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 Lands:	84
Commonwealth Heritage Places:	11
Listed Marine Species:	58
Whales and Other Cetaceans:	24
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	1
Australian Marine Parks:	1
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	2
EPBC Act Referrals:	62
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Hosnies spring	Within Ramsar site	In feature area
The dales	Within Ramsar site	In feature area

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 a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
EEZ and Territorial Sea	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Accipiter hiogaster natalis			
Christmas Island Goshawk [82408]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris canutus			
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Chalcophaps indica natalis			
Christmas Island Emerald Dove, Emerald Dove (Christmas Island) [67030]	Endangered	Species or species habitat known to occur within area	In feature area
Fregata andrewsi			
Christmas Island Frigatebird, Andrew's Frigatebird [1011]	Endangered	Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Ninox natalis			
Christmas Island Hawk-Owl, Christmas Boobook [66671]	Vulnerable	Species or species habitat known to occur within area	In feature area
Papasula abbotti			
Abbott's Booby [59297]	Endangered	Species or species habitat known to occur within area	In feature area
Phaethon lepturus fulvus			
Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat known to occur within area	In feature area
Turdus poliocephalus erythropleurus			
Christmas Island Thrush [67122]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
Thunnus maccoyii			
Southern Bluefin Tuna [69402]	Conservation Dependent	Breeding known to occur within area	In feature area
MAMMAL			
Balaenoptera borealis			
Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Balaenoptera physalus			
Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Crocidura trichura			
Christmas Island Shrew [86568]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Pteropus natalis			
Christmas Island Flying-fox, Christmas Island Fruit-bat [87611]	Critically Endangered	Species or species habitat known to occur within area	In feature area
PLANT			
Asplenium listeri			
Christmas Island Spleenwort [65865]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pneumatopteris truncata fern [68812]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Tectaria devexa [14767]	Endangered	Species or species habitat likely to occur within area	In feature area
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Cryptoblepharus egeriae Christmas Island Blue-tailed Skink, Blue-tailed Snake-eyed Skink [1526]	Critically Endangered	Species or species habitat may occur within area	In feature area
Cyrtodactylus sadleiri Christmas Island Giant Gecko [86865]	Endangered	Species or species habitat known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area	In feature area
Lepidodactylus listeri Christmas Island Gecko, Lister's Gecko [1711]	Critically Endangered	Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Ramphotyphlops exocoeti](#)			
Christmas Island Blind Snake, Christmas Island Pink Blind Snake [1262]	Vulnerable	Species or species habitat likely to occur within area	In feature area
SHARK			
[Carcharodon carcharias](#)			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Rhincodon typus](#)			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
[Sphyrna lewini](#)			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
[Anous stolidus](#)			
Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
[Fregata andrewsi](#)			
Christmas Island Frigatebird, Andrew's Frigatebird [1011]	Endangered	Breeding known to occur within area	In feature area
[Fregata ariel](#)			
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area
[Fregata minor](#)			
Great Frigatebird, Greater Frigatebird [1013]		Breeding known to occur within area	In feature area
[Phaethon lepturus](#)			
White-tailed Tropicbird [1014]		Breeding known to occur within area	In feature area
[Phaethon rubricauda](#)			
Red-tailed Tropicbird [994]		Breeding known to occur within area	In feature area
[Sula leucogaster](#)			
Brown Booby [1022]		Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Sula sula](#) Red-footed Booby [1023]		Breeding known to occur within area	In feature area
Migratory Marine Species			
[Balaenoptera borealis](#) Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat likely to occur within area	In buffer area only
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Balaenoptera physalus](#) Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Carcharhinus longimanus](#) Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lepidochelys olivacea			
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area	In feature area
Megaptera novaeangliae			
Humpback Whale [38]		Species or species habitat may occur within area	In buffer area only
Mobula birostris as Manta birostris			
Giant Manta Ray [90034]		Species or species habitat known to occur within area	In feature area
Natator depressus			
Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Orcinus orca			
Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Physeter macrocephalus			
Sperm Whale [59]		Species or species habitat may occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
Cecropis daurica			
Red-rumped Swallow [80610]		Species or species habitat known to occur within area	In feature area
Hirundo rustica			
Barn Swallow [662]		Species or species habitat known to occur within area	In feature area
Motacilla cinerea			
Grey Wagtail [642]		Species or species habitat known to occur within area	In feature area
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Environment and Heritage		
Commonwealth Land - Christmas Island National Park [94103]	CI	In buffer area only
Commonwealth Land - Christmas Island National Park [94104]	CI	In buffer area only
Commonwealth Land - Christmas Island National Park [94105]	CI	In feature area
Commonwealth Land - Christmas Island National Park [94101]	CI	In buffer area only
Commonwealth Land - Christmas Island National Park [94102]	CI	In feature area
Unknown		
Commonwealth Land - [94252]	CI	In buffer area only
Commonwealth Land - [94280]	CI	In feature area
Commonwealth Land - [94225]	CI	In buffer area only
Commonwealth Land - [94251]	CI	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [94228]	CI	In buffer area only
Commonwealth Land - [94224]	CI	In buffer area only
Commonwealth Land - [94262]	CI	In feature area
Commonwealth Land - [94260]	CI	In buffer area only
Commonwealth Land - [94261]	CI	In feature area
Commonwealth Land - [94235]	CI	In buffer area only
Commonwealth Land - [94218]	CI	In buffer area only
Commonwealth Land - [94231]	CI	In buffer area only
Commonwealth Land - [94234]	CI	In buffer area only
Commonwealth Land - [94219]	CI	In buffer area only
Commonwealth Land - [94253]	CI	In feature area
Commonwealth Land - [94232]	CI	In buffer area only
Commonwealth Land - [94233]	CI	In buffer area only
Commonwealth Land - [94230]	CI	In buffer area only
Commonwealth Land - [94227]	CI	In buffer area only
Commonwealth Land - [94277]	CI	In buffer area only
Commonwealth Land - [94276]	CI	In buffer area only
Commonwealth Land - [94213]	CI	In buffer area only
Commonwealth Land - [94212]	CI	In buffer area only
Commonwealth Land - [94214]	CI	In buffer area only
Commonwealth Land - [94215]	CI	In buffer area only
Commonwealth Land - [94210]	CI	In buffer area only
Commonwealth Land - [94211]	CI	In buffer area only
Commonwealth Land - [94238]	CI	In buffer area only
Commonwealth Land - [94239]	CI	In buffer area only
Commonwealth Land - [94257]	CI	In feature area
Commonwealth Land - [94259]	CI	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [94254]	CI	In feature area
Commonwealth Land - [94274]	CI	In buffer area only
Commonwealth Land - [94275]	CI	In buffer area only
Commonwealth Land - [94272]	CI	In buffer area only
Commonwealth Land - [94273]	CI	In buffer area only
Commonwealth Land - [94270]	CI	In buffer area only
Commonwealth Land - [94271]	CI	In buffer area only
Commonwealth Land - [94258]	CI	In buffer area only
Commonwealth Land - [94216]	CI	In buffer area only
Commonwealth Land - [94222]	CI	In buffer area only
Commonwealth Land - [94223]	CI	In buffer area only
Commonwealth Land - [94256]	CI	In feature area
Commonwealth Land - [94217]	CI	In buffer area only
Commonwealth Land - [94269]	CI	In buffer area only
Commonwealth Land - [94209]	CI	In buffer area only
Commonwealth Land - [94208]	CI	In buffer area only
Commonwealth Land - [94207]	CI	In buffer area only
Commonwealth Land - [94206]	CI	In buffer area only
Commonwealth Land - [94201]	CI	In buffer area only
Commonwealth Land - [94226]	CI	In buffer area only
Commonwealth Land - [94221]	CI	In buffer area only
Commonwealth Land - [94220]	CI	In buffer area only
Commonwealth Land - [94205]	CI	In buffer area only
Commonwealth Land - [94268]	CI	In buffer area only
Commonwealth Land - [94243]	CI	In buffer area only
Commonwealth Land - [94242]	CI	In buffer area only
Commonwealth Land - [94263]	CI	In feature area

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [94267]	CI	In buffer area only
Commonwealth Land - [94247]	CI	In buffer area only
Commonwealth Land - [94246]	CI	In buffer area only
Commonwealth Land - [94241]	CI	In buffer area only
Commonwealth Land - [94240]	CI	In buffer area only
Commonwealth Land - [94265]	CI	In buffer area only
Commonwealth Land - [94204]	CI	In buffer area only
Commonwealth Land - [94249]	CI	In buffer area only
Commonwealth Land - [94248]	CI	In buffer area only
Commonwealth Land - [94264]	CI	In feature area
Commonwealth Land - [94245]	CI	In buffer area only
Commonwealth Land - [94203]	CI	In buffer area only
Commonwealth Land - [94244]	CI	In buffer area only
Commonwealth Land - [94236]	CI	In buffer area only
Commonwealth Land - [94250]	CI	In buffer area only
Commonwealth Land - [94237]	CI	In buffer area only
Commonwealth Land - [94229]	CI	In buffer area only
Commonwealth Land - [94279]	CI	In buffer area only
Commonwealth Land - [94278]	CI	In buffer area only
Commonwealth Land - [94202]	CI	In buffer area only
Commonwealth Land - [94255]	CI	In feature area

Commonwealth Heritage Places			[Resource Information]
Name	State	Status	Buffer Status
Historic			
Administrators House Precinct	EXT	Listed place	In buffer area only
Bungalow 702	EXT	Listed place	In feature area
Drumsite Industrial Area	EXT	Listed place	In buffer area only
Industrial and Administrative Group	EXT	Listed place	In buffer area only

Name	State	Status	Buffer Status
Malay Kampong Group	EXT	Listed place	In feature area
Malay Kampong Precinct	EXT	Listed place	In feature area
Phosphate Hill Historic Area	EXT	Listed place	In buffer area only
Poon Saan Group	EXT	Listed place	In buffer area only
Settlement Christmas Island	EXT	Listed place	In buffer area only
South Point Settlement Remains	EXT	Listed place	In buffer area only
Natural			
Christmas Island Natural Areas	EXT	Listed place	In feature area

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus			
Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris canutus			
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Cecropis daurica as Hirundo daurica Red-rumped Swallow [80610]		Species or species habitat known to occur within area overfly marine area	In feature area
Fregata andrewsi Christmas Island Frigatebird, Andrew's Frigatebird [1011]	Endangered	Breeding known to occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Breeding known to occur within area	In feature area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat known to occur within area overfly marine area	In feature area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat known to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Breeding known to occur within area	In feature area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat known to occur within area	In feature area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Sula leucogaster](#) Brown Booby [1022]		Breeding known to occur within area	In feature area
[Sula sula](#) Red-footed Booby [1023]		Breeding known to occur within area	In feature area
Fish			
[Choeroichthys brachysoma](#) Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area	In feature area
[Choeroichthys sculptus](#) Sculptured Pipefish [66197]		Species or species habitat may occur within area	In feature area
[Corythoichthys amplexus](#) Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area	In feature area
[Corythoichthys flavofasciatus](#) Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area	In feature area
[Corythoichthys haematopterus](#) Reef-top Pipefish [66201]		Species or species habitat may occur within area	In feature area
[Corythoichthys intestinalis](#) Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area	In feature area
[Corythoichthys schultzi](#) Schultz's Pipefish [66205]		Species or species habitat may occur within area	In feature area
[Cosmocampus banneri](#) Roughridge Pipefish [66206]		Species or species habitat may occur within area	In feature area
[Cosmocampus maxweberi](#) Maxweber's Pipefish [66209]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Doryrhamphus baldwini Redstripe Pipefish [66718]		Species or species habitat may occur within area	In feature area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area	In feature area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area	In feature area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area	In feature area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area	In feature area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area	In feature area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area	In feature area
Halicampus macrorhynchus Whiskered Pipefish, Ornate Pipefish [66222]		Species or species habitat may occur within area	In feature area
Halicampus mataafae Samoan Pipefish [66223]		Species or species habitat may occur within area	In feature area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area	In feature area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area	In feature area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area	In feature area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In feature area
Hippichthys spicifer Belly-barred Pipefish, Banded Freshwater Pipefish [66232]		Species or species habitat may occur within area	In feature area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area	In feature area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In feature area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area	In feature area
Micrognathus brevirostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area	In feature area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area	In feature area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Trachyrhamphus bicoarctatus](#) Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In feature area
[Trachyrhamphus longirostris](#) Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	In feature area
Reptile			
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Lepidochelys olivacea](#) Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area	In feature area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
[Balaenoptera borealis](#) Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat likely to occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In buffer area only
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area	In buffer area only
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Indopacetus pacificus Longman's Beaked Whale [72]		Species or species habitat may occur within area	In buffer area only
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area	In buffer area only
Kogia sima as Kogia simus Dwarf Sperm Whale [85043]		Species or species habitat may occur within area	In buffer area only
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat may occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
[Mesoplodon densirostris](#) Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area	In buffer area only
[Mesoplodon ginkgodens](#) Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area	In buffer area only
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
[Peponocephala electra](#) Melon-headed Whale [47]		Species or species habitat may occur within area	In buffer area only
[Physeter macrocephalus](#) Sperm Whale [59]		Species or species habitat may occur within area	In buffer area only
[Stenella attenuata](#) Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In buffer area only
[Stenella coeruleoalba](#) Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area	In buffer area only
[Stenella longirostris](#) Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area	In buffer area only
[Steno bredanensis](#) Rough-toothed Dolphin [30]		Species or species habitat may occur within area	In buffer area only
[Tursiops truncatus s. str.](#) Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only
[Ziphius cavirostris](#) Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area	In buffer area only

Commonwealth Reserves Terrestrial

[Resource Information]

Name	State	Type	Buffer Status
Christmas Island	EXT	National Park (Commonwealth)	In feature area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories	Buffer Status
Christmas Island	Habitat Protection Zone (IUCN IV)	In buffer area only

Extra Information

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
"The Dales", Christmas Island	EXT	In buffer area only
Hosine's Spring, Christmas Island	EXT	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Christmas Island Airport Expansion	2001/434	Controlled Action	Post-Approval	In buffer area only
Christmas Island Port Facility	2001/435	Controlled Action	Post-Approval	In buffer area only
Construction of mobile phone tower	2002/694	Controlled Action	Completed	In buffer area only
Cultural Appearance Upgrade of the Chinese Literary Association Building	2007/3568	Controlled Action	Completed	In buffer area only
East Christmas Island Phosphate Mines (9 sites)	2001/487	Controlled Action	Completed	In feature area
Exploration for Mineable Phosphate, Christmas Island	2000/43	Controlled Action	Completed	In feature area
Lily Beach Recreational Facilities	2001/395	Controlled Action	Post-Approval	In buffer area only
Lily Beach Rock Pool Development	2001/400	Controlled Action	Completed	In buffer area only
Phosphate Mining in South Point Christmas Island	2012/6653	Controlled Action	Post-Approval	In buffer area only
Proposed exploration drilling programme for Christmas Island	2016/7779	Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Road Upgrade/Construction between Lily Beach Road and Port Faci	2001/436	Controlled Action	Post-Approval	In buffer area only
Salvage, transport and processing of phosphate resource with extended airport si	2003/1217	Controlled Action	Post-Approval	In feature area
Yellow Crazy Ant Biological Control	2013/6836	Controlled Action	Post-Approval	In feature area
Not controlled action				
96-108 Gaze Road - Residential upgrade	2006/2632	Not Controlled Action	Completed	In feature area
Aerial Baiting, Yellow Crazy Ant Supercolonies, Christmas Island, WA	2019/8492	Not Controlled Action	Completed	In feature area
Boat Ramp Construction	2001/237	Not Controlled Action	Completed	In buffer area only
Building of a carport adjacent to residential house	2004/1538	Not Controlled Action	Completed	In buffer area only
Christmas Island/Construction of a double storey shed/carport at MQ387 Gaze Road	2004/1561	Not Controlled Action	Completed	In feature area
Christmas Island Fuel Consolidation Project, Christmas Island	2012/6454	Not Controlled Action	Completed	In buffer area only
Community Recreation Centre	2003/1279	Not Controlled Action	Completed	In feature area
courtyard shower & handbasin facilities	2006/2803	Not Controlled Action	Completed	In buffer area only
Dwelling demolition, maintenance and carpark/carport/storage shed works	2004/1837	Not Controlled Action	Completed	In feature area
Extension of a Masonary Brick Wall adjacent to the Poon Saan Club by 500 mm	2004/1564	Not Controlled Action	Completed	In feature area
Flying Fish Cove Christmas Island Boat Ramp Maintenance	2021/8924	Not Controlled Action	Completed	In buffer area only
Flying Fish Cove Landslide Mitigation Project	2020/8616	Not Controlled Action	Completed	In feature area
Garage and Office Facilities	2004/1919	Not Controlled Action	Completed	In feature area
Housing and Garden Maintenance Works	2004/1487	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Hydroponics Research Program	2007/3338	Not Controlled Action	Completed	In buffer area only
Identification of unmarked grave, exhumation/identification of remains which may belong to a sailor	2006/2992	Not Controlled Action	Completed	In buffer area only
Internal and external modifications Lot 1014 Gaze Road	2004/1807	Not Controlled Action	Completed	In feature area
Light Industrial Subdivision Development	2004/1799	Not Controlled Action	Completed	In buffer area only
Lot 1056 Extensions and Alterations	2004/1801	Not Controlled Action	Completed	In buffer area only
Maintenance of Tai Jin House, Smith Point	2009/4933	Not Controlled Action	Completed	In buffer area only
Mobile Radio Communications System Upgrade	2002/718	Not Controlled Action	Completed	In buffer area only
Placement of bitumen/ concrete on rail sections of heritage listed incline, Christmas Island	2013/7009	Not Controlled Action	Completed	In feature area
Power Station Diesel Generator Replacement	2009/4685	Not Controlled Action	Completed	In buffer area only
Proposed sale or lease of Crown land, 11 lots, Christmas Island	2018/8220	Not Controlled Action	Completed	In feature area
Realignment of Gaze Road Service Road and Gaze Road Junction	2004/1735	Not Controlled Action	Completed	In feature area
Refurbishment and Extension of Seaview Lodge	2012/6353	Not Controlled Action	Completed	In buffer area only
renovate free-standing servant's quarters	2006/2811	Not Controlled Action	Completed	In buffer area only
Replacement of deteriorating flat roof at rear of Mosque and extending side verandahs, Christmas Is	2013/6851	Not Controlled Action	Completed	In buffer area only
Residential upgrade, 2 Coconut Grove	2007/3295	Not Controlled Action	Completed	In buffer area only
Stormwater Remediation Project, Christmas Island	2019/8467	Not Controlled Action	Completed	In feature area
Subdivision of Lot 571 on DP 26701	2008/4230	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Subdivision of Part 7 of Lot 1014	2009/4851	Not Controlled Action	Completed	In buffer area only
Supermarket Extensions	2006/2515	Not Controlled Action	Completed	In feature area
Upgrade of Residence, Coconut Grove	2006/2728	Not Controlled Action	Completed	In buffer area only
Verandah Extension to Existing Breezeway Unit, Gaze Road	2005/1970	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Addition of Verandah to Block of Four Units	2005/2315	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Aerial Baiting of Yellow Crazy Ants	2012/6438	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Asbestos Removal from Commonwealth Owned Assests including Commonwealth Heritage	2009/4873	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Baiting Efficacy Trial of Feral Cat Bait and PAPP Toxicant	2008/4383	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Commonwealth Marine/Flying Fish Cove Jetty Extension	2012/6675	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Crazy Ant Aerial Baiting Control Program	2002/722	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Helicopter baiting of exotic yellow crazy ant supercolonies, Christmas Island, Indian Ocean	2009/5016	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
New Housing Program	2011/6056	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
Swimming Pool modification	2007/3312	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Trials of a bait delivery system for the control of Yellow Crazy Ants	2009/4763	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Water supply upgrade	2005/2269	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Referral decision				
Alterations and Improvements to existing residence at Lot 3015 Gaze Rd, Christmas Island	2009/5039	Referral Decision	Completed	In buffer area only
Rocky Point Dwelling Redevelopment	2005/2203	Referral Decision	Referral Decision	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian 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, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-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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