ASSESSMENT OF MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

WARRILL VIEW QUARRY

Prepared for
Groundwork Plus

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BAAM
ECOLOGICAL CONSULTANTS

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Date:18 May, 2020

Director

ASSESSMENT OF MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

WARRILL VIEW QUARRY

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Table of Terms and Abbreviations

ASL	Above Sea Level
BAAM	Biodiversity Assessment and Management Pty Ltd
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
MNES	Matters of National Environmental Significance
PMST	Protected Matters Search Tool
RE	Regional Ecosystem
TEC	Threatened Ecological Community

1.0 INTRODUCTION

This report has been prepared for Groundwork Plus on behalf of Neilsens Quality Gravels Pty Ltd to document the results of an assessment of Matters of National Environmental Significance (MNES) and a determination of whether there will be any significant impacts to MNES as a result of a proposed quarry development in south-east Queensland.

The proposed quarry is located at Leitch Road, Rosevale and 299 Hayes Road, Silverdale and includes Lot 1 on Registered Plan 51909 and Lots 2, 7, 8, 10 and 18 on Registered Plan 50377 (project area) (**Figure 1.1**).

The specific aims of this assessment are to:

- undertake a desktop assessment of the MNES known or likely to occur in the project area and surrounds;
- undertake field assessments to verify the known or likely occurrence of MNES and enable an informed assessment of potential impacts from the proposed actions, including the identification of vegetation communities and associated habitat values for potentially occurring significant species, with a particular focus on identifying and documenting Koala habitat trees and the likely impacts on Koala habitat as a result of the proposed development; and
- evaluate the significance of potential impacts of the proposed quarry on the MNES known or likely to occur in the project area and surrounds.

1.1 PROPOSED ACTION

The proposed action is for hard rock extraction. The proposed quarry consists of an east quarry pit and a west quarry pit, with Warroolaba Creek separating the two pits.

Works will commence in the east pit working in a south-west direction from the northern end of the pit. It is also possible that works within the west pit will commence concurrently. The combined reserves of the east and west pits, based on current drilling data, is expected to have a lifespan of more than 100 years.

Access to the project area is proposed to occur via an existing, unformed road which connects directly to the Cunningham Highway. Approximately four (4) kilometres of new road will need to be constructed, to allow for two (2) way traffic movement to occur. The road will terminate at the north-eastern corner of Lot 18 RP 50377, where the internal access road will commence (refer **Figures 3.1 & 3.2**).

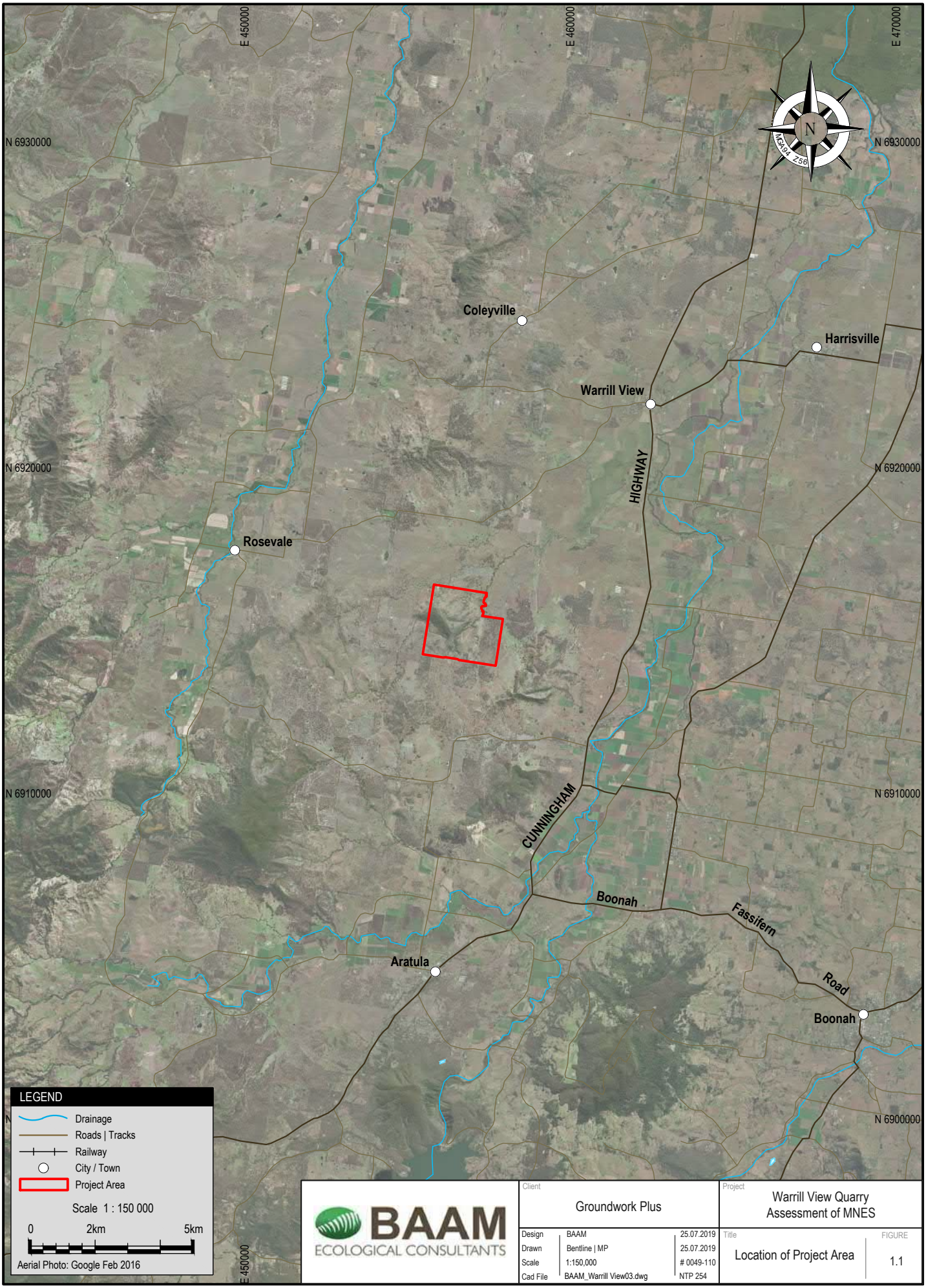
1.2 DESCRIPTION OF PROJECT AREA

The project area is situated between Ipswich (~35 km north-east) and Warwick (~60 km south-west) in an area that is dominated by cattle production.

Two large hills (~250 m ASL) and a number of smaller hills dominate the project area. The two large hills form the proposed east and west quarry pit locations, and are separated by Warroolaba Creek.

The project area currently supports a residential building and associated sheds, and fenced cattle/horse yards, and is currently stocked with beef cattle and horses.

Much of the project area has been historically cleared of native vegetation with the exception of vegetation towards the top of the large western hill, a narrow band of riparian vegetation associated with Warroolaba Creek and patches of vegetation in the eastern portions of the project area.



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Client	Groundwork Plus	
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Scale	1:150,000	# 0049-110
Cad File	BAAM_Warrill View03.dwg	NTP 254
Title	Location of Project Area	FIGURE 1.1

2.0 METHODOLOGY

2.1 DESKTOP

Prior to the field survey, publicly available information on MNES known or likely to occur in the project area and surrounds was accessed and reviewed, to provide the study team with sufficient background to ensure survey methods were suitably designed to detect and verify the actual presence or absence of these values. This included:

- Use of the Department of the Environment and Energy (DoEE) EPBC Act Online Protected Matters Search Tool for determining whether any MNES as defined under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) may occur.
- Review of the Queensland Herbarium's current, certified Region Ecosystem (RE) mapping (Version 10.1) to determine which remnant and high-value regrowth vegetation communities and associated habitats for significant flora and fauna species may occur in the project area, including REs that are analogous to EPBC Act-listed TECs.
- Review of relevant species profiles and Listing Advice for TECs and significant species.
- Searches of Atlas of Living Australia portal (ALA 2019) and the Queensland Government Wildlife Online database to provide records of significant flora and fauna species known from within a 10 km radius of the centre of the project area.
- Relevant published literature on the ecology of the project area, where readily available.
- A review of aerial photography and project area boundaries to assist in the determination of suitable representative sampling sites for field surveys.

2.2 FIELD SURVEYS

Following the desktop assessment, two field surveys were conducted by BAAM Wildlife Specialist Adrian Caneris and BAAM Senior Ecologist (Flora) Shelley Trevaskis on 5 April and 24 May 2016 to verify the accuracy of State vegetation mapping and to identify potential ecological constraints to the proposed quarry.

A repeat ecological assessment was conducted by BAAM Senior Ecologist (Fauna) Dr Jo Chambers and Shelley Trevaskis on 14 November, 2017. The focus of this survey was to identify the suitability of habitats to support conservation significant species. The southern portions of the proposed West Pit area and the eastern portions of the proposed East Pit area were the focus areas for this survey.

On 5 and 7 July, 2019, the northern portions of the proposed West Pit area and the entire proposed East Pit area were surveyed for the presence/absence of listed flora and fauna species, with a particular focus on locating evidence of Koala usage of the project area.

Total survey time over the three years equates to 84 survey hours.

Flora survey data from across the project area was collected using best practice floristic sampling (Neldner *et al.* 2019). To record vegetation community composition across the project area, Quaternary site data, undertaken in accordance with the methodology prescribed in Neldner *et al.* (2019), was collected at representative locations (refer **Figure 3.1** for survey site locations). Quaternary site data measures the height, canopy cover and dominant species present in each stratum of a vegetation community and informs the applicable remnant status and RE type; as well as habitat condition for significant flora and fauna species.

Targeted surveys for threatened flora species with the potential to occur were undertaken opportunistically during all field traverses.

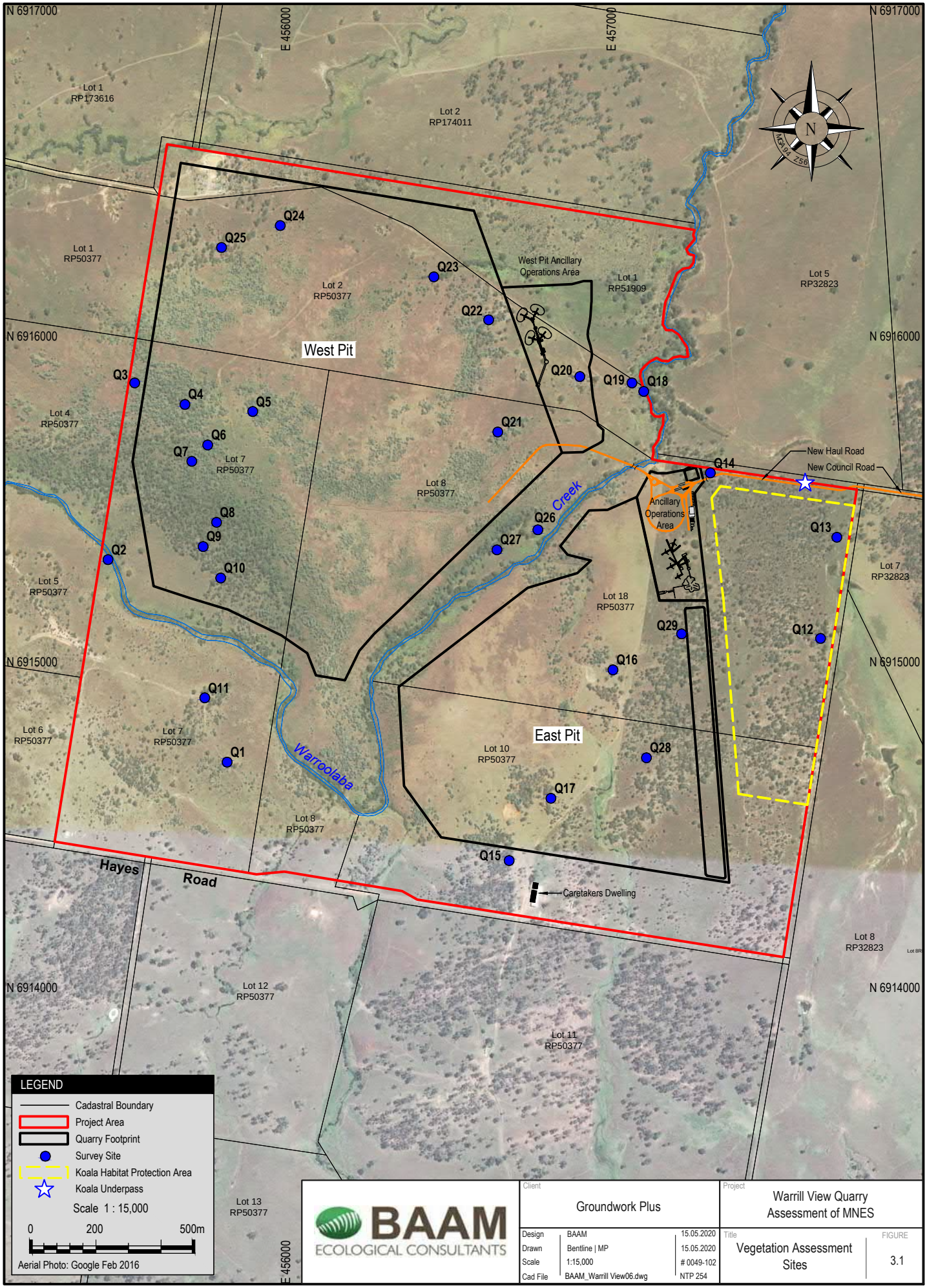
Fauna habitat assessments were conducted at each Quaternary site (**Figure 3.1**) as well as opportunistically whilst traversing between sites. The ground surface beneath trees was searched for the distinctive scats of Koala *Phascolarctos cinereus*, Greater Glider *Petauroides volans*, Spotted-tailed Quoll (SE Mainland) *Dasyurus maculatus maculatus* and Long-nosed Potoroo *Potorous tridactylus tridactylus* (SE Mainland). Notes were kept on availability of food resources and shelter for Squatter Pigeon *Geophaps scripta scripta*.

Any significant values identified were recorded by GPS for subsequent mapping purposes. All work was performed in accordance with BAAM's Scientific Purposes Permit and Animal Ethics Approval.

2.3 LIKELIHOOD OF OCCURRENCE OF MNES

In order to assist in the determination of the project area's value to threatened species and ecological communities, a likelihood of occurrence exercise was completed using the following four categories:

- **Known to occur**: the species was detected, or is known from past surveys in the project area and is not now considered locally extinct.
- **Likely to occur**: a medium to high probability the species occurs in or regularly visits the project area because suitable habitat occurs, the project area is within the known distribution of the species, there are past records of the species in the vicinity, and the species is not considered locally extinct.
- **Potential to occur**: either: (a) there are no past records of the species in the vicinity but suitable habitat occurs and there is insufficient information on the distribution of the species (e.g. it is naturally rare and/or difficult to detect) to categorise the species as likely or unlikely to occur; or (b) there are past records of the species in the vicinity of the project area but habitat in the project area is marginal or spatially limited meaning that the species' presence on the project area would be transitory at best.
- **Unlikely to occur**: a very low probability that the species occurs in the project area because: (a) suitable habitat does not occur; or (b) there are no local records and the project area is outside the known distribution of the species; or (c) the species is considered locally extinct; or (d) suitable habitat occurs and there are past records of the species in the vicinity but the species has not been observed despite sufficient spatial and temporal survey effort for detecting the species.



BAAM ECOLOGICAL CONSULTANTS

Client	Groundwork Plus	Project	Warrill View Quarry Assessment of MNES
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Cad File	BAAM_Warrill View06.dwg		NTP 254
Title	Vegetation Assessment Sites	FIGURE	3.1

3.0 FIELD SURVEY RESULTS

3.1 GENERAL ECOLOGICAL VALUES

The large western hill (reaching 250 metres above sea level) is partially covered by remnant vegetation over the ridge and southern hillside (**Photo 1**). This vegetation was confirmed as Regional Ecosystem (RE) 12.8.17. (*Eucalyptus melanophloia +/- E. crebra, E. tereticornis, Corymbia tessellaris* woodland on Cainozoic igneous rocks). The status and extent of this mapping was ground-truthed and confirmed during initial vegetation studies on the project area.

Photo 1: View northward to the large western hill, showing remnant vegetation present on the ridge, with open pasture and Warroolaba Creek in the foreground.

Remnant vegetation on the higher slopes (**Photo 2**) tended to display a greater cover of sub-canopy and shrub species, mainly dominated by *Alphitonia excelsa* and *Acacia* species, as well as the exotic *Lantana camara*. Vegetation on the lower slopes (excluding that along Warroolaba Creek) was generally devoid of sub-canopy and shrub vegetation.

Photo 2: Remnant vegetation observed on the upper slopes of the large western hill.

Beyond mapped remnant vegetation, the proposed west pit area was characterised by open, cleared pasture with occasional stands of native vegetation. On the higher slopes, this vegetation was generally dominated by *Eucalyptus melanophloia* with *E. crebra* and *Corymbia tessellaris*. On the lower slopes, *Eucalyptus tereticornis* and *Angophora subvelutina* were also recorded.

The large eastern hill has been cleared for grazing and was largely devoid of vegetation.

East of this hill, the project area is covered by regrowth vegetation, which is generally dominated by semi-mature *Eucalyptus tereticornis, E. crebra* and *Corymbia tessellaris* (**Photo 3**).

Photo 3: Typical view of vegetation within the proposed east pit area.

A floodplain in the north-eastern section of the project area featured a higher proportion of large, old *Eucalyptus tereticornis* (**Photo 4**).

Photo 4: North-eastern section of the project area, adjacent to a floodplain showing old *Eucalyptus tereticornis*.

Warroolaba Creek crosses the project area and separates the proposed west and east pit areas. A generally narrow strip of riparian vegetation has been retained along this watercourse, which was observed to hold water in some sections during each field investigation (**Photos 5 and 6**). Evidence of cattle trampling of riparian vegetation was recorded in some locations.

Riparian vegetation associated with Warroolaba Creek in the western portions of the project area was mainly dominated by *Melaleuca viminalis, Tristaniopsis laurina* and *Angophora subvelutina.* In the central and northern portion of the project area, this waterway supported some large old-growth *Eucalyptus tereticornis*.

Photo 5: View of relatively undisturbed portions of Warroolaba Creek and fringing vegetation.

Photo 6. Disturbed portions of Creek showing no standing water.

Smaller ephemeral and largely unvegetated gullies - tributaries to Warroolaba Creek are present within both proposed quarry pit areas.

Vegetation recorded at the quaternary assessment sites across the project area is described in **Appendix 1**, with specific assessment sites indicated on **Figure 3.1**.

Grazed lands across the project area provide habitats for Whiptail Wallabies *Macropus parryi* and Eastern Grey Kangaroo *Macropus giganteus*, which were observed throughout the project area. Treed areas throughout the project area support feeding, roosting and breeding habitats for locally common rural bird species and arboreal mammals. Scats of Common Brushtail Possum *Trichosurus vulpecula* and Common Ringtail Possum *Pseudocheirus peregrinus and* Koala were observed in treed areas. A deceased Sugar Glider *Petaurus breviceps* was observed caught on barbed-wire fencing.

Fallen debris for ground-dwelling fauna species (reptiles or ground-dwelling mammals) was scattered throughout the project area in association with mature trees. Leaf litter was only present under large, mature trees.

Many termite mounds showed evidence of Short-beaked Echidna *Tachyglossus aculeatus* **(Photo 6)**.

Photo 6. Evidence of Echidna foraging in termite mound.

Stags and hollow-bearing trees (**Photo 7**) were sparsely scattered throughout the project area, particularly near Warroolaba Creek (**Figure 3.2**). Large hollow-bearing trees were more prevalent in the western portions of the project area in comparison to the eastern portions.

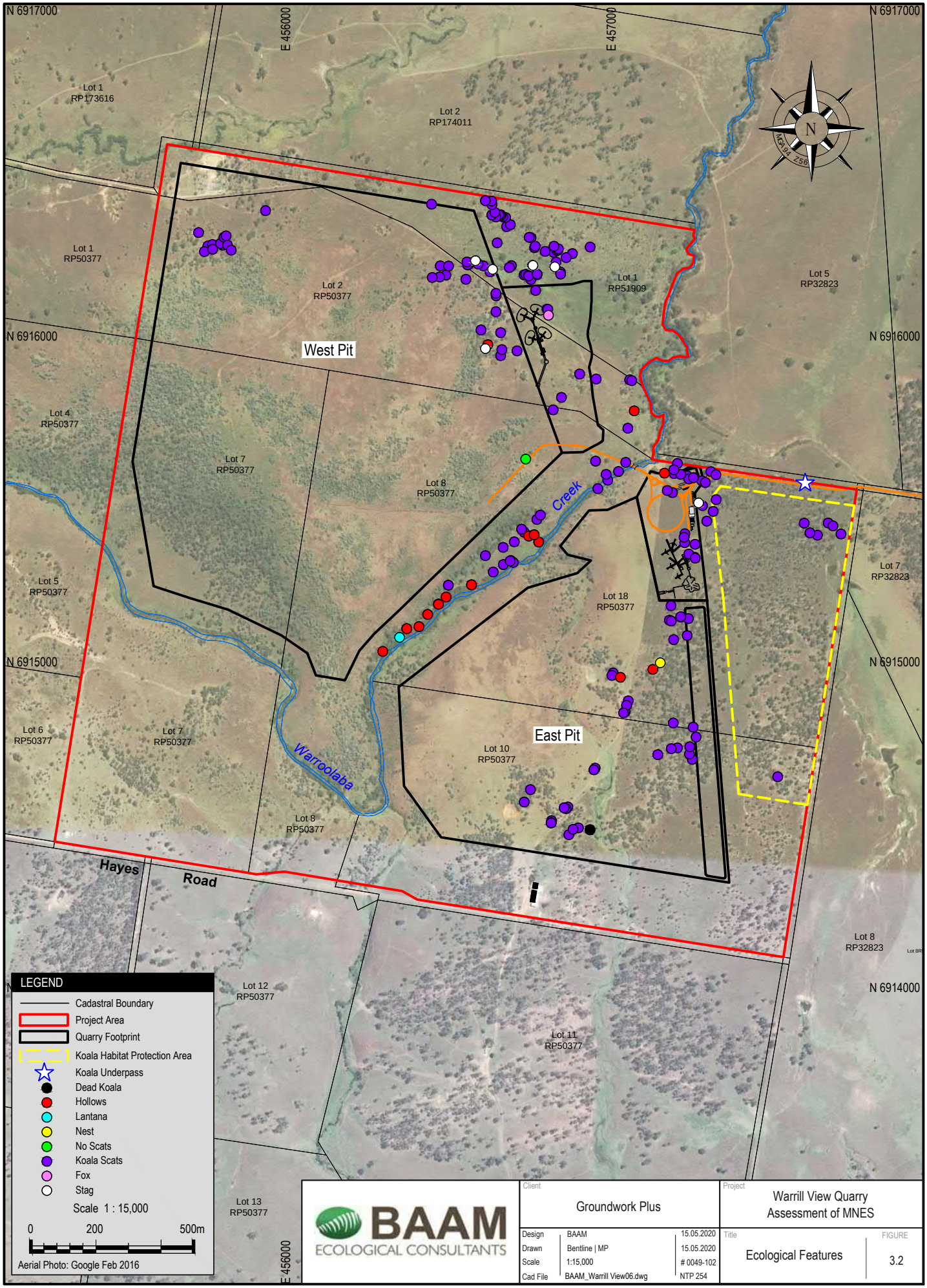
Koala evidence was found throughout the low-lying portions of the project area (**Figure 3.2**). Of the trees which supported evidence of Koala use, all but two were Forest Red Gum *Eucalyptus tereticornis*.

A recently deceased adult male Koala was found at the base of a favoured food tree (multiple scats of varying ages). The cause of

death is uncertain, as there were no obvious marks indicating trauma.

Photo 7: Large, hollow bearing *Eucalyptus tereticornis* present on the upper banks of Warroolaba Creek, between the western and eastern hillsides.

Warroolaba Creek (**Photo 5**) provides potential habitats for locally common frog species. Low-lying lands near the eastern border of the project area support ephemeral wetlands, which may provide potential breeding habitats for common frog species such as Ornate Burrowing Frog, *Platyplectrum ornatum,* Spotted Grass Frog *Limnodynastes tasmaniensis* and Eastern sign-bearing Frog *Crinia parinsignifera,* dependent on the duration of inundation.



BAAM ECOLOGICAL CONSULTANTS

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Cad File	BAAM_Warrill View06.dwg	NTP 254	
Title	Ecological Features	FIGURE	3.2

3.2 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

3.2.1 Threatened Ecological Communities

The EPBC Protected Matters Search (**Appendix 2)** indicates two EPBC listed Threatened Ecological Communities (TECs) may potentially occur onsite, these being:

- Lowland Rainforest of Subtropical Australia (Critically Endangered); and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered).

No vegetation communities with species indicative of these TECs are identified on State vegetation mapping and the field survey confirmed these TECs do not occur within the project area (i.e. no species characteristic of these TECs was identified in the project area during the field survey).

3.2.2 Threatened Flora

No nationally listed threatened flora species were recorded during the survey, nor are any considered likely to occur within the project area (**Appendix 3**).

The majority of threatened flora species identified as having potential to occur in the project area either have not been recorded in the broader landscape or have only marginally suitable habitat available in the project area.

3.2.3 Threatened Fauna

MAMMALS

The following text discusses the ecological requirements of mammal species identified in the PMST report that are known or considered to have potential to occur within the project area. Listed mammal species that are not expected to be present are addressed in **Appendix 3**.

Koala *Phascolarctos cinereus*

EPBC Act Status: Vulnerable.

Habitat and ecology: Koalas have a distinct association with eucalypt woodland and forest habitat types containing suitable food trees (Hume and Esson 1993; Moore and Foley 2000; Martin *et al.* 2008), particularly those growing on alluvial or other fertile soils (Moore *et al*. 2004, Crowther *et al.* 2009). They are not necessarily restricted to bushland or remnant areas and are known to occur and breed within farmland and the urban environment (Dique *et al.* 2004). Similarly, movement is not confined to vegetated corridors, as they also move across cleared rural land and through suburbs (Martin *et al.* 2008).

Koalas use a variety of trees, including many non-eucalypts, for feeding and resting (Dique *et al.* 2004; Martin *et al.* 2008). They do, however, have distinct, localised feeding preferences throughout their range, selecting some species in preference to others (Pahl and Hume 1990). Tree species preferences vary around Queensland. In the Scenic Rim local government area, *Eucalyptus tereticornis* and *E. microcorys* are recognised as primary Koala feed trees, whist *E. biturbinata, E. exserta, E. melliodora, E. moluccana* and *E. propinqua* are listed as secondary food trees (AKF 2015). Koala tend to select trees with higher leaf moisture (Wu *et al*. 2012). Primary food trees tend to have significantly higher usage than secondary food trees (Callaghan *et al.* 2011).

Threats: Current threats to Koalas include habitat destruction and fragmentation, bushfire and disease (Maxwell *et al.* 1996). Populations around urban areas are also at increased risk of mortality due to dog attack and vehicle strike (Preece 2007, DERM 2009; Rhodes *et al*. 2011).

Occurrence in the project area: A recently (<2 weeks) dead Koala was observed under a frequently used (i.e. many Koala scats of varying ages) *Eucalyptus tereticornis* (**Figure 3.2**). The cause of death is unknown, but there were no obvious signs of trauma. No live Koala were observed during the field surveys.

Scats consistent with Koala were detected at a number of locations within the proposed impact areas and outside of the impact areas (**Figure 3.2**). All trees that had Koala scats under them, with the exception of two *Eucalyptus crebra*, were *Eucalyptus tereticornis*.

None of the observed scats appeared fresh (i.e. less than a week old), with many appearing to be at least many months of age.

Habitat in the project area: Vegetation communities in the project area were

characterised as providing potential habitat for Koala if they included the following tree species (known to be preferred Koala food tree species in the Scenic Rim district (AKF 2015)) as common or dominant components of the tree canopy: *Eucalyptus biturbinata, E. exserta*, *E. melliodora, E. microcorys, E. moluccana, E. propinqua and E. tereticornis*. *E. microcorys* and *E. tereticornis* are recognised as Primary Koala food trees (AKF 2015).

Of these listed preferred Koala food trees, only *E. tereticornis* was present within the project area. This species was sparsely scattered amongst mature and regrowth *E. melanophloia, E. crebra* and *Corymbia tessellaris* on the level to low incline portions of the project area, and were more abundant in gully lines, along the banks of Warroolaba Creek and in the floodplain areas located east of the proposed East Pit area.

The results of a habitat assessment performed in accordance with the EPBC Act referral guidelines for Koala habitat assessment tool (DoE 2014) are summarised in **Table 3.1**. The total habitat score from this assessment is 8; as this total score is greater than 5, Koala habitat within the project area is recognised as 'habitat critical to the survival of Koala' under the EPBC Act referral guidelines.

Grey-headed Flying-fox *Pteropus poliocephalus*

EPBC Act Status: Vulnerable.

Ecology and Habitat: Two habitat characteristics are important for Grey-headed Flying-foxes: foraging resources and roosting sites. As the species is a canopy-feeding frugivore and nectarivore, they utilise vegetation including rainforests, open eucalypt forests, woodlands, melaleuca swamps and banksia woodlands.

Roosts are commonly within dense vegetation close to water, primarily rainforest patches, stands of melaleuca, mangroves or riparian vegetation (Nelson 1965), but colonies may use exotic vegetation in urban areas (Birt *et al.* 1998). The species congregates in large camps of up to 200,000 individuals from early until late summer, with the number of bats within a camp being influenced by the availability of blossom in the surrounding area. Adults normally disperse during the winter and can migrate up to 750 km as individuals or small groups, with the young forming winter camps (Churchill 2008).

Breeding occurs during the spring months when food resources are at their most plentiful.

Threats: Grey-headed Flying-foxes are subject to several threatening processes, the most severe being loss of habitat. It has been suggested that this resulted in a 50% decline in the population by the 1930s (Duncan *et al.* 1999). The loss of habitat, particularly important habitat such as reliable winter resources along the east coast, has continued to lead to population decline.

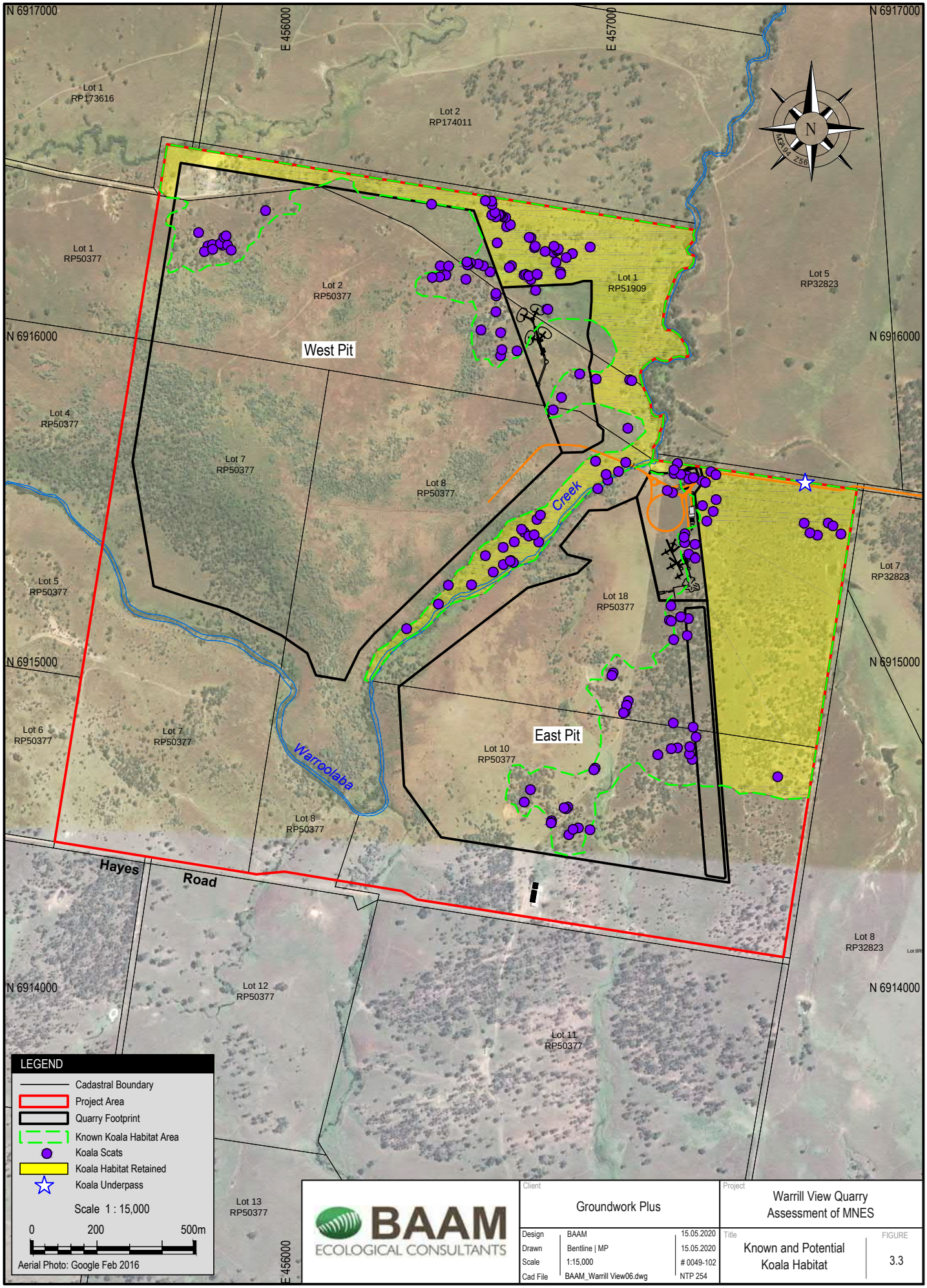
Occurrence in the project area: The project area does not support a Flying-fox roost site and the nearest Grey-headed Flying-fox camp is located approximately 32 km north near Laidley. Spotlighting was not conducted during the field surveys; therefore, it is not known if Grey-headed Flying-fox forage within the project area.

Habitat in the project area: Flowering eucalypts throughout the project area, particularly the winter-flowering *Eucalyptus tereticornis,* provide potential food resources for Grey-headed Flying-fox. Melaleuca species associated with the riparian vegetation alongside Warroolaba Creek also provide potential foraging resources when in flower. Potential habitat for Grey-headed Flying-Fox occupies the same areas as potential habitat mapped for Koala (**Figures 3.3**).

Table 3.1. Koala habitat assessment tool results summary.

Attribute	Score	Coastal area criteria	Score	Assessment details
Koala occurrence	+2 (high)	Evidence of one or more Koalas within the last 2 years	**2**	**Desktop:** The EPBC Act Protected Matters Search Tool report identified the Koala as 'species or species' habitat known to occur' within the area. The Wildlife Online point buffer search identified 10 Koala records since 1980 within a 2 km radius of the project area. **On-ground:** Koala evidence was recorded both within the impact area and within retained habitats. A recently deceased Koala was observed in the area of the proposed East Pit.
	+1 (medium)	Evidence of one or more Koalas within 2 km of the edge of the impact area within the last 5 years		
	0 (low)	None of the above		
Vegetation Composition	+2 (high)	Has forest or woodland with 2 or more known Koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	**2**	**Desktop:** The Queensland RE and pre-clear mapping identifies the project area as supporting *Eucalyptus* spp. dominated remnant vegetation. **On-ground:** The project area supports forest or woodland with 2 known food trees (*E. tereticornis, E. crebra*).
	+1 (medium)	Has forest or woodland with only 1 species of known Koala food tree present.		
	0 (low)	None of the above		
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 500 ha.	**2**	Although located within a highly modified rural environment, the project area does form part of contiguous landscape ≥500 ha and is within a mapped regional biodiversity corridor.
	+1 (medium)	Area is part of a contiguous landscape < 500 ha but ≥300 ha.		
	0 (low)	None of the above		
Key existing threats	+2 (high)	Little or no evidence of Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence	**2**	A recently deceased male Koala was found at the base of a favoured feed tree (i.e. abundant scats underneath). The cause of death could not be ascertained, but no puncture wounds were observed and the location was a long distance from the roadway or internal access. The project area occurs within a sparsely populated landscape with minimal vehicle traffic in the local area. No evidence (scats) of dogs was observed outside of the immediate vicinity of the residential dwelling.
	+1 (medium)	Evidence of infrequent or irregular Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence		
	0 (low)	Evidence of frequent or regular Koala mortality from vehicle strike or dog attack in the project area at present		
Recovery value *	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context	**0**	The majority of habitats within the east and west pits are associated with hilly terrain that are unlikely to provide habitat refuges during drought conditions. Field survey results indicate Koala were absent where topography was >100 m in height. The project area supports riparian environments that separate the east and west pits and flood plains that would provide habitat refuges during drought conditions. These habitats will be retained, protected and enhanced as part of the proposed action.
	+1 (medium)	Uncertainty exists as to whether the habitat is important for achieving the interim recovery objectives for the relevant context		
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context		
Total Score			**8**	As the total score is >5, Koala habitat within the project area is recognised as 'habitat critical to the survival of Koala' under the EPBC Act referral guidelines.

* Interim recovery objective in inland areas is to 'protect and conserve the quality and extent of habitat refuges for the persistence of the species during droughts and periods of extreme heat, especially in riparian environments and other areas with reliable soil moisture and fertility', and 'maintain the quality, extent and connectivity of large areas of koala habitat surrounding habitat refuges' (Commonwealth of Australia 2014).



BAAM ECOLOGICAL CONSULTANTS

Client	Groundwork Plus	Project	Warrill View Quarry Assessment of MNES
Design	BAAM	15.05.2020	
Drawn	Bentline | MP	15.05.2020	
Scale	1:15,000	# 0049-102	
Cad File	BAAM_Warrill View06.dwg	NTP 254	
Title	Known and Potential Koala Habitat	FIGURE	3.3

Greater Glider *Petauroides volans*

EPBC Act Status: Vulnerable.

Habitat and ecology: The Greater Glider is an arboreal marsupial that is active at night and inhabits a wide range of eucalypt forests and woodlands, but reaching its highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows, and forests with a diversity of eucalypt species due to seasonal variation in its preferred tree species. Greater Gliders feed mostly on eucalypt leaves and occasional flowers. Individual home ranges are generally small (1-4 ha), but are larger (up to 16 ha) in less productive forests and in more open woodlands. Greater Gliders have a relatively low reproductive rate; females give birth to a single young from March to June, and sexual maturity is reached only in the second year (TSSC 2016).

Threats: The main threat to Greater Glider is habitat loss and fragmentation through clearing, clearfell logging and the destruction of senescent trees due to prescribed burning. The species has a poor ability to move between fragments in fragmented landscapes. Population loss or declines have also been reported following high intensity fires, so too intense or frequent fires are an important additional threat (TSSC 2016).

Occurrence in the project area: Greater Glider was not targeted during the field surveys; however, suitable habitat for the species (eucalypt woodland with more than one eucalypt tree species) occurs throughout project area. The closest database record is approximately 14 km south in Moogerah Peaks National Park. The highly fragmented nature of the regional landscape means there is only a low likelihood of Greater Glider still persisting within forested areas of the project area.

Habitat in the project area: Potentially suitable habitat for Greater Glider is restricted to the riparian vegetation associated with Warroolaba Creek. These habitats will be retained and protected as part of the proposed quarry development.

Spotted-tailed Quoll (SE Mainland) *Dasyurus maculatus maculatus*

EPBC Act Status: Endangered.

Ecology and Habitat: Spotted-tailed Quoll are solitary animals, except during mating, and are predominantly nocturnal and partly arboreal. Spotted-tailed Quoll occur in a wide variety of habitats including rainforests, wet and dry sclerophyll forests, coastal heath, scrub and sometimes Red Gum forests along inland rivers. They are found from sea-level to sub-alpine regions (Menkhorst and Knight 2004). They shelter in rock caves, boulder piles and hollow logs or trees, with basking sites usually nearby (Menkhorst and Knight 2004). Males occupy overlapping and undefended home ranges whereas females appear to defend exclusive territories (Körtner *et al.* 2004). Home range size is greater for males than females, averaging 363 ha for males and 133 ha for females in north-eastern NSW (Glen and Dickman 2008), averaging 992 ha (621-2561 ha) for males and 244 ha (88-65 ha) for females in southern NSW (Claridge *et al*. 2005), ranging from 108-757 ha for males and 76-175 ha for females in south-east NSW, and 783-1202 ha over five days for males in the Granite Belt of south-east Queensland (Meyer-Gleaves 2008). The species feeds on a variety of prey including small and medium-sized mammals, birds, large arthropods, carrion and food scraps, however mammals constitute approximately 80% of its diet (Belcher 1995; Jones and Barmuta 1998, 2000; Burnett and Meyer-Gleaves 2012).

Threats: The primary reason for the decline of Spotted-tailed Quoll is habitat loss and fragmentation through clearing for primary production and urbanisation, which has been particularly severe in south-east Queensland (Maxwell *et al.* 1996). Other current threats include competition with foxes, dingoes/wild dogs and feral cats, predation by foxes and dogs, persecution at poultry yards and poisoning by Cane Toads *Rhinella marina*. Death from vehicle strikes is probably only a significant threat where heavily used roads bisect quoll habitat (Burnett and Meyer-Gleaves 2012). Concerns have been raised in the past over the potential for 1080 poisoning (intended for wild dogs/foxes) of Spotted-tail Quoll (Maxwell *et al.* 1996; NPWS 2003). However, a number of studies show this not to be the case (Körtner and Watson 2005; Glen *et al.* 2007; Claridge and Mills 2007; Körtner 2007), and that reduction of canid populations through 1080 baiting is much more likely to aid quoll populations (Glen and Dickman 2008).

Occurrence in the project area: Quoll was not targeted during the field surveys. There has been only one record of this species within

6 km west of the project area since 1930 (ALA 2019). The project area does not support any rock caves or bolder piles but supports potential shelter sites in the form of hollow logs and trees, although these are very sparsely scattered throughout the project area. It is therefore considered there is only a low potential for this species to be present within the project area.

Habitat in the project area: Potential shelter sites are present in the large hollow-bearing trees shown on **Figure 3.2**). The observed large old-growth hollow-bearing trees often had large fallen limbs underneath which also supported hollows (**Photo 8**).

Photo 8. Hollow logs provide potential shelter sites for Spotted-tailed Quoll.

Long-nosed Potoroo *Potorous tridactylus tridactylus* (SE Mainland)

EPBC Act Status: Vulnerable.

Ecology and Habitat: The Long-nosed Potoroo has been recorded in a variety of habitat types including disturbed subtropical and warm-temperature rainforests, tall open forests with a moist understorey, woodland with tussock grass, open forest with shrubby understorey, and heathlands. Although the vegetation type used by this species varies, they are generally captured in areas where there is a dense ground cover and are reluctant to move from dense undergrowth (Heinsohn 1968; Seebeck 1981; Menkhorst and Beardsell 1982; Amos 1983; Bennett 1993).

They are predominantly solitary, though males and females may share shelter sites. Shelter and refuge during the day is taken in shallow depressions that are covered by thick tussock grass or vegetation (Amos 1983; Bennett 1993). The species feeds predominantly on hypogeal (underground) fungi, but also consumes fruit, seeds and arthropods when fungi are scarce. Breeding occurs throughout the year and females give birth to one young (Long 2001).

Threats: The species is threatened by habitat loss, habitat alteration by grazing, replacement of native ground cover with introduced pasture grasses, inappropriate fire regimes and predation by foxes, cats and dogs (Maxwell *et al*. 1996; NPWS 2002).

Occurrence in the project area: Potoroo was not targeted during the field surveys. The closest known record for this species is 22 km to the south in Main Ridge National Park, recorded in 2014 (ALA 2019).

Habitat in the project area: The narrow band of riparian habitats associated with Warroolaba Creek is the only location within the project area that supports dense ground cover. However, this ground cover has been impacted by stock trampling; therefore, there is only a low potential for this species to be present within the project area.

BIRDS

The following text discusses the ecological requirements of avian species identified in the PMST report that are considered to have potential to occur within the project area. Listed avian species that are not expected to be present are addressed in **Appendix 3**.

Red Goshawk *Erythrotriorchis radiatus*

EPBC Act Status: Vulnerable.

Ecology and Habitat: Red Goshawk occur in woodlands and forests of tropical and warm temperate Australia. It prefers mosaic habitats that hold a large population of birds and permanent water. Riparian areas are heavily favoured. Within these habitats it prefers forest of intermediate density – open enough to allow fast flight and manoeuvring, closed enough to allow ambush from a concealed position. It is a solitary and secretive bird and hunts mostly birds, but also mammals, reptiles and insects (Marchant and Higgins 1993).

The species is sparsely distributed, with home ranges of 120 km^2 and 200 km^2 for females and males, respectively. Breeding pairs are thought to be sedentary, and will use the same

nesting territory for many years. Nests are restricted to trees taller than 20 metres and within one kilometre of a watercourse or wetland (Garnett et al 2011).

Occurrence in the project area: No Red Goshawk was recorded during the field surveys. The nearest known record is approximately 26 km north-east of the project area, recorded in 1973 (ALA 2019).

Habitat in the project area: The narrow band of riparian habitats associated with Warroolaba Creek is the only location within the project area that supports potential habitats for this species.

Australian Painted Snipe Rostratula australis

EPBC Act Status: Endangered.

Habitat and ecology: Australian Painted Snipe is a secretive, cryptic, crepuscular species that occurs in terrestrial shallow wetlands, both ephemeral and permanent, usually freshwater but occasionally brackish. It also uses inundated grasslands, saltmarsh, dams, rice crops, sewage farms and bore drains. The species feeds on vegetation, seeds and invertebrates, including crustaceans and molluscs (Marchant and Higgins 1993).

The Australian population is estimated to be between 1,000 and 1,500 mature individuals, and is estimated to have declined by more than 30% over the past 26 years (Garnett et al. 2011). This declining trend is likely to continue into the future based on ongoing habitat loss (DoEE 2019).

Breeding occurs mainly in the Murray-Darling region, though is also recorded in other parts of Queensland, New South Wales and South Australia. Nests are shallow scrapes on the ground and are often found on islands in freshwater swamps/wetlands. Breeding habitat requirements appear to be specific, including shallow wetlands with patches of bare mud, dense low cover and sometimes tall dense cover (Rogers *et al*. 2005).

Threats: Australian Painted Snipe is principally threatened by drainage of wetlands, diversion of water from rivers, clearance of wetland vegetation, and overgrazing (Garnett *et al.* 2011, DoEE 2019). It is estimated that around 50% of wetlands in Australia have been lost since European settlement (DoEE 2019). Substantial declines in records from the Murray-Darling Basin have coincided with major changes in water diversion to irrigated agriculture.

Occurrence in the project area: No Australian Painted Snipe was observed during the field surveys. The closest known record for this species is from Lake Dyer approximately 32 km north-west of the project area (ALA 2019).

Habitat in the project area: The north-eastern portions of both the East and west Pits and portions of the the Koala Habitat Protection Area (**Figure 3.2**) occur in floodplains that provides marginal habitats for this species. However, there were no obvious depressions, and these areas may not hold water long enough to provide suitable foraging resources for this species.

REPTILES

No reptiles listed on the PMST report (**Appendix 2**) are expected to be present within the project area, as outlined in **Appendix 3**.

AMPHIBIANS

The project area does not support preferred habitats for the frog species listed in the PMST report (**Appendix 2**), as outlined in **Appendix 3**.

3.2.4 Migratory Fauna Species

No migratory species were observed during the field survey. Two migratory bird species, Oriental Cuckoo *Cuculus optatus* and Rufous Fantail *Rhipidura rufifrons*, may be occasional visitors to the project area during summer months. However, the project area does not support important habitats for either of these species.

Listed migratory species that are not expected to be present are addressed in **Appendix 3**.

4.0 MNES IMPACTS

4.1 IMPACT AVOIDANCE

East Pit

Following the results of the 2018 field surveys, where Koala evidence and numerous *Eucalyptus tereticornis* were recorded in an area that was originally planned as a stockpile area, the proposed footprint for the East Pit has been reduced to allow higher value habitats to be retained and protected within a designated Koala Habitat Protection Area (refer **Figures 3.1, 3.2**). The restoration of this Koala Habitat Protection Area will be guided by a specific Koala Habitat Management Plan (KHMP) for this area (**Appendix 5**).

West Pit

The 2019 field surveys identified an area of relatively high Koala usage located in the proposed west pit ancillary/operations area. To protect this area and minimise impacts to threatened species, the size of the proposed ancillary/operations area was reduced by 7 ha; thereby retaining an additional 7 ha of Koala habitats.

Prior to commencement of vegetation clearing for the West Pit, fencing will be erected to prevent cattle/horses from entering areas supporting known Koala habitat to the north and east of the west pit. This management strategy will allow regeneration of Koala habitat in enclosed areas; thereby providing an increase in Koala habitat trees within retained areas.

4.2 TOTAL DISTURBANCE AREAS

The total area of MNES (i.e. in terms of habitat for threatened species known or considered to have potential to occur) expected to be directly impacted by the proposed quarry footprint are summarised in **Table 4.1**. Due to partial overlap in the habitat requirements for the subject species, a total of approximately 43 ha of MNES habitat will be directly impacted. Approximately half of these 43 ha currently support cleared cattle-grazed lands that hold limited values for MNES. However, email advice from DOEE (K. Dunstan 10/7/2019), indicated that Koala move across cleared areas whilst travelling between feed/refuge trees; therefore cleared areas should be included as habitat. We have therefore included cleared areas in calculating the 43 ha, despite the fact that they hold very limited habitat values for significant species.

Known and potential habitats for MNES will also be retained as part of the proposed action. **Table 4.2** provides an estimate of areas of habitat for MNES that will not be directly impacted as a result of the proposed actions. Of the 145 ha of known and potential MNES habitat within the project area, 102 ha (71%) (refer **Figure 3.3** and **Appendix 6**) will be retained, protected and restored under the guidance of the Koala Habitat Management Plan (**Appendix 5**) and the Rehabilitation Plan for the 13 ha area south of the west pit (**Appendix 6**).

The retention, protection and restoration of these degraded lands will minimise the risk of significant impact on MNES as a result of the proposed action.

Table 4.1 Summary of the areas of MNES habitat expected to be directly impacted by the proposed actions.

MNES	Known habitat (ha)	Potential habitat (ha)	Total habitat (ha)
Koala (west pit)	18.7		18.7
Koala (east pit)	22.6	2.2	24.8
Grey-headed Flying-Fox		42.3	42.3
Greater Glider		0	0
Spotted-tailed Quoll		0.48	0.48
Long-nosed Potoroo		0	0
Red Goshawk		0	0
Australian Painted Snipe		0	0

Table 4.2. Areas of MNES habitat to be retained as part of the proposed actions.

MNES	Known habitat (ha)	Potential habitat (ha)	Total habitat (ha)
Koala (west pit)	35.3	16.3	51.6
Koala (east pit)	30	20.5	50.5
Grey-headed Flying-Fox		94.1	94.1
Greater Glider		0	0
Spotted-tailed Quoll		0.48	0.48
Long-nosed Potoroo		13.1	13.1
Red Goshawk		13.1	13.1
Australian Painted Snipe		2.2	2.2

4.3 IMPACT MITIGATION AND MANAGEMENT

Environmental Management Plan(s) will be prepared in accordance with State approval conditions that incorporate measures to reduce direct and indirect impacts of the proposed quarry on MNES values. In addition, retained habitats will be managed in accordance with the State approved rehabilitated plan and the Koala Habitat Management Plan (**Appendix 5**).

Approximately 13 ha of currently cleared lands associated with Warroolaba Creek located to the south of the mapped regulated vegetation in Lots 7 and 8 will be rehabilitated in a manner that will, in time, allow this rehabilitated patch to be mapped by the State as regulated vegetation, and replace the ecosystem functions of the vegetation proposed to be removed.

The retention, protection and restoration of approximately 30 ha of Koala habitat within the Koala Habitat Protection Area to the east of the proposed east pit will enhance connectivity to a large patch (~80 ha) of Koala habitat located immediately adjacent to the north-eastern boundary of the project area. This adjacent patch of habitat is mapped by the State as 'essential habitat' for Koala. Approximately half of the 30 ha Koala Habitat Protection Area currently supports cleared cattle-grazed lands. The restoration of these degraded lands, particularly along the alluvial flats, which show the highest density of Koala usage throughout the project area, will greatly improve the overall habitat values for MNES at this location.

The retention, protection and restoration of approximately 40 ha of known and potential habitat for MNES to the west of Warroolaba Creek, particularly riparian habitats, will provide ongoing habitat values, and will provide important refuge habitats during drought conditions.

Research into Koala habitat and diet shows that Koala utilised a range of habitat types, but activity tended to be based around stream fringing vegetation communities (Melzer *et al.* 2014).

The natural topography of the project area, which results in very steep hills being present on either side of Warroolaba Creek, naturally limits the extent to which the riparian vegetation community can grow. Currently, cattle intrusions into the riparian vegetation has resulted further narrowing of this band of vegetation which is now <5 m in width throughout the project area. The proposed restoration of habitats associated with Warroolaba Creek will, over time result in a net increase in riparian vegetation and preferred habitat for a number of MNES.

Approximately half of the retained habitat for MNES currently supports degraded cattle-grazed lands which hold no, or very minimal habitat values for MNES. The restoration of these disturbed habitats will, overtime

To minimise the risk of fauna/vehicle interactions, a dedicated Koala underpass, with associated fauna fencing, will be constructed across the northern access road at the location of the Koala Habitat Protection Area (refer **Figures 3.1-3.3**). Detailed design for this underpass has not been completed, but will be constructed in accordance with Queensland Department of Transport and Main Roads *Fauna Sensitive Road Design.* The KHMP (**Appendix 5**) also provides additional management actions to reduce the risk of Koala injury/death as a result of dog attack or vehicle strike.

Further mitigation measures will include:

Pre-construction:

- Cattle/horse exclusion fencing around the proposed 13 ha rehabilitation area located to the south of the west pit will be erected.
- Fencing to prevent cattle/horse from accessing riparian habitats associated with Warroolaba Creek will be installed.
- Pre-clear fauna surveys will be undertaken to identify, investigate and flag the following habitat features prior to vegetation clearing within the disturbance footprint:
  - Hollow fallen timber that may support Spotted-tailed Quoll;
  - Hollow-bearing trees;
  - Presence of Koala; and
  - Active animal breeding places.

Construction:

- Fauna-exclusion fencing will be erected around the northern and western boundaries of the Koala Habitat Protection Area and around the boundaries of the west pit.
- Progressive demarcation (by temporary fencing or bunting) of retained vegetation and habitats adjoining the disturbance footprint will be undertaken, within which no construction activity, machinery, stockpiles or equipment storage can occur.
- A Fauna Spotter/Catcher will be present during clearing activities, with specific focus on habitat features flagged during pre-construction pre-clear surveys and any vegetation that may support Koalas. The activities of the Fauna Spotter/Catcher will be guided by the applicable Environmental Management Plan and a Species Management Program (required under the Queensland *Nature Conservation Act 1992*) designed to minimise impacts on animal breeding places.
- Protection of habitats adjacent to the quarry disturbance footprint from:
  - Soil erosion and sedimentation.
  - Dust from disturbed soil and materials stockpiles.
  - Weed introduction and or spread, with prevention, management and monitoring.
  - Leakages and accidental spills from construction machinery/equipment and refuelling activities, with prevention and management actions.

Operation:

The temporary fencing or bunting erected during the construction phase to flag important habitats adjacent to the quarry footprint will remain in place throughout the operation phase, and any disturbance within these areas is to be avoided.

4.4 IMPACT ASSESSMENT

An assessment of the potential for the proposed actions to result in significant impacts on MNES has been undertaken against the Significant Impact Guidelines 1.1 (Commonwealth of Australia 2013) and is provided in full in **Appendix 4**.

The results of this assessment indicate that the proposed action is unlikely to have a significant impact on MNES, with the exception of loss of Koala habitat, which is considered to be a moderately high risk of significant impact to Koala.

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APPENDIX 1

Descriptions of Vegetation and Representative Photographs

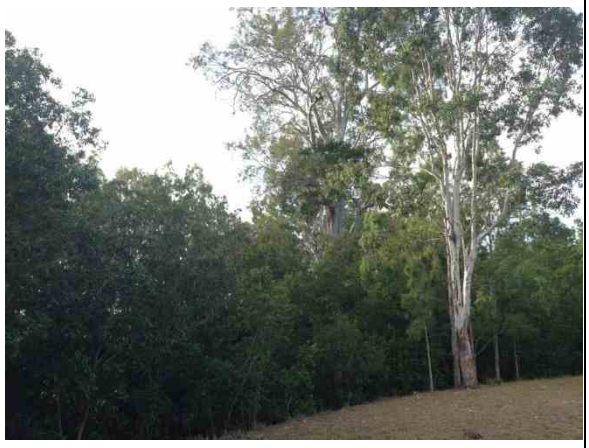
Descriptions and representative photographs of surveyed vegetation.

Site	Habitat description	Representative photo
Q1	**Brief description:** Non-remnant regrowth. **Canopy (T1):** Mid-dense. Height range 7-9m; median height 8m: *Eucalyptus crebra*. **Shrub (S1) Very s**parse. Height range 0.5-1m; median height 0.5m. *Lantana camara** **Groundcover:** Dense. Height range 0-0.3m; median height 0.2m: grazed grasses, *Chrysocephalum apiculatum, Verbena aristigera*.*	
Q2	**Brief description:** narrow belt of waterway vegetation with fringing eucalypts. . **Canopy (T1):** Dense. Height range 6-8m; median height 8m. Dominant species: *Melaleuca viminalis, Tristaniopsis laurina.* Associated species: *Acacia melanoxylon, Angophora subvelutina.* Adjacent upper banks*: E. tereticornis, C. tessellaris.* **Shrub (S1) Very s**parse. Height range 1-2m; median height 1.5m. Co-dominant species: *Acacia melanoxylon, Lantana camara*.* **Groundcover:** Mid-dense. Height range 0.1-0.5m; median height 0.4m. Dominant species*: Lomandra longifolia,* grazed grasses*.*	
Q3	**Brief description:** Non-remnant eucalypt open forest/woodland. **Canopy (T1):** Mid-dense. Height range 8-10m; median height 9m. Dominant species: *Eucalyptus melanophloia*. **Sub-canopy (T2**): Very sparse. Height range 4-6m; median height 5m. Dominant species: *Eucalyptus melanophloia, Alphitonia excelsa.* **Shrub (S1)** Mid-dense. Height range 1.5-2m; median height 1.5m. Dominant species: *Lantana camara*.* **Groundcover:** Dense. Height range 0.4-1m; median height 1m. Co-dominant species*: Heteropogon contortus, Themeda triandra, Aristida spp.*	
Q4	**Brief description:** Eucalypt open forest. **Canopy (T1):** Mid-dense. Height range 13-16m; median height 16m: *Eucalyptus melanophloia, Eucalyptus crebra, Corymbia tessellaris.* **Sub-canopy (T2):** Mid-dense. Height range 7-10m; median height 8m. *Eucalyptus melanophloia Corymbia tessellaris, Alphitonia excelsa, Eucalyptus crebra.* **Shrub (S1)** patchy. Height range 1.5-2m; median height 1.5m: *Lantana camara*, Eucalyptus melanophloia, Grewia latifolia.* **Groundcover:** Dense. Height range 0.1-1m; median height 1m *Heteropogon contortus Themeda triandra.*	

Site	Habitat description	Representative photo
Q5	**Brief description:** regrowth. **Canopy (T1):** Mid-dense. Height range 9-11m; median height 9m. Co-dominant species: *Eucalyptus melanophloia, Corymbia tessellaris* **Sub-canopy (T2):** Very sparse. Height range 4-7m; median height 6m. Co-dominant species: *Eucalyptus melanophloia, Corymbia tessellaris* *Alphitonia excelsa.* **Shrub (S1)** Very sparse. Height range 1.5-2m; median height 2m. Dominant species: *Lantana camara*.* **Groundcover: D**ense. Height range 0.1-1m; median height 1m. Co-dominant species*: Heteropogon contortus, Themeda triandra, Sida cordifolia*	
Q6	**Brief description:** non-remnant regrowth. **Canopy (T1):** Mid-dense. Height range 9-11m; median height 10m. Dominant species: *Eucalyptus melanophloia, Eucalyptus crebra.* **Sub-canopy (T2): Sparse. Height range 4-6m; median height 5m. Dominant species:** *Eucalyptus melanophloia, Eucalyptus crebra, Alphitonia excelsa, Acacia maidenii, Opuntia tomentose*, Erythrina vespertilio,* **Shrub (S1)** Very sparse. Height range 1.5-2m; median height 2m. Dominant species: Lantana camara*. **Groundcover:** Dense. Height range 0.1-1m; median height 1m. Co-dominant species: *Heteropogon contortus, Themeda triandra, Sida cordifolia.*	n/a
Q7	**Brief description:** Eucalypt open forest. **Canopy (T1):** Mid-dense. Height range 13-15mm; median height 13m. Co-dominant species: *Eucalyptus crebra, Eucalyptus melanophloia.* **Sub-canopy (T2):** Mid-dense. Height range 5-9m; median height 8m. Dominant species: *Eucalyptus crebra, Eucalyptus melanophloia, Alphitonia excelsa, Acacia disparrima.* **Shrub (S1)** Mid-dense. Height range 1.5-2m; median height 2m. Dominant species: *Lantana camara*, Alphitonia excelsa.* **Groundcover:** Dense. Height range 0.1-1m; median height 1m. Co-dominant species: *Heteropogon contortus, Sida cordifolia.*	
Q8	**Brief description:** Eucalypt open forest **Canopy (T1):** Mid-dense. Height range 16-18m; median height 17m. Dominant species: *Eucalyptus crebra, Corymbia intermedia, Angophora subvelutina, Eucalyptus melanophloia.* **Sub-canopy (T2):** Very sparse. Height range 7-10m; median height 8m. Dominant species:, *Alphitonia excelsa, Acacia maidenii, Erythrina vespertilio.* **Shrub (S1)** patchy. Height range 1.5-2m; median height 2m. Dominant species: *Lantana camara*, Alphitonia excelsa.* **Groundcover:** Dense. Height range 0.1-1m; median height 1m. Co-dominant species: *Heteropogon contortus, Themeda triandra, Sida cordifolia.*	

Site	Habitat description	Representative photo
Q9	**Brief description:** Eucalypt open forest **Canopy (T1):** Mid-dense. Height range 16-21m; median height 19m. Dominant species: *Eucalyptus crebra, Corymbia intermedia, Angophora subvelutina, Eucalyptus tereticornis.* **Sub-canopy (T2):** Sparse. Height range 9-11m; median height 9m. Dominant species:, *Eucalyptus tereticornis, Eucalyptus crebra, Eucalyptus melanophloia, Corymbia tessellaris.* **Shrub (S1)** Very sparse. Height range 1-2m; median height 2m. Dominant species: *Lantana camara*, Alphitonia excelsa.* **Groundcover:** Dense. Height range 0.5-1m; median height 1m. Co-dominant species: *Heteropogon contortus, Themeda triandra.*	
Q10	**Brief description:** Eucalypt open forest **Canopy (T1):** Mid-dense. Height range 9-12m; median height 12m. Dominant species: *Eucalyptus crebra, Corymbia tessellaris, Eucalyptus tereticornis.* **Sub-canopy (T2):** Very sparse. Height range 4-5m; median height 4m. Dominant species:, *Eucalyptus crebra, Acacia maidenii.* **Shrub (S1)** Very sparse. Height range 0.5-1m; median height 1m. Dominant species: *Lantana camara*.* **Groundcover:** Dense. Height range 0.1-0.5m; median height 0.5m. Co-dominant species: *Heteropogon contortus, Themeda triandra.*	
Q11	**Brief description:** non-remnant (small patch) eucalypt open forest. **Canopy (T1):** Mid-dense. Height range 14-16m; median height 16m. Dominant species: *Eucalyptus crebra.* **Sub-canopy (T2):** Very sparse. Height range 5-6m; median height 6m. Dominant species:, *Alphitonia excelsa, Acacia disparrima.* **Shrub (S1)** Very sparse. Height range 1-2m; median height 1m. Dominant species: *Lantana camara*.* **Groundcover:** Mid-dense. Height range 0.1-0.5m; median height 0.3m. Co-dominant species: grazed grasses*, Chrysocephalum apiculatum, Verbena aristigera**	
Q12	**Brief description:** regrowth. **Canopy (T1):** Sparse. Height range 10-15m; median height 14m. Co-dominant species: *Eucalyptus tereticornis, E. crebra.* Associated species: *Angophora subvelutina.* **Sub-canopy (T2):** Sparse. Height range 5-9m; median height 8m. Dominant species: *C. tessellaris Associated* species: *E. crebra.* **Shrub (S1)** Very sparse. Height range 0.5-1m; median height 0.5m. Dominant species: *C. tessellaris Associated* species: *Gomphocarpus physocarpus*.* **Groundcover:** Mid-dense. Height range 0.1-0.4m; median height 0.2m. Dominant species*: Themeda triandra, Chrysocephalum apiculatum, Verbena aristigera*, Dianella cerulea, Senecio madagascariensis*.* **Koala scats detected**	

Site	Habitat description	Representative photo
Q13	**Brief description:** Eucalypt open woodland on floodplain. **Canopy (T1):** Very sparse. Height range 15-17m; median height 15m. Dominant species: *Eucalyptus tereticornis.* **Sub-canopy (T2):** Very sparse. Height range 4-8m; median height 7m. Dominant species: *Corymbia tessellaris, E. tereticornis, E. crebra. .* **Shrub (S1)** Very sparse. Height range 0.4-1m; median height 0.4m. Co-dominant species: eucalypt saplings. **Groundcover:** Dense. Height range 0.1-0.4m; median height 0.3m. Dominant species*: Themeda triandra, Chrysocephalum apiculatum, Verbena aristigera*, Dianella cerulea, Senecio madagascariensis*.* **Koala scats detected** **Hollows present in older trees**	
Q14	**Brief description:** Eucalypt open woodland on floodplain. **Canopy (T1):** Sparse. Height range 25-35m; median height 25m. Dominant species: *Eucalyptus tereticornis, E. crebra.* **Sub-canopy (T2):** Very sparse. Height range 6-11m; median height 7m. Dominant species: *E. tereticornis, Corymbia tessellaris, E. crebra. .* **Shrub (S1)** absent **Groundcover:** Dense. Height range 0.1-0.4m; median height 0.3m. Dominant species*: Imperata cylindrica,* grazed grasses. **Koala scats detected** **Hollows present in older trees**	
Q15	**Brief description:** non-remnant regrowth **Canopy (T1):** Mid-dense. Height range 12-16m; median height 15m. Co-dominant species: *Eucalyptus tereticornis, E. crebra.* **Sub-canopy (T2):** Very sparse. Height range 7-10m; median height 7m. Co-dominant species: *C. tessellaris, E. crebra.* **Shrub (S1)** absent **Groundcover:** Dense. Height range 0.1-0.4m; median height 0.3m. Dominant species*:,* grazed grasses, *Senecio madagascariensis*.*	
Q16	**Brief description:** non-remnant regrowth **Canopy (T1):** Sparse. Height range 15-17m; median height 16m. Co-dominant species: *Eucalyptus tereticornis, E. crebra.* **Sub-canopy (T2):** Sparse. Height range 7-13m; median height 10m. Co-dominant species: *C. tessellaris, E. crebra, E. melanophloia.* **Shrub (S1)** absent **Groundcover:** Dense. Height range 0.1-0.4m; median height 0.3m. Dominant species*:* grazed grasses, *Senecio madagascariensis*.* **Koala scats detected** **Hollows present in older trees**	

Site	Habitat description	Representative photo
Q17	**Brief description:** non-remnant regrowth **Canopy (T1):** Mid-dense. Height range 10-13m; median height 10m. Co-dominant species: *Eucalyptus tereticornis, C. tessellaris, E. crebra.* **Sub-canopy (T2):** Very sparse. Height range 5-8m; median height 6m. Co-dominant species: *C. tessellaris, E. crebra.* **Shrub (S1)** absent **Groundcover:** Dense. Height range 0.1-0.4m; median height 0.3m. Dominant species*:*, grazed grasses, *Senecio madagascariensis*.* **Koala scats detected**	
Q18	**Brief description:** Narrow strip of riparian vegetation. **Canopy (T1):** Very sparse. Height range 15-30m; median height 20m. Dominant species: *Eucalyptus tereticornis.* Suppressed species: *Corymbia tessellaris.* **Sub-canopy (T2):** Dense. Height range 6-10m; median height 10m. Dominant species: *Tristaniopsis laurina, Casuarina cunninghamiana, Callistemon viminalis.* **Shrub (S1)** Very sparse. Height range 1-2m; median height 1.5m. Co-dominant species: *Lantana camara*, Tristaniopsis laurina, Maclura cochinchinensis.* **Groundcover:** Sparse. Height range 0.1-0.5m; median height 0.5m. Dominant species*:* heavily grazed grasses, *Lomandra longifolia* **Koala scats detected** **Hollows present in older trees**	
Q19	**Brief description:** non-remnant copse of semi-mature eucalypts. **Canopy (T1):** Sparse. Height range 10-16m; median height 10m. Dominant species: *Eucalyptus tereticornis, Eucalyptus melanophloia.* Associated species: *Eucalyptus crebra.* **Sub-canopy (T2):** n/a **Shrub (S1)** Very sparse. Height range 1-3m; median height 3m. Dominant species: *Lantana camara** **Groundcover:** Very sparse. Height range 0.1-0.3m; median height 0.1m. Dominant species*:* heavily grazed grasses **Koala scats detected**	
Q20	**Brief description:** non-remnant copse of semi-mature eucalypts, with one large emergent. **Emergent (E):** Very sparse. Height 16m. Dominant species: *Eucalyptus crebra.* **Canopy (T1):** Dense. Height range 7-9m; median height 9m. Dominant species: *Eucalyptus crebra.* Associated species: *Corymbia tessellaris, Eucalyptus melanophloia* Suppressed species: *Eucalyptus tereticornis* **Sub-canopy (T2):** n/a **Shrub (S1)** n/a **Groundcover:** Very sparse. Height range 0.1-0.3m; median height 0.1m. Dominant species*:* heavily grazed grasses **Koala scats detected**	

Site	Habitat description	Representative photo
Q21	**Brief description:** non-remnant copse of semi-mature eucalypts mid-slope on hillside. **Canopy (T1):** Mid-dense. Height range 6-11m; median height 9m. Dominant species: *Eucalyptus melanophloia.* Suppressed species: *Corymbia tessellaris* **Sub-canopy (T2):** n/a **Shrub (S1)** Very sparse. Height range 1-2m; median height 1m. Dominant species: *Lantana camara** **Groundcover:** Very sparse. Height range 0.1-0.4m; median height 0.3m. Dominant species*:* heavily grazed grasses, *Aristida spp. Sida cordifolia*.*	
Q22	**Brief description:** non-remnant copse of semi-mature eucalypts lower slope of hillside. **Canopy (T1):** Mid-dense/dense. Height range 9-16m; median height 14m. Dominant species: *Eucalyptus melanophloia.* Associated species: *Eucalyptus tereticornis* Suppressed species: *Corymbia tessellaris* **Sub-canopy (T2):** Very sparse. Height range 5-7m; median height 6m. Dominant species*: Corymbia tessellaris.* **Shrub (S1)** n/a **Groundcover:** Very sparse. Height range 0.1-0.2m; median height 0.1m. Dominant species*:* heavily grazed grasses, **Koala scats detected**	
Q23	**Brief description:** Vegetated gully. **Canopy (T1):** Mid-dense/sparse. Height range 13-17m; median height 16m. Dominant species: *Eucalyptus tereticornis.* Associated species: *Corymbia tessellaris* Suppressed species: *Angophora subvelutina*, *Eucalyptus melanophloia* (edges only) **Sub-canopy (T2):** Very sparse. Height range 4-6m; median height 5m. Dominant species: *Corymbia tessellaris, Acacia disparrima.* **Shrub (S1)** Very sparse. Height range 1-2m; median height 1m. Dominant species: *Lantana camara*.* **Groundcover:** Mid-dense. Height range 0.1-0.5m; median height 0.2m. Dominant species*:* heavily grazed grasses Associated species: *Plectranthus parviflorus, Aristida spp., Senecio madagascariensis*.* **Koala scats detected**	

Site	Habitat description	Representative photo
Q24	**Brief description:** non-remnant copse of mature and semi-mature eucalypts, lower slope of hillside. **Canopy (T1):** Mid-dense/sparse. Height range 20-30m; median height 20m. Dominant species: *Eucalyptus crebra.* Associated species: *Eucalyptus tereticornis* **Sub-canopy (T2):** Sparse. Height range 3-9m; median height 6m. Dominant species: *Corymbia tessellaris, E. crebra, Eucalyptus melanophloia.* **Shrub (S1)** Very sparse. Height range 0.5-1m; median height 1m. Dominant species: *Lantana camara*.* **Groundcover:** Very sparse. Height range 0.1-0.2m; median height 0.1m. Dominant species*:* heavily grazed grasses,	
Q25	**Brief description:** Copse of mature eucalypts, lower slope of hillside. **Canopy (T1):** Mid-dense. Height range 20-25m; median height 25m. Dominant species: *Eucalyptus tereticornis.* Associated species: *Corymbia tessellaris.* Suppressed species: *Eucalyptus crebra.* **Sub-canopy (T2):** Very sparse. Height range 6-10m; median height 8m. Dominant species*: E. tereticornis Corymbia tessellaris, E. crebra..* **Shrub (S1)** Very sparse. Height range 0.5-1m; median height 0.5m. Dominant species: *Lantana camara*.* **Groundcover:** Sparse. Height range 0.1-0.3m; median height 0.2m. Dominant species*:* heavily grazed grasses, *Aristida* spp. **Koala scats detected**	
Q26	**Brief description:** Open, grazed valley dominated by very large, old Eucalypts. **Canopy (T1):** Very sparse. Height range 15-30m; median height 20m. Dominant species: *Eucalyptus tereticornis* (valley). Associated species: *Corymbia tessellaris, Eucalyptus crebra* (lower slopes of adjoining hillside) **Sub-canopy (T2):** Very sparse. Height range 6-11m; median height 8m. Dominant species: *E. tereticornis Corymbia tessellaris.* **Shrub (S1)** Very sparse. Height range 0.5-1m; median height 0.5m. Dominant species: *Lantana camara*.* **Groundcover:** Mid-dense. Height range 0.1-0.4m; median height 0.1m. Dominant species*:* heavily grazed grasses, *Imperata cylindrica*. **Koala scats detected** **Hollows present in older trees**	

Site	Habitat description	Representative photo
Q27	**Brief description:** Eucalypt open forest on lower slopes of hillside. Upper slopes of adjoining hillside dominated by dense *Dodonaea triquetra.* **Canopy (T1):** Mid-dense/dense. Height range 15-20m; median height 18m. Dominant species: *Angophora subvelutina*. Suppressed species: *Eucalyptus tereticornis, Eucalyptus melanophloia.* **Sub-canopy (T2):** Very sparse. Height range 7-10m; median height 9m. Dominant species: *Angophora subvelutina.* **Shrub (S1)** Mid-dense. Height range 1-2m; median height 01m. Dominant species: *Lantana camara*, Xanthorrhoea johnsonii.* **Groundcover:** Mid-dense. Height range 0.1-0.5m; median height 0.2m. Dominant species*:* heavily grazed grasses.	
Q28	**Brief description:** non-remnant semi-mature eucalypts. **Canopy (T1):** Sparse. Height range 12-18m; median height 14m. Dominant species: *Eucalyptus crebra, Corymbia tessellaris.* Suppressed species: *Corymbia intermedia, Eucalyptus tereticornis.* **Sub-canopy (T2):** Sparse. Height range 6-10m; median height 6m. Dominant species: *Corymbia tessellaris, E. crebra.* **Shrub (S1)** Very sparse. Height range 1-2m; median height 1m. Dominant species: *E. crebra, C. tessellaris.* **Groundcover:** Very sparse. Height range 0.1-0.2m; median height 0.1m. Dominant species*:* heavily grazed grasses. **Koala scats detected**	
Q29	**Brief description:** non-remnant copse of mature and semi-mature eucalypts, lower slope of hillside. **Canopy (T1):** Mid-dense/sparse. Height range 16-20m; median height 17m. Dominant species: *Eucalyptus crebra, Corymbia tessellaris.* Associated species: *Eucalyptus tereticornis* **Sub-canopy (T2):** Sparse. Height range 1-5m; median height 5m. Dominant species: *Eucalyptus crebra, Corymbia tessellaris.* Associated species: *Eucalyptus tereticornis* **Shrub (S1)** n/a **Groundcover:** Very sparse. Height range 0.1-0.2m; median height 0.1m. Dominant species*:* heavily grazed grasses, **Koala scats detected**	

APPENDIX 2

Protected Matters Search Tool Results

EPBC Act Protected Matters Report

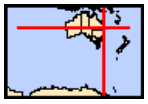
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

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

Report created: 25/06/19 13:46:29

Coordinates
Buffer: 5.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	35
Listed Migratory Species:	16

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	22
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	33
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Moreton bay	50 - 100km upstream
Moreton bay	50 - 100km upstream

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Mixophyes fleayi Fleay's Frog [25960]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Bosistoa transversa Three-leaved Bosistoa, Yellow Satinheart [16091]	Vulnerable	Species or species habitat likely to occur within area
Bulbophyllum globuliforme Miniature Moss-orchid, Hoop Pine Orchid [6649]	Vulnerable	Species or species habitat may occur within area
Cupaniopsis tomentella Boonah Tuckeroo [3322]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Lepidium peregrinum Wandering Pepper-cress [14035]	Endangered	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Notelaea lloydii Lloyd's Olive [15002]	Vulnerable	Species or species habitat likely to occur within area
Phebalium distans Mt Berryman Phebalium [81869]	Critically Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area
Saiphos reticulatus Three-toed Snake-tooth Skink [88328]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

Invasive Species

[Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus africanus Climbing Asparagus, Climbing Asparagus Fern [66907]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat may occur within

Name	Status	Type of Presence area

Caveat

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

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

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

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

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

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-27.8887 152.557

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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APPENDIX 3

Assessment of Likelihood of Occurrence of MNES

Threatened terrestrial flora and vertebrate fauna species listed in the PMST but not discussed in the main body of the report, and an assessment of likelihood of occurrence within or immediately adjoining the subject site.

Abbreviations: EPBC = status under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth); **NCA** = status under the *Nature Conservation Act 1992* (Queensland); **PM** = EPBC Protected Matters Search Tool database search within a 10 km radius of the study area; **WN** = Queensland Department of Environment and Heritage Protection WildNet database search within a 25 km radius of the study area; E = Endangered; V = Vulnerable; NT = Near Threatened; M = Migratory; S = Special Least Concern (Migratory or culturally significant); LC = Least Concern; X = species occurrence predicted (PM).

Likelihood of occurrence categories: Known - from other surveys (BAAM, other consultancies, databases), species recorded onsite; **Likely to occur** – species not known to occur onsite but the site is within the known range of the species, potentially suitable habitat is present and there are either database records for the local region or knowledge of the species occurrence suggests it may occur as a resident or visitor; means 'high potential' or good habitat is present but no species were observed onsite; **Potential to occur** – the site is within the known range of the species and potentially suitable habitat is present but there are no database records for the local region and/or it is a rare, erratic or poorly known species; means 'low potential' or habitat for species is not definitive; **Unlikely to occur** – no suitable habitat present and/or the site is outside of the known range of the species.

Species	Common name	EPBC	NCA	PM	WN	Preferred habitat characteristics	Likelihood of occurrence
Plants							
Arthraxon hispidus	Hairy-joint Grass	V	V	X		The species occupy a diverse range of ecosystem types including edges of rainforest, wet eucalyptus forest, near creeks or swamps, woodland, freshwater springs, coastal dunes, gullies and sandy alluvium in open forests (DoE 2019a).	**Unlikely.** This species was not detected along Warroolaba Creek and lower lying areas in the eastern part of the study area. Whilst some suitable habitat is on site (wetter, lower lying areas), the ground stratum is highly grazed and there are no historical records within and surrounding the study area.
Bosistoa transversa (includes B. selwynii)	Three Leaved Bosistoa, Heart-leaved Bosistoa	V	V	X		Lowland subtropical rainforest up to 300 m above sea level (DoE, 2019b) from Mullumbimby NSW to Mt Larcom near Gladstone.	**Unlikely.** The subject site does not support rainforest.
Bulbophyllum globuliforme	Miniature Moss-orchid,	V	NT	X		The Miniature Moss-orchid is a host-specific species, only growing on the Hoop Pine, where it colonises the upper branches of mature trees (DoE 2019c).	**Unlikely.** The subject site does not support any Hoop Pine.
Cupaniopsis tomentella	Boonah Tuckeroo	V	V	X		Known only from an area between Boonah and Ipswich in south-eastern Queensland (DoE 2019d). It grows in vine thickets predominantly on fertile clay soils .	**Unlikely.** The subject site does not support any vine thickets.
Dichanthium setosum	Bluegrass	V		X		Associatedwith heavy basaltic black soils and red-brown loams with clay subsoil *Dichanthium setosum. O*ften found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. (DoE 2019e).	**Unlikely.** The study area provides potential, disturbed habitats in the form of partially/historically cleared eucalypt forest and heavily disturbed pasture. However, due to historic grazing, the lack of cracking clays, and no records are known from the locality, (the closest records being near Toowoombao, over 50km west of the study area) it is considered unlikely that this species would be present.

Species	Common name	EPBC	NCA	PM	WN	Preferred habitat characteristics	Likelihood of occurrence
Lepidium peregrinum	Wandering Pepper-cress	E				Grows in riparian open forest dominated by *Eucalyptus camaldulensis* and *Casuarina cunninghamiana,* in the tussock grassland fringe of the riparian open forest, and in shade under shrubs close to the creek bank (DoE 2019j).	**Unlikely.** This species was not detected along Warroolaba Creek and lower lying areas in the eastern part of the study area. Whilst some suitable habitat is on site (wetter, lower lying areas), the ground stratum is highly grazed and there are no historical records within and surrounding the study area.
Macadamia integrifolia	Macadamia Nut	V	V	X		Prefers mild frost-free areas with a reasonably high rainfall. Vegetation communities in which the Macadamia Nut is found range from complex notophyll mixed forest, extremely tall closed forest, simple notophyll mixed very tall closed forest to simple microphyll-notophyll mixed mid-high closed forest with *Araucaria* and *Argyrodendron* emergents (DoE, 2019f).	**Unlikely.** The subject site does not support preferred habitat for the species.
Notelaea lloydii	Lloyd's Native Olive	V	V			Found in the ecotone between eucalypt open forests and vine thicket on undulating to hilly terrain either in moist gullies or on gentle to steep dry slopes, but rarely on rocky outcrops. Soil types are mostly shallow, well drained and stony to very rocky in texture (DoE 2019g).	**Unlikely.** The subject site does not support any vine thicket and was not detected on rocky hill slopes.
Phebalium distans	Mt Berryman Phebalium	CE	E	X		Semi-evergreen vine thicket on red volcanic soils, or in communities adjacent to this vegetation type (DoE 2019h).	**Unlikely.** The subject site does not support any vine thickets.
Thesium australe	Toadflax	V	V	X		Semi-parasitic on roots of a range of grass species notably Kangaroo Grass (*Themeda triandra*) occurs in shrubland, grassland or woodland, often on damp sites (DoE 2019i).	**Unlikely**. This species was not detected. Themeda triandra was recorded on the upper hillslopes of the study area, however these areas were very dry. Grassy habittas on wetter, lower slopes are heavily grazed.
Corynocarpus rupestris subsp. arborescens	Southern Corynocarpus		V		X	Found in Araucarian notophyll vineforest often on red basaltic slopes (DES 2019).	**Unlikely.** The subject site does not support any vineforest.
Birds							
Anthochaera phrygia	Regent Honeyeater	E,M	E	X		Box-ironbark eucalypt forests and woodlands on the inland slopes of the Great Dividing Range, preferring the wettest, most fertile sites (Garnett *et al*. 2011).	**Unlikely**. The species is not known from the local region and only low value habitats for the species.
Botaurus poiciloptilus	Australasian Bittern	E	C	X		Shallow, vegetated freshwater or brackish swamps, favouring those dominated by sedges, rushes and/or reeds (Garnett *et al*. 2011).	**Unlikely**. The creeks within the site do not support preferred habitat conditions.

Species	Common name	EPBC	NCA	PM	WN	Preferred habitat characteristics	Likelihood of occurrence
Calidris ferruginea	Curlew Sandpiper	CE	E	X		Mainly occur on intertidal mudflats in sheltered coastal areas, and also around non-tidal swamps. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (Higgins & Davies 1996).	**Unlikely.** The subject site does not support any dams or waterholes with bare edges.
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	E	E	X		Usually recorded from drier rainforests and adjacent wetter eucalypt forest but rarely seen due to its small size and cryptic habits. The bird shows a decided preference for fig trees, but also feeds on other fruiting rainforest species (DoEC 2015).	**Unlikely**. The subject site does not support any fig trees (naturally growing or planted). Closest records are approximately 25 km to the west in the Main Range (ALA 2019).
Dasyornis brachypterus	Eastern Bristlebird	E		X		Inhabits a broad range of vegetation communities with a variety of plant species compositions that are generally defined by a similar structure of low, dense, ground or understorey vegetation (OEH 2012).	**Unlikely**. Much of the subject site has been heavily grazed and supports limited ground and understorey vegetation. Nearest record for this species is approximately 27 km west (ALA 2019).
Geophaps scripta scripta	Squatter Pigeon	V		X		Dry grassy eucalypt woodlands and open forests, also *Callitris* and *Acacia* woodlands. Most birds live in sandy sites near permanent water (Frith 1982; Blakers *et al*. 1984; Crome and Shields 1992).	**Unlikely.** Not known in local landscape and the site does not support suitable land zones (i.e. 5 or 7).
Grantiella picta	Painted Honeyeater	V	V	X		Inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees (Garnett *et al*. 2011).	**Unlikely:** There were very minor occurrences of mistletoe throughout the study area. The closest known record is approximately 42 km to the north recorded in 1900 (ALA 2019)..
Lathamus discolor	Swift Parrot	E	E	X		Mainly dry open eucalypt forest and woodland, including those with Grey Box or River Red Gum (Higgins 1999).	**Unlikely.** One record approximately 15 km to the north (ALA 2019). The study area does not support preferred eucalyptus species.
Numenius madagascariensis	Eastern Curlew	CE	E	X		Cccur on sheltered coasts, especially estuaries, harbours and coastal lagoons, and are often recorded in saltmarsh and on mudflats within mangroves. They mainly forage on intertidal mudflats and sandflats and roost on sandy spits and islets and saltmarsh (Higgins and Davies 1996).	**Unlikely.** The subject site does not support suitable habitats for this species.

Species	Common name	EPBC	NCA	PM	WN	Preferred habitat characteristics	Likelihood of occurrence
Poephila cincta cincta	Southern Black-throated Finch	E		X		Dry open grassy woodlands and forests with seeding native grasses and free-standing water (Higgins *et al.* 2006b).	**Unlikely.** The subject site is dominated by pasture grasses, with very limited native grasses present. Closest record is approximately 10 km south-east (ALA 2019).
Rostratula australis	Australian Painted Snipe	E	V	X		Terrestrial shallow wetlands, ephemeral and permanent, usually freshwater but occasionally brackish. They also use inundated grasslands, saltmarsh, dams, rice crops, sewage farms and bore drains (Marchant and Higgins 1993).	**Potential.** The north-eastern portions of the Koala Protection Area occur in a floodplain which provides marginal habitats for this species, although closest record is 20 km to the north (ALA 2019).
Turnix melanogaster	Black-breasted Button-quail	V	V	X		Semi-evergreen vine thicket and low microphyll vine forest; also dry rainforest (softwood scrubs) of Brigalow Belt, mature Hoop Pine plantations, and *Acacia* and *Austromyrtus* scrubs on sandy coastal soils (Garnett *et al*. 2011).	**Unlikely**. The site does not support vine thickest or forests.
Phaethon rubricauda	Red-tailed Tropicbird	M	V		X	A marine species that may occassionaly occur inland after a storm event (OEH 2018).	**Unlikely**. This marine species would not be present in the subject site.
Frogs							
Mixophyes fleayi	Fleay's Frog	E	E	X		Is associated with montane rainforest (Corben & Ingram 1987). In Queensland, important habitat has been defined as: 'permanent and semi-permanent freshwater streams, between 100-1000 m in altitude, in rainforest and other forest communities (Hines & SEQTFRT 2002).	**Unlikely.** The small waterways within the subject site do not provide sufficient breeding or refuge habitat for this species.
Mammals							
Chalinolobus dwyeri	Large Pied Bat	V	V	X		Little known, but may depend heavily on sandstone outcrops. It has been found roosting in disused mine shafts, caves, overhangs and disused Fairy Martin *Petrochelidon ariel* nests (Hoye and Schulz 2008). It also possibly roosts in the hollows of trees (Duncan *et al.* 1999).	**Unlikely.** The subject site does not support any sandstone outcrops. There is one record for this species approximately 20 km west.
Petrogale penicillata	Brush-tailed Rock Wallaby	V	V	X		Rocky areas with boulder piles and/or cliffs in a broad range of vegetation types (Menkhorst and Knight, 2004).	**Unlikely.** The subject site does not support suitable habitats and there are no local records.
Pseudomyes novaehollandiae	New Holland Mouse	V				This species inhabits open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes (DoEE 2019j,).	**Unlikely.** The subject site soes not support preferred habitats and there are no nearby recors.
Reptiles							
Delma torquata	Collared Delma	V	V	X		Shelters in soil cracks, leaf litter and under loose surface rocks in open eucalypt forest with a shrub and tussock grass understorey.	**Unlikely.** No suitable habitat present and not known from the local region.

Species	Common name	EPBC	NCA	PM	WN	Preferred habitat characteristics	Likelihood of occurrence
Furina dunmalli	Dunmall's Snake	V	V	x		Inhabits forests and woodlands on black alluvial cracking clay and clay loams dominated by Brigalow native Cypress or Bull Oak. Also found in various open forest and woodland associations on sandstone derived soils. (DoEE 2019k).	**Unlikely.** The subject site does not support the preferred soil type and there are no records within 100 km of the site.
Coeranoscincus reticulatus	Three-toed Snake-toothed Skink	V		X		Inhabits subtropical rainforest and nearby wet sclerophyll forests. Most records are from montane rainforest on dark soils, but it also occurs on Fraser Island and nearby Cooloola coast in rainforests on pale sands (DoE 2019l).	**Unlikely.** No suitable habitat present and not known from the local region.
Anilios insperatus	Fassifern Blind Snake		V		X	Has only been recorded in pasture from one location and there is no available data relating to habitat preferences.	**Potential.** There are two records for this species 10 km north of the subject site (ALA 2019).
Migratory Terrestrial Species							
Cuculus optatus	Oriental Cuckoo	M				This species is a relatively sparse migrant to south-east Queensland in areas of suitable, open habitat.	**Potential.** May be an occasional visitor to the study area.
Hirundapus caudacutus	White-throated Needletail	M		X		This is an aerial species, typically occurring over forested habitats, but also over coastal areas, including cities (Higgins 1999; Pizzey and Knight 2003). They forage aerially in small to huge flocks for insects and spiders, often associated with low pressure weather systems in combination with other aerial species.	**Likely.** This species may occur over the site, primarily in summer preceding rainfall and storm events. This species has little to no relevance to the proposed actions.
Monarcha melanopsis	Black-faced Monarch	S,M		X		Mainly rainforests, also wet sclerophyll forest and open forest near rainforest (Higgins *et al.* 2006a).	**Unlikely.** The study area does not support rainforest or wet sclesrophyll forest.
Monarcha trivirgatus	Spectacled Monarch	M		X		Spectacled Monarchs are mostly found singly or in pairs in low dense vegetation, mainly in rainforests, but also in wet sclerophyll forests and other dense vegetation such as mangroves, drier sclerophyll forests, woodlands, parks and gardens.	**Unlikely.** The study area does not support sufficient areas of low dense vegetation to suit this species.
Motacilla flava	Yellow Wagtail	M		X		Non-breeding habitat only: mostly well-watered open grasslands and the fringes of wetlands (DoEE 2015).	**Unlikely.** The study area does not support suitable wetland areas and there are no local records.
Myiagra cyanoleuca	Satin Flycatcher	M		X		Satin Flycatchers are mostly found in eucalypt forest, favouring wet forests, moist gullies and watercourses. They are largely absent from regrowth forests (DoEE 2019m).	**Unlikely.** Potential to occur in the forested habitats associated with the large creek on the subject site.

Species	Common name	EPBC	NCA	PM	WN	Preferred habitat characteristics	Likelihood of occurrence
Rhipidura rufifrons	Rufous Fantail	S,M		X		Moist habitats, including closed forests, coastal scrubs, mangroves and along watercourses and gullies, and urban/rural areas during mid-year migration (Pizzey and Knight, 2003; Higgins *et al.* 2006a).	**Potential.** Potential summer visitor to habitats associated with Warroolaba Creek.

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APPENDIX 4

Assessment of Significant Impact on MNES

Assessment of the significance of removing habitat critical to the survival of Koala (refer Sections 6, 7, 8 of DotE 2014).

Characteristics that could adversely affect habitat critical to the survival of Koala	Assessment of Proposed Actions
The score calculated for the impact area (higher score = greater risk)	The project area achieved a score of 8 (out of 10) for habitat quality. This score reflects the presence of Koala and presence of Koala food trees. **Potential for high risk of significant impact.**
Amount of Koala habitat being cleared (more habitat cleared = greater risk)	The proposed quarry will remove approximately 48 ha of known and potential Koala habitat and will retain approximately 66 ha of known and potential Koala habitat. **High risk of significant impact.**
Method of clearing	All vegetation clearing will be conducted under the supervision of an experienced fauna spotter in accordance with the Queensland government *Nature Conservation (Koala) Conservation Plan 20017* (DES 2017). **Low risk of significant impact expected.**
The density or abundance of Koalas	A dead Koala was observed and Koala scats were found in low-lying vegetation throughout the project area, indicating the project area is/was utilised by at least one Koala. **Moderate risk of significant impact.**
Level of fragmentation caused by the clearing	The project area occurs within a landscape that has undergone extensive clearing for agricultural purposes. Warroolaba Creek currently separates Koala habitats in the west and east. Retention of habitats associated with this creek will provide ongoing connectivity. The proposed action will remove Koala habitat, but will not cause an increase in the existing level of habitat fragmentation. **Low risk of significant impact.**

Assessment of the significance of Project impacts interfering with the recovery of Koala.

Impacts which are likely to substantially interfere with the recovery of the Koala	Assessment of Proposed Actions
Increasing Koala fatalities to dog attacks	The proposed quarry will most likely result in a decrease in the presence of dogs in the local landscape. **Low risk of significant impact expected.**
Increasing Koala fatalities to vehicle-strikes	The construction of an access road to link the project area with the Cunningham Highway to the east has the potential to lead to an increase in Koala/vehicle strikes along this stretch of road. Exclusion fencing will be installed along the northern boundary of the Koala Habitat Protection Area and will extend to include eastern Koala habitats on both sides of the roadway to minimise the risk vehicle strikes at this location. **High risk of significant impact expected.**
Facilitating the introduction or spread of disease of pathogens, that are likely to significantly reduce the reproductive output of Koalas,	The clearing of Koala habitats can induce stress on individual animals, which then makes the animals predisposed to succumbing to diseases/pathogens such as Chlamydia. No Koala will be placed in a stressful situation by forcing them to move from a tree targeted for clearing. A qualified fauna spotter/catcher will be present during all vegetation clearing to report the presence of any sick or injured Koala observed within the study area. **Moderate risk of significant impact expected.**
Creating a barrier to movement to, between or within habitat critical to the survival of the Koala that is likely to result in the long-term reduction of genetic fitness.	Warroolaba Creek separates the eastern and western Koala habitats. Currently this creek would not be considered a barrier to movement through the project area. Free access from the Koala Habitat Protection Area to the adjacent eastern 80 ha patch of Koala habitat will be retained. A dedicated Koala underpass will constructed across the northern access road to promote safe movement in a north/south direction. **Moderate risk of significant impact.**

Impacts which are likely to substantially interfere with the recovery of the Koala	Assessment of Proposed Actions
Changing hydrology which degrades habitat critical to the survival of the Koala to the extent the carrying capacity of the habitat is reduced in the long-term.	Stormwater runoff and site drainage will be managed to ensure the proposed actions do not impact on retained Koala habitat. **Moderate risk of significant impact expected.**

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Spotted-tailed Quoll (SE Mainland) *Dasyurus maculatus maculatus* assessment against Significant Impact Guidelines 1.1.

Criteria	Assessment of Impact Significance
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of a population of a species.	**No significant impact likely.** The proposed quarry will retain all hollow-bearing trees associated with Warroolaba Creek; therefore, the loss of a small amount of potential shelter habitat in the proposed quarry pit areas is unlikely to lead to a long-term decrease in the local population.
Reduce the area of occupancy of the species.	**No significant impact likely.** There is only a low probability that Spotted-tailed Quoll will be present within the project area. All hollow bearing logs or stags will be transferred to retained habitats; therefore, there will be minimal loss of potential habitats.
Fragment an existing population into two or more populations.	**No significant impact likely.** Retention of habitats surrounding the proposed quarry pits will maintain connectivity between potential habitats within the project area and in adjacent areas.
Adversely affect habitat critical to the survival of a species	**No significant impact likely.** Habitats within the project area and in the surrounding landscape are only marginally suitable for Spotted-tailed Quoll, and are not considered habitat critical to the survival of the species.
Disrupt the breeding cycle of a population.	**No significant impact likely.** The majority of potential habitats (hollows) will be retained; therefore, proposed actions are unlikely to disrupt the breeding cycle.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**No significant impact likely.** The loss of the limited area of potential habitat, in comparison to habitats in the surrounding landscape, is unlikely to cause this species to decline.
Result in invasive species that are harmful to an endangered species becoming established in the species' habitat.	**No significant impact likely.** Foxes are known to occur within the project area, and it is expected that, once quarry operations begin, foxes will move away from the disturbance. The proposed quarry is unlikely to result in an increase in dogs or cane toads becoming established within potential habitats.
Introduce disease that may cause the species to decline.	**No significant impact likely.** The proposed quarry is unlikely to introduce any disease which may impact on this species.
Interfere with the recovery of the species.	**No significant impact likely.** The limited area of potential habitat disturbance is unlikely to interfere with the recovery of the species as suitable habitats will be retained and restored to provide ongoing resources.

Australian Painted Snipe *Rostratula australis* assessment against Significant Impact Guidelines 1.1.

Criteria	Assessment of Impact Significance
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of a population of a species.	**No significant impact likely.** Potential habitats for this species will be retained and protected within the eastern portions of the Koala Habitat Protection Area.
Reduce the area of occupancy of the	**No significant impact likely.** There is only a low probability that this species will be present within the

Criteria	Assessment of Impact Significance
species.	project area. Potential habitats will be retained.
Fragment an existing population into two or more populations.	**No significant impact likely.** Retention of habitats within the far eastern portions of the project area will provide connectivity to potential habitats in adjacent lands.
Adversely affect habitat critical to the survival of a species	**No significant impact likely.** Habitats within the project area and in the surrounding landscape are only marginally suitable for Spotted-tailed Quoll, and are not considered habitat critical to the survival of the species.
Disrupt the breeding cycle of a population.	**No significant impact likely.** It is unlikely that the project area would support breeding habitats for this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**No significant impact likely.** Potential habitats for this species will be retained and protected within the eastern portions of the Koala Habitat Protection Area.
Result in invasive species that are harmful to an endangered species becoming established in the species' habitat.	**No significant impact likely.** Potential habitats will be retained and protected by fencing; therefore, it is unlikely that invasive species would become established in the potential habitats.
Introduce disease that may cause the species to decline.	**No significant impact likely.** The proposed quarry is unlikely to introduce any disease which may impact on this species.
Interfere with the recovery of the species.	**No significant impact likely.** The limited area of potential habitat disturbance is unlikely to interfere with the recovery of the species as suitable habitats will be retained to provide ongoing resources.

Grey-headed Flying-Fox *Pteropus poliocephalus* assessment against Significant Impact Guidelines 1.1.

Criteria	Assessment of Impact Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species.	**No significant impact likely.** The loss of a small amount of potential foraging habitat, when viewed in the context of availability of potential foraging habitats in the landscape between the nearest known roost site and the project area, is unlikely to lead to a long-term decrease in the local population.
Reduce the area of occupancy of an important population.	**No significant impact likely.** Areas outside of the quarry footprint supporting foraging habitats will be retained, and abundant resources are available in surrounding properties.
Fragment an existing important population into two or more populations.	**No significant impact likely.** As there are no Flying-Fox roost sites within the vicinity of the project area (closest being 32 km north), the proposed quarry will not fragment an existing population.
Adversely affect habitat critical to the survival of a species	**No significant impact likely.** Habitats within the project area would not be considered critical for this species.
Disrupt the breeding cycle of an important population.	**No significant impact likely.** As there are no Flying-Fox roost sites within the vicinity of the project area, the proposed quarry will not disrupt the breeding cycle.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**No significant impact likely.** The loss of the limited area of potential foraging habitat, in comparison to potential habitats that occur between the project area and the nearest known roost site, is unlikely to contribute to the species' decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat.	**No significant impact likely.** There are no known invasive species that are harmful to Grey-headed Flying-fox.
Introduce disease that may cause the species to decline.	**No significant impact likely.** The proposed quarry is unlikely to introduce any disease which may impact on this species.
Interfere substantially with the recovery of the species.	**No significant impact likely.** The limited area of potential habitat disturbance is unlikely to interfere substantially with the recovery of the species as suitable habitats will be retained and restored to provide ongoing resources.

***Long-nosed Potoroo Potorous tridactylus tridactylus (SE Mainland)* assessment against Significant Impact Guidelines 1.1.**

Criteria	Assessment of Impact Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species.	**No significant impact likely.** Potential sheltering and foraging sites within the project area are associated with Warroolaba Creek. These habitats will be retained as part of the proposed quarry development.
Reduce the area of occupancy of an important population.	**No significant impact likely.** The retention of potential habitats associated with Warroolaba Creek will ensure the proposed quarry does not reduce the area of occupancy of this species, if present.
Fragment an existing important	**No significant impact likely.** Warroolaba Creek provides

Criteria	Assessment of Impact Significance
population into two or more populations.	connectivity to potential habitats outside of the project area; therefore, there will be no fragmentation of a population, if present.
Adversely affect habitat critical to the survival of a species	**No significant impact likely.** Habitats within the project area would not be considered critical for this species.
Disrupt the breeding cycle of an important population.	**No significant impact likely.** Due to the small area of potential habitat for this species, it is unlikely that the project area supports an important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**No significant impact likely.** Potential Potoroo habitats within the project area will be retained and protected.
Result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat.	**No significant impact likely.** The proposed actions are not likely to result in an increase in invasive species establishing in potential habitats.
Introduce disease that may cause the species to decline.	**No significant impact likely.** The proposed quarry is unlikely to introduce any disease which may impact on this species.
Interfere substantially with the recovery of the species.	**No significant impact likely.** Suitable habitats will be retained and protected to provide ongoing resources for this species.

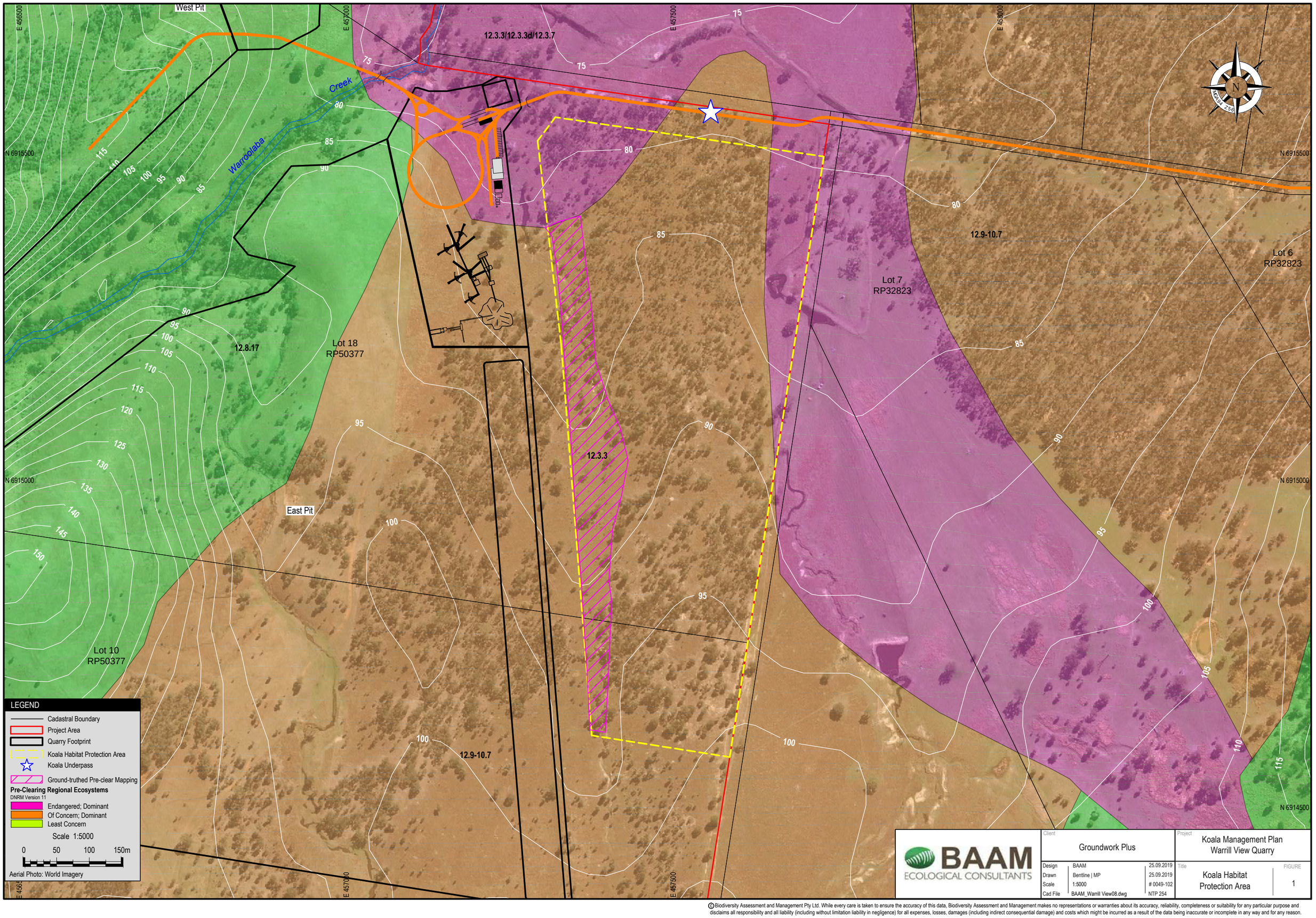
Red Goshawk Erythrotriorchis radiatus **assessment against Significant Impact Guidelines 1.1.**

Criteria	Assessment of Impact Significance
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species.	**No significant impact likely.** Potential habitats within the project area are associated with Warroolaba Creek. These habitats will be retained and protected as part of the proposed action.
Reduce the area of occupancy of an important population.	**No significant impact likely.** Foraging habitats will be retained within the project area and abundant resources are available in surrounding properties.
Fragment an existing important population into two or more populations.	**No significant impact likely.** This is a wide ranging species for which the project will not lead to fragmentation of any important populations that may occur in the area.
Adversely affect habitat critical to the survival of a species	**No significant impact likely.** Habitats within the project area would not be considered critical for this species.
Disrupt the breeding cycle of an important population.	**No significant impact likely.** Potential habitats within the project area are associated with Warroolaba Creek. These habitats will be retained and protected as part of the proposed action, such that disruptions to the breeding cycle of any important population in the area are unlikely..
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**No significant impact likely.** There will be no loss of potential Red Goshawk habitats as a result of the proposed action.
Result in invasive species that are harmful to a vulnerable species becoming established in the	**No significant impact likely.** The proposed actions are not likely to result in an increase in invasive species establishing in potential habitats.

Criteria	Assessment of Impact Significance
species' habitat.	
Introduce disease that may cause the species to decline.	**No significant impact likely.** The proposed quarry is unlikely to introduce any disease which may impact on this species.
Interfere substantially with the recovery of the species.	**No significant impact likely.** There will be no loss of potential Red Goshawk habitats as a result of the proposed action.

APPENDIX 5

Koala Habitat Protection Area Management Plan



BACKGROUND

This Koala Management Plan (the Plan) has been prepared to ensure development of the quarry meets the requirements of EPA Approval Conditions L11-12 (APP0030093), being:

- L11. Prior to clearing of vegetation that supports Koalas; a Koala Management Plan must be developed for the Koala Habitat Protection Area (KHPA) as shown in **Figure 1**.
- L12. The Koala Management Plan must:
    - describe measures to be implemented to minimise Koala mortality attributable to dog attack and vehicle strike within the project site;
    - describe measures that will be implemented to protect and enhance Koala habitat;
    - clearly define the management measures;
    - outline an adaptive management approach to improve koala habitat quality within the Koala Protection Zone;
    - state clear and concise outcomes and performance indicators against which achievement of the outcomes identified will be measured;
    - specify a method to monitor the impact and effectiveness of the management measures;
    - identify the contingency measures and appropriate corrective actions that will be undertaken if the performance indicators or outcomes are not being met.

SPECIFIC OUTCOMES

In compliance with condition L10, the KHPA must be able to support the establishment of the same amount of vegetation that supports Koalas (i.e. area, or number of non-juvenile Koala trees) that is cleared onsite as a result of the quarry activities within six months of vegetation clearing.

MANAGEMENT MEASURES

MINIMISE KOALA MORTALITY FROM DOG ATTACK

Once the use of the site converts from farming activities (which currently support domestic dogs) to a working quarry, the threat of dog attack will decrease considerably. In addition, all visitors/staff will be prohibited from bringing dogs onto the quarry site.

Wild dogs and wandering domestic dogs from nearby properties could still be a threat to the local Koala population. As wild and domestic dogs are attracted by food waste, staff, contractors and visitors will be prohibited from leaving food scraps in any areas other than dedicated waste bins. All waste bins will be mounted off the ground and have secure lids that cannot be opened by dogs. These practices will reduce the risk that the operation of the quarry will cause an increase in wild or wandering domestic dogs from entering the site.

An Action Plan that includes management objectives, actions, performance outcomes and corrective actions to minimise the risk of dog attack is provided as **Appendix 1**.

Minimise Koala mortality from vehicle strike

The Quarry will operate on a 24/7 basis and there will be an increase in road traffic and hence potential impacts to the local Koala population from vehicle strike. Night traffic is likely to cause the greatest risk of Koala/vehicle interactions, as Koala are usually sedentary during the day. However, it is noted that Koala sometimes move from tree to tree during daylight hours.

Speed limits along the access road will be set at 40 km/h for 1.5 km from entrance to quarry.

A dedicated Koala underpass and associated fauna guide-fencing will be constructed at a strategic location (refer **Figure 1**).

An Action Plan that includes management objectives, actions, performance outcomes and corrective actions to minimise the risk of vehicle strike is provided as **Appendix 1**.

MEASURES TO PROTECT AND ENHANCE KOALA HABITAT

The KHPA is 30 ha in area, and currently supports mature and regrowth Forest Red Gum *Eucalyptus tereticornis, Eucalyptus crebra* and *Corymbia tessellaris* over a ground cover of native and exotic grasses. The KHPA also supports cleared areas that have been heavily grazed.

State mapping of pre-clear regional ecosystems (REs) indicates the RE that once occurred over the majority of the KHPA is RE 12.9-10.7: *Eucalyptus crebra* +/- *E. tereticornis, Corymbia tessellaris*, *Angophora* spp., *E. melanophloia* woodland on sedimentary rocks. Lower-lying sections in the north-east and north-west corners of the KHPA supported pre-clear RE 12.3.3: *Eucalyptus tereticornis* woodland on Quaternary alluvium. Quaternary sites located within these areas generally support the pre-clear mapping. However, the low-elevation eastern areas of the KHPA also support alluvial soils and it is considered these areas should also be mapped as pre-clear RE 12.3.3 (refer **Figure 1**).

Management measures will vary depending on the pre-clear RE, but will focus primarily on areas supporting alluvial soils and mapped as pre-clear RE12.3.3, as these areas support the highest densities of preferred Koala habitat trees, Forest Red Gum, and signs of Koala usage of these trees (scats) were recorded during recent field surveys. It is estimated, based on average tree densities specified within the Queensland Herbarium technical description for RE12.3.3 (i.e. 115 T1; 160 T2), that currently cleared areas within the portions of the KHPA ground-truthed as pre-clear RE 12.3.3 (~5 ha in area) would support an additional 1375 Koala trees. Trees should be planted with 20 m centres.

Encourage native species recruitment and establishment

To promote natural regeneration of native species, cattle/horses will be excluded and exclusion fencing will be erected around the boundaries of the KHPA. Signage stating ***Authorised Access Only*** will be placed approximately 100 m apart at strategic locations along this fencing.

The Quarry Manager or their representative will ensure the integrity of the exclusion fencing is routinely checked on a monthly basis. Any breaks in the fence line or opportunities for cattle/horse entry are to be rectified.

Routine monthly monitoring of the level of native flora species recruitment should be undertaken to determine if natural recruitment will achieve the objectives of this Plan, or whether supplementary plantings and/or soil preparation may be necessary.

Koala Habitat Tree Plantings

Species selected for planting should be reflective of RE12.3.3, with at least 80% of seedlings to be Eucalyptus tereticornis. Seedlings should be sourced from local provenance (i.e. within 10 km, or a close as possible). Alternatively seeds could be collected from mature trees within the quarry site and used to direct seed the cleared areas, or used to propagate seedlings for later planting.

Each species is to be planted in a random, ‘natural’ manner across the Rehabilitation Area, at a spacing of 20 m apart.

All plants will be planted at 50mm tubestock size and may be planted in one single planting event (i.e. staging will not be required).

All plants are to be planted into prepared holes that measure the depth and twice the width of the tube stock. Tree guards are to be used if grazing macropods are present. If there is a likelihood that macropod grazing of plants will occur and tree guards are not sufficient to prevent damage to plantings, temporary fencing should be installed along the boundaries of the planting areas until plants become established.

Watering and Fertilizers

A minimum of 5-10 L of water should be applied to each tube stock directly after planting. A diluted solution of SeaSol® liquid fertiliser may also be applied in order to reduce transplant shock and encourage root growth at the time of planting. A suitable fertiliser tablet for native species should be placed adjacent to but not touching the root ball. A follow-up application of fertiliser is unnecessary as native plants are generally adapted to low nutrient level in the soil.

Watering schedule should follow the following recommendations in **Table 1**, although may be subject to change depending on rainfall frequency and intensity. Adjustments to watering frequency and quantity should also be made according to visual inspection of site condition and plant health. Watering should be carried out early in the morning or late in the afternoon to avoid excessive water loss from evaporation.

Table 1: Watering schedule

Week	Frequency*
1 – 2	One cycle every second day
2 – 7	Two cycles per week
7 – 12	Once cycle per week
12-20	Site to be monitored for wilting of plants and watering to be undertaken as required.

***During periods where rainfall events occur, watering will not be required.**

MEASURES TO PROTECT AND ENHANCE KOALA HABITAT

The following additional management measures will be implemented to ensure the KHPA is protected and Koala habitat is enhanced.

- Prior to the commencement of works, clearly define the boundaries of the KHPA and erect signage stating ***Authorised Access Only***.
- Advise staff and contractors during site inductions that there is to be no dumping or stockpiling of cleared vegetation or soil within the KHPA.
- Erect cattle/horse exclusion fencing around the KHPA to encourage natural regeneration of vegetation communities.
- The Quarry Manager or their representative will ensure the integrity of the exclusion fencing is routinely checked on a monthly basis. Any breaks in the fence line or opportunities for cattle/horse entry are to be rectified.
- Engage a suitably qualified ecologist/rehabilitation contractor to identify and map weed occurrences and treat environmental weeds. Management of exotic grasses (which have been heavily grazed, and are likely to proliferate once stock have been excluded from the KHPA) could include slashing or pulse grazing or herbicide treatment. The use of herbicides must be undertaken in accordance with manufacturer's guidelines and must be approved for use in agricultural areas and near waterways.
- Fence the northern and western borders of the KHPA with Koala proof fencing, to minimise the risk of Koala movement into the east pit and access road but allow movement to/from Koala habitat to the east and within the retained southern portions of the site.
- Prepare a Fire Management Plan to minimise the risk of wild fire destroying Koala habitat. The Fire Management Plan should include management strategies for the different vegetation communities present, being:
  - Areas mapped as pre-clear RE 12.9-10.7 should be subject to a low to moderate intensity burn at intervals of between 4-25 years within summer to winter, with the aim of a 40-60% mosaic burn.
  - Areas mapped as pre-clear RE 12.3.3 should be subject to a low intensity burn at intervals of 3-6 years within summer to late autumn, with the aim of a 40-60% mosaic burn.
- Monitor the effectiveness of management measures every six months in accordance with the following monitoring regime.

MONITORING

A suitably qualified ecologist or habitat restoration specialist will be engaged to undertake monitoring within the KHPA every six months, as follows:

- Establish three 200 m long transects running in an east/west direction in the northern, central and southern portions of the KHPA.
- Along each transect, establish and permanently mark four 5 m^2 monitoring plots to give a total of 12 plots for the KHPA. Ensure two of the four plots in each transect are located in bare or lightly treed areas.
- Take a reference photograph whilst standing near the south-eastern corner of the plot. Ensure there is enough distance away from the plot to capture all vegetation within the plot, without including much of the surrounding vegetation in the photo.
- Within each plot measure and record the following:
  - evidence of Koala presence;
  - count of Koala non-juvenile habitat trees;
  - count of juvenile habitat trees;
  - health of Koala habitat trees;
  - percentage (%) cover of:
    - bare ground;
    - weeds;
    - shrubs;
    - Koala habitat trees.
  - all flora species present within plot;
  - health of vegetation; and
  - signs of disturbance.

MAINTENANCE SCHEDULE

Maintenance of the KHPA should be undertaken in accordance with **Table 2**.

Table 2: Maintenance schedule

Timing	Maintenance Task
First 3 months after planting	**Control weeds** – Check for weeds monthly and control as required**,** taking care not to damage planted and regenerating native species, including grasses and forbs. **Watering** – Water any planted trees as per **Table 2** depending upon prevailing weather conditions and then monthly or as necessary until seedlings are established and self-sustaining (approximately 3 – 6 months). **General Site Maintenance** – e.g. remove any rubbish found on site; check for signs of erosion;

Timing	Maintenance Task
	check for excessive fuel load and remove woody debris if necessary. **Replacement Planting –** Replace dead or senescent plants and continue replacement planting until 95% survival rate achieved. **Monitoring** – Monitor health of planted vegetation on a monthly basis.
3-36 months after planting	**Control weeds** – Continue monthly weed checks and control as required as specified for first three months. **Watering** – Continue to water each seedling as necessary until seedlings are established (approximately 3 – 6 months). Any replacement seedlings should be watered weekly during the first month following planting, then water as necessary until seedlings are established (approximately 3 – 6 months after planting). **Replacement Planting** – Replace dead or senescent plants and continue replacement planting until 95% survival rate achieved. **General Site Maintenance** – Remove any rubbish dumped on site; check for signs of erosion; check for fuel load and remove woody debris if necessary. **Monitoring** – Undertake regular site monitoring tasks on a 6-monthly basis for first year.
36 months-non-juvenile size	**Monitoring –** Monitoring of plant health, weed intrusions, fuel load will be undertaken until such time as planted or naturally recruited Koala trees have reached non-juvenile status (i.e. ≥10 cm DBH or ≥4 m in height). Replace dead plantings and conduct weed removal as necessary.

Reporting

The results of each monitoring event will be presented in a brief report format to the Quarry Manager within one month of completion, or earlier if adaptive management actions are required. At the completion of each year's monitoring, a detailed report, including any recommended adaptive management actions, will be provided to the Quarry Manager. The Quarry Manager must keep a copy of all monitoring result reports for the duration of the quarry life.

ADAPTIVE MANAGEMENT APPROACH TO IMPROVE KOALA HABITAT

If monitoring results indicate natural recruitment and/or supplementary plantings have not, or will not reach the required level to achieve the objectives of Condition L10 (i.e. establish the same amount of vegetation that supports Koalas that is cleared onsite within the 'Koala Habitat Protection Area', within 6 months of the clearing of the vegetation), the following adaptive management measures will be initiated:

- Following weed removal, lightly rip soils to a maximum depth of 20 cm in areas where natural recruitment is not advancing. If necessary, erect sediment control fencing around ripped areas to minimise the risk that newly ripped soil will enter Warroolaba Creek and other drainage lines during rain events.
- Undertake supplementary plantings of Forest Red Gum, which is a favoured Koala habitat tree species, in cleared areas if monitoring results indicate no or minimal natural recruitment has occurred. Additional plants should be spaced at 20 m intervals.
- Erect tree guards around planted and young regrowth trees if monitoring results indicate herbivore damage to plants is occurring.
- Maintain and monitor the supplementary plantings as per **Table 1**.

PERFORMANCE INDICATORS

The following performance indicators will be used to measure the success or failure of the prescribed management measures:

- After three years, the KHPA supports a sufficient number of self-supporting non-juvenile Koala habitat trees to achieve compliance with Condition L10 for each stage of clearing.
- There has been an increase in Koala habitat trees within the KHPA that reflects the loss of Koala habitat through vegetation clearing.
- After three years, the KHPA supports a sufficient number of non-juvenile Koala habitat trees to achieve compliance with Condition L10 for each stage of clearing.
- No Koala deaths from dog attack or vehicle strike have been recorded.

CONTINGENCY MEASURES

Corrective actions will be implemented if monitoring results and adaptive management measures indicate the requirements of Condition L10 will not be met within six months of vegetation clearing. Corrective actions included:

- Cease vegetation clearing of Koala habitat trees until the cause of non-achievement of Condition L10 has been identified and rectified.
- Meet with Quarry Manager, Environmental Manager and Restoration contractor to discuss reasons why Condition L10 has not been met.
- Instigate findings from meeting.
- Increase monitoring and maintenance schedule.

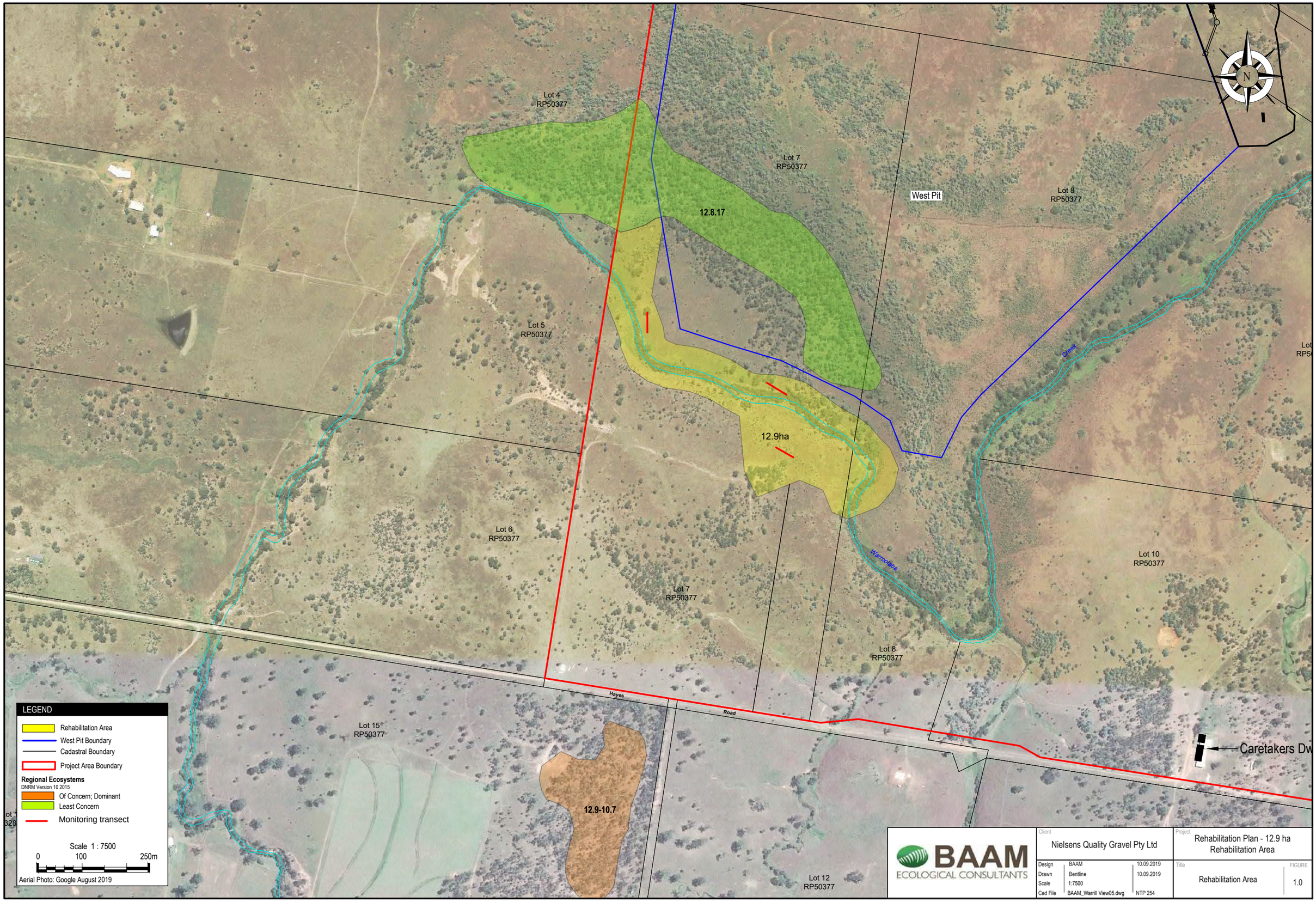
Action Plan to prevent death or injury to Koalas from dog attack and vehicle strike.

Performance Outcome	Actions / Responsible Officer(s)	Performance Criteria	Corrective Actions	Timing / Frequency
Minimise the risk of death or injury to Koala from dog attack	A 'Standard Operation Procedure' (SOP) will be developed and implemented for minimising the risk of dog attack and vehicle strike. As a minimum, it will ensure the following measures are undertaken to minimise the risk of death or injury to Koala from dog attack: • Site inductions for all staff, contractors and visitors include education regarding presence of Koala in the area and the potential impacts from dog attack. As a minimum, the site induction will include the following instructions; - all persons entering the quarry (staff, contractors, visitors) are prohibited from bringing dogs onto the site; - all persons within the quarry are prohibited from leaving food scraps in areas that may entice dogs. • food waste disposal bins will be installed in convenient locations; • food waste disposable bins will be mounted at least 50 cm from the ground to minimise the risk that a dog could tip over a bin; • food waste disposable bins will include lids that cannot be easily opened by a dog.	• No death or injuries to Koalas have occurred as a result of dog attack. • The 'Standard Operation Procedure' for dog attack and vehicle strike is implemented and functioning effectively on-site. • Protocols for minimising the risk of dog attack have been included in the site induction program and all persons entering the site are aware of these protocols. • No evidence of food waste in areas other than designated waste disposal bins. • No evidence of domestic or wild dogs entering the site.	• All Koala deaths or injuries will be investigated within 24 hours of notification and reported to the Regulatory Authorities within 7 days and, as required, actions will be developed to prevent future Koala deaths or injuries within 7 days. • All failures of the SOP for dog attack will be investigated within 24 hours and, as required, actions will be developed within 7 days to prevent future failures. • If dog attack on Koala has been confirmed, liaise with DAF and local government to devise a trapping/baiting program.	• The 'Standard Operation Procedure' for dog attack and vehicle strike will be established before construction commences and will be maintained over the life of the quarry. • The induction program is to be prepared before construction commences and will be maintained over the life of the quarry.
Minimise the risk of death or injury to Koala from vehicle strike	A 'Standard Operation Procedure' (SOP) will be developed and implemented for minimising the risk of vehicle strike. As a minimum, it will ensure the following measures are undertaken to minimise the risk of death or injury to Koala from vehicle strike: • Site inductions for all staff, contractors and visitors include education regarding presence of Koala in the area and the potential impacts from vehicle strike. As a minimum, the site induction will confirm the location of the Koala Habitat Protection Area and reduced speed	• No deaths, injuries or near-misses have occurred as a result of vehicle strike during quarry activities. • The 'Standard Operation Procedure' for vehicle strike is implemented and functioning effectively on-site. • Protocols for minimising the risk of vehicle strike have been included in the site induction	• If deaths, injuries or near misses are recorded, investigate immediately the cause and liaise with Lead Ecologist to determine best mitigation strategy. • All failures of the SOP for dog attack will be investigated within 24 hours and, as required, actions will be developed within 7 days to	• The 'Standard Operation Procedure' for vehicle strike will be established before construction commences and will be maintained over the life of the quarry. • The induction program is to be prepared before construction commences and will

Performance Outcome	Actions / Responsible Officer(s)	Performance Criteria	Corrective Actions	Timing / Frequency
	zones. • Erect Koala exclusion fencing along northern and western boundaries of Koala Habitat Protection Area (KHPA). • The integrity of the Koala fencing will be periodically inspected. • Construct dedicated Koala underpass across access road (refer **Figure 1** of Koala Management Plan for location). Underpass is to be constructed under the guidance of the Qld DTMR *Fauna Friendly Road Design* Manual. • Erect fauna fencing to choreograph Koala to underpass. • Erect 'Koala Area' signage advising of reduced speed and increased driver alertness 1.5km from entrance to east pit. • Limit vehicle speed to 40 kph for final 1.5 km of the western portions of entrance roadway.	program and all persons entering the site are aware of these protocols. • The Koala exclusion fencing (and signage) is installed and functioning effectively around high risk areas. • Fauna underpass has been constructed in a manner to provide dry and safe movements for Koala and other local fauna. • Fauna fencing is erected at the appropriate location to funnel Koala through the underpass. • All persons entering/exiting the site are driving to stated speed limits.	prevent future failures. • All failures of the Koala exclusion fencing will be repaired in a timely manner and will be investigated and, as required, actions will be developed to prevent future breaches within 7 days of notification of failure. • Staff, contractors or visitors who disobey the speed limit will be issued with a disciplinary warning.	be maintained over the life of the quarry. • Koala exclusion fencing (and signage) will be established before the quarrying commences and will be advanced as required to keep pace with quarry activities over the life of the quarry.

APPENDIX 6

Rehabilitation Area



REHABILITATION OBJECTIVES

The objectives of this Rehabilitation Plan are to meet the requirements of EPA Approval Conditions L3-5 (APP0030093), being:

- L3. Prior to any clearing of regional ecosystem (RE) 12.8.17 in West Pit, rehabilitation of the 'Rehabilitation Area' as shown in **Figure 1** must be completed.
- L4. Regional ecosystem (RE) 12.8.17 in the West Pit must be clearly marked and signposted, to ensure that contractors and operators are aware of this restricted area of the site.
- L5. The completed rehabilitation in L3 must:
  - ensure suitable native species of vegetation for the location are established and sustained for earthen surfaces;
  - ensure **remnant** status for the 'Rehabilitation Area' as shown in **Figure 1** is achieved; and
  - be certified by an appropriately qualified person as meeting the requirements of this condition.

Demarcation of RE 12.8.17 in West Pit (L4)

Prior to commencement of works within the West Pit, the Quarry Manager or their representative will ensure the boundaries of the mapped RE12.8.17, (area shown in green on **Figure 1**) are accurately identified, clearly marked and signposted at strategic locations (***Authorised Personnel Only***).

Demarcation of Rehabilitation Area

As soon as practical, following development approval, the Quarry Manager or their representative will ensure the boundaries of the 'Rehabilitation Area' shown on **Figure 1** have been identified and clearly marked.

REHABILITATION METHODOLOGY (L3, L5)

Weed management

The focus of weed management will be the removal of patches of Lantana *Lantana camara*, which were recorded at a number of locations within the Rehabilitation Area. Lantana is listed as a restricted species under the Queensland *Biosecurity Act 2014*. Dependent on the level of infestation, this weed can be hand-pulled, cut-stumped, splatter-gunned and/or foliar sprayed. The use of herbicides must be undertaken in accordance with manufacturer's guidelines and must be approved for use in agricultural areas and near a waterway.

The ground layer within the Rehabilitation Area is dominated by exotic grasses that have been heavily grazed. Once stock have been excluded from the Rehabilitation Area, these grasses are likely to proliferate. As part of the weed and rehabilitation monitoring (refer **Table 3**), the extent and impact of exotic grasses will be recorded. Dependent on the level of impacts ,e.g. cover, density and height of exotic grasses has reached stage that it precludes natural regeneration, adaptive management measures should be initiated. Adaptive measures could include slashing of grasses or pulse grazing, controlled burns or herbicide treatment.

Encourage native species recruitment and establishment

To promote natural regeneration of native species, cattle/horses will be excluded and exclusion fencing will be erected around the boundaries of the Rehabilitation Area. Signage stating ***Authorised Access Only*** will be placed approximately 100 m apart at strategic locations along this fencing.

The Quarry Manager or their representative will ensure the integrity of the exclusion fencing is routinely checked on a monthly basis. Any breaks in the fence line or opportunities for cattle/horse entry are to be rectified.

Routine monthly monitoring of the level of native flora species recruitment should be undertaken in accordance with **Table 3** to determine if natural recruitment will achieve the objectives of this Plan, or whether supplementary plantings and/or soil preparation may be necessary.

Supplementary plantings

Exclusion of stock should facilitate natural regeneration of native species, particularly those species associated with the riparian zone, such as *Melaleuca viminalis and Acacia melanoxylon.* However, much of the Rehabilitation Area is devoid of native trees; therefore, potential propagule resources for natural regeneration may be limited in totally cleared areas. It is therefore recommended that supplementary plantings of species reflective of the pre-clear regional ecosystem (RE12.8.17) be undertaken in strategic areas to supplement natural recruitment.

Species to be planted are indicated in **Table 1** below, based on the pre-clear regional ecosystem RE12.8.17. Seedlings should be sourced from local provenance (i.e. within 10 km, or a close as possible). Alternatively seeds could be collected from mature trees within the quarry site and used to direct seed the cleared areas, or used to propagate seedlings for later planting.

Each species is to be planted in a random, 'natural' manner across the Rehabilitation Area, at the spacings provided in **Table 1.** The spacing of canopy and ground cover species required within the Rehabilitation Area are in accordance with the Queensland Herbarium regional ecosystem technical descriptions for RE12.8.17.

Table 1: Species selection and spacing

Species Name	Common Name	Area for Planting	Spacing (m apart)
Canopy species			
Eucalyptus tereticornis	Forest Red Gum	On lower slopes	5
Eucalyptus crebra	Narrow-leaved Ironbark	On higher slopes	5
Eucalyptus melanophloia	Silver-leaved Ironbark	At highest slopes in western portions of area.	5
Corymbia tessellaris	Moreton Bay Ash	On higher slopes	5
Melaleuca viminalis	Bottle Brush	On lower slopes near riparian vegetation	20
Shrub species			
Jacksonia scoparia	Dogwood	On higher slopes	5
Alphitonia excelsa	Soap Tree	Lower slopes	5
Acacia fimbriata	Fringed Wattle	Lower slopes	5
Dodonaea viscosa	Hop Bush	On higher slopes	5
Groundcover species			
Chrysocephalum apiculatum	Yellow Buttons	On lower slopes	1
Dianella cerulea	Blue Flax-lily	On lower slopes near riparian vegetation	1
Lomandra longifolia,	Spiny Mat-rush	Beside creek	1
Themeda triandra	Kangaroo Grass	On higher slopes	1
Heteropogon contortus	Spear Grass	On higher slopes	1
Imperata cylindrica	Blady Grass	On higher slopes	1

All plants will be planted at 50mm tubestock size.

All plants are to be planted into prepared holes that measure the depth and twice the width of the tube stock. Tree guards are to be used if grazing macropods are present. If there is a likelihood that macropod grazing of plants will occur and tree guards are not sufficient to prevent damage to plantings, temporary fencing should be installed along the boundaries of the planting areas until plants become established.

Watering and Fertilizers

A minimum of 5-10 L of water should be applied to each tube stock directly after planting. A diluted solution of SeaSol® liquid fertiliser may also be applied in order to reduce transplant shock and encourage root growth at the time of planting. A suitable fertiliser tablet for native species should be placed adjacent to but not touching the root ball. A follow-up application of fertiliser is unnecessary as native plants are generally adapted to low nutrient level in the soil.

Watering schedule should follow the following recommendations in **Table 2**, although may be subject to change depending on rainfall frequency and intensity. Adjustments to watering frequency and quantity should also be made according to visual inspection of site condition and plant health. Watering should be carried out early in the morning or late in the afternoon to avoid excessive water loss from evaporation.

Table 2: Watering schedule

Week	Frequency*
1 – 2	One cycle every second day
2 – 7	Two cycles per week
7 – 12	Once cycle per week
12-20	Site to be monitored for wilting of plants and watering to be undertaken as required.

***During periods where rainfall events occur, watering will not be required.**

MONITORING AND MAINTENANCE SCHEDULE

Three 50 m transects should be established in representative vegetation communities following contours within the Rehabilitation Area, as shown in **Figure 1**. The start and end point should be permanently marked for future reference. Along each 50 m transect record the following;

- photograph at start and end of transect taken looking along the length of transect;
- species and height of ecologically dominant layer (EDL);
- fuel loads measured in accordance with Victoria Department of Sustainability and Environment *Overall* fuel hazard assessment guide (2010) (i.e. elevated fuel, near-surface fuel and surface fuel levels);
- signs of disturbance (e.g. herbivore damage, fire damage, trampling etc.);

Along each 50 m transect establish three 1 x 1 m permanent monitoring plots; one at the start, one in middle and one at end of transect, positioned on opposite sides of transect.

Take a photograph of entire area within the monitoring plot and within each plot record the following:

- species and height of ecologically dominant layer (EDL);
- weed species and percentage cover of each weed species;
- weed species present;
- percentage of bare ground cover;
- percentage of native plant cover;
- all flora species present within plot;
- number, species and health (dead, poor, typical) of naturally recruited plants;
- number, species and health of planted stock;

Monitoring and maintenance of the Rehabilitation Area should be undertaken as per Table 3 until such time as systematic surveys determine that the area has reached remnant status; i.e. the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the undisturbed canopy for RE 12.8.

Maintenance will be undertaken by the rehabilitation contractor or other suitably qualified contractor as per Table 3.

Table 3: Monitoring and maintenance schedule

Timing	Maintenance Task
Monthly for first 12 months after stock exclusion	**Control weeds** – Check for weeds and control as required**,** taking care not to damage planted and regenerating native species, including grasses and forbs. **Watering** – Water each planted stock as per **Table 2**, depending upon prevailing weather conditions, and then monthly or as necessary until seedlings are established and self-sustaining (approximately 3 – 6 months). **General Site Maintenance** – e.g. remove any rubbish found on site; check for signs of erosion; check for excessive fuel load and remove woody debris if necessary. **Replacement Planting –** Replace dead or senescent plants according to the planting methods in this plan and continue replacement planting until 95% survival rate achieved. **Monitoring** – Monitor health of planted and retained vegetation on a monthly basis.
Bi-yearly for 36 months after stock exclusion	**Control weeds** – Continue weed checks and control as required as specified for first three months. **Watering** –Any replacement seedlings should be watered weekly during the first month following planting, then water as necessary until seedlings are established (approximately 3 – 6 months after planting). **Replacement Planting** – Replace dead or senescent plants according to the planting methods detailed in this plan and continue replacement planting until 95% survival rate achieved. **General Site Maintenance** – Remove any rubbish dumped on site; check for signs of erosion; check for fuel load and remove woody debris if necessary.
Yearly until reaches remnant status	**Monitoring –** Monitor plant health, weed intrusions, fuel load until such time as the rehabilitation area has received remnant status (i.e. the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the undisturbed canopy for RE 12.87).

Soil preparation (if necessary)

If monitoring results indicate natural recruitment has not reached the expected level (i.e. at least one new native seedling per monitoring plot) to achieve the Plan objectives, adaptive management measures should be initiated.

Following weed removal, lightly rip soils to a maximum depth of 20cm in areas where natural recruitment is not advancing. If necessary (e.g. a heavy rainfall event is imminent whilst soil is exposed), erect sediment control fencing around ripped areas to minimise the risk that newly ripped soil will enter Warroolaba Creek during rain events.

REPORTING

Following completion of each monitoring event, the rehabilitation contractor will provide the results and any management recommendations in a written report to the Quarry manager or their appointed personnel.

Once a suitably qualified person certifies that vegetation within the Rehabilitation Area has reached remnant status, a report will be issued to the Department of Environment and Science, or appropriate regulatory body, to have the Rehabilitation Area recognised and mapped on State vegetation mapping as remnant. The report will include results from vegetation assessments undertaken within the Rehabilitation Area and conducted in accordance with Neldner *et.al* (2019).

REFERENCES

Neldner v.J., Wilson B.A., Dillewaard H.A., Ryan T.S, Butler D.W., McDonald W.J.F., Addicott E.P. and Appelman C.N. (2019). Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland Version 5.0. Queensland Herbarium, Science and Technology Division Department of Environment and Science.