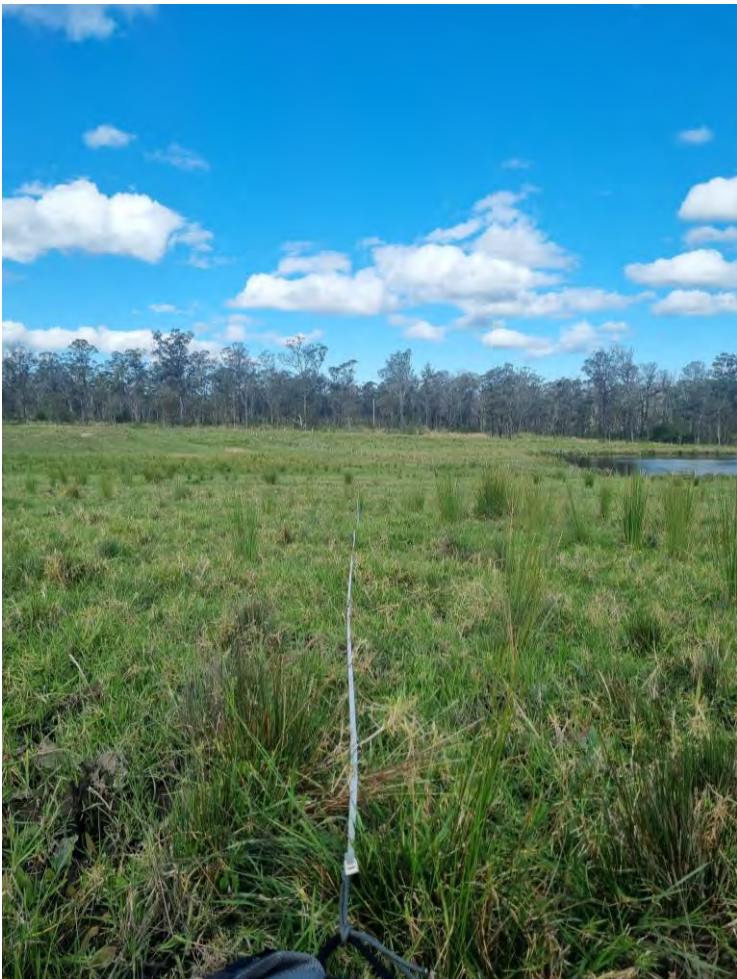


Koala Plan of Management (KPOM)

Deep Creek Quarry,
279 Deep Creek Road, Limeburners Creek NSW 2324



Rev 2
23 December 2022



Koala Plan of Management (KPOM)

Deep Creek Quarry,
279 Deep Creek Road, Limeburners Creek NSW 2324

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Version Control

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

Wedgetail Project Consulting Pty Ltd (WPC) was engaged by Ironstone Developments Pty Ltd to prepare a Koala Plan of Management (KPoM) for the proposed Deep Creek Quarry (DCQ) at 279 Deep Creek Road, Limeburners Creek NSW 2324 (hereafter referred to as the ‘Study Area’) (**Figure 1**). The provision of this KPoM is a requirement of the *State Environmental Planning Policy (Koala Habitat Protection) 2020* (NSW) (known hereafter as “*Koala SEPP 2020*”) and the identification of ‘Core Koala Habitat’ in accordance with the *Koala SEPP 2020* within the Study Area (Wedgetail 2022).

The following terms are used throughout this report to describe geographical areas (**Figure 2**):

- **Development Site:** The area to be directly impacted by the proposed Project (31.89 hectares)
- **Study Area:** The area comprising the Development Site plus a buffer area ranging from 25 to 50 m wide to account for possible indirect impacts (44.21 hectares).
- **Study Area:** Lot 472 DP 1162208, Lot 48 DP 753178, Lot 72 DP 753175 and part Lots 551 DP 1238818, Lot 552 DP 1238818 and Lot 1 DP 507807.
- **Locality:** land within a 10 km radius of the Study Area.
- **Region –** The North Coast Koala Management Area

The requirement to prepare a KPoM was triggered due to the determination that the Development Site contains areas of potential koala habitat and core koala habitat (as defined by SEPP2020) which was assessed within the Biodiversity Development Assessment Report (BDAR) for the project (Wedgetail 2022).

1.2 SITE DESCRIPTION

The Study Area is located approximately 10 km north-east of Clarence Town and 11 km northwest of Karuah, within the Local Government Area (LGA) of the Mid-Coast and within the NSW North Coast Interim Biogeographic Regionalisation for Australia (IBRA) Region and the Karuah Manning IBRA Subregion. The majority of the Study Area is located approximately 1.5 km west of The Bucketts Way, with The Bucketts Way and Pacific Highway intersection located a further 11.5 km south at Twelve Mile Creek.

The Study Area consists of vegetated spurs and drainage gullies, with a mosaic of remnant vegetation and previously cleared land for pasture and historical timber harvesting activities. The proposed Development Site is located on mid to upper slopes of a vegetated spur, with the infrastructure areas on the lower and more cleared slopes west of Deep Creek. The proposed site access road (approximately 2 km) crosses Deep Creek and is located upon a combination of disturbed native vegetation and cleared agricultural pastures. The cleared agricultural pastures are currently used for cattle grazing. Surrounding lands contain rural properties of approximately 40-200 ha, with smaller 2-10 ha lots further south off Forest Glen Road.

1.3 PROPOSED DEVELOPMENT

The proposed development includes the establishment of a hard-rock (rhyolite) quarry (i.e. “Deep Creek Quarry” [DCQ]), weighbridge, workshop, stockpiles, and crushing areas. The development will also involve the construction of a new private haul road from the pit and associated infrastructure to a new intersection onto The Bucketts Way. The road will include a crossing of Deep Creek, and culvert crossings over other minor drainage lines. The total Development Site footprint is 31.89 ha. The expected life of the DCQ project is 30 years.

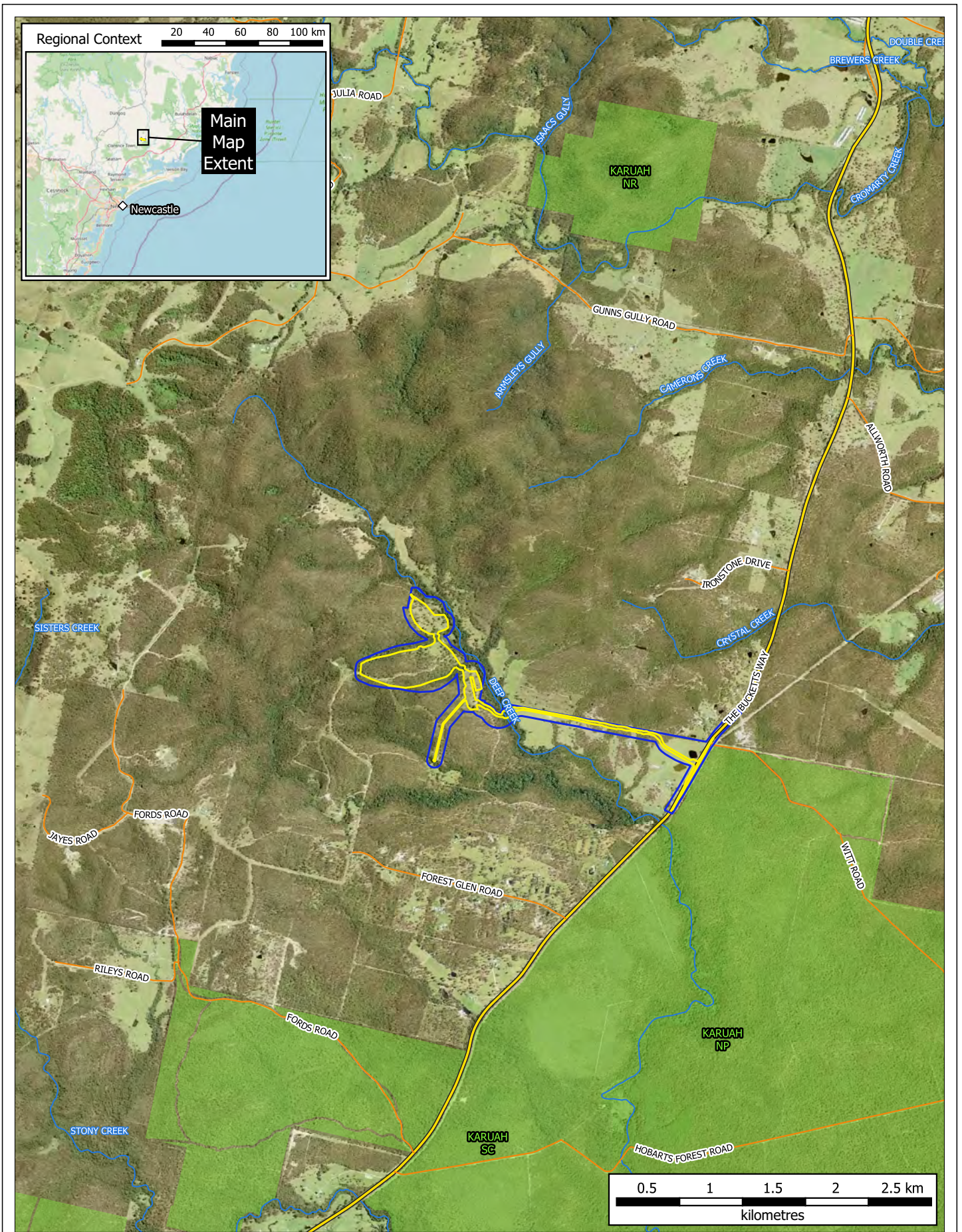
1.4 MANAGEMENT PLAN OBJECTIVES

This KPOM has been completed in accordance with requirements of the *Koala SEPP 2020*, and Section 2.2.2 of the guidelines (i.e. *State Environmental Planning Policy No. 44 – Koala Habitat Protection – Circular NO. B35*).

The key objectives of this KPOM are based on matters provided in Section 2.2.2 of the guidelines (i to viii), and include the following:

1. Provide a summary of the koala habitat value within the Study Area,
 - *Estimation of koala population size and extent (i),*
 - *Identification of preferred feed tree species for the locality and extent of resource available (ii),*
 - *Assessment of the regional distribution of koalas and the extent of alternative habitat available to compensate for that affected by the actions (iii),*
 - *Identification of linkages of core koala habitat to other adjacent areas of habitat and movement of koalas between areas of habitat. Provision of strategies to enhance and manage these actions (iv).*
2. Identify key threats to the koala population occurring as a result of the proposed development,
 - *Identification of major threatening processes such as disease, clearance of habitat, road kill and dog attack which impact on the population. Provision of methods for reducing these impacts (v).*
3. Outline measures for impact mitigation and amelioration measures to be employed during construction and throughout the operation of the proposed development, and
 - *Provision of detailed proposals for amelioration of impacts on koala populations from any anticipated development within zones of core koala habitat (vi),*
 - *Identification of any opportunities to increase size or improve condition of existing core habitat, this should include lands adjacent to areas of identified core koala habitat (vii).*
4. Detail plans for the management of the resident koala population and key koala habitat values present within the Study Area, including monitoring programme, throughout the KPOM implementation period (total operational period of the DCQ – expected to be 30 years).
 - *The plan should state clearly what it aims to achieve (for example, maintaining or expanding the current population size or habitat area) (viii).*

Discussion of existing koala habitat values, potential impacts and recommended management measures detailed within this KPOM have been informed by a review of relevant literature and vegetation assessments and targeted koala surveys undertaken as part of the Biodiversity Development Assessment Report (BDAR) (Wedgetail 2022).



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Legend

- Development Site Boundary
- Study Area
- National Park
- Arterial Road
- Local Road
- Named Watercourse

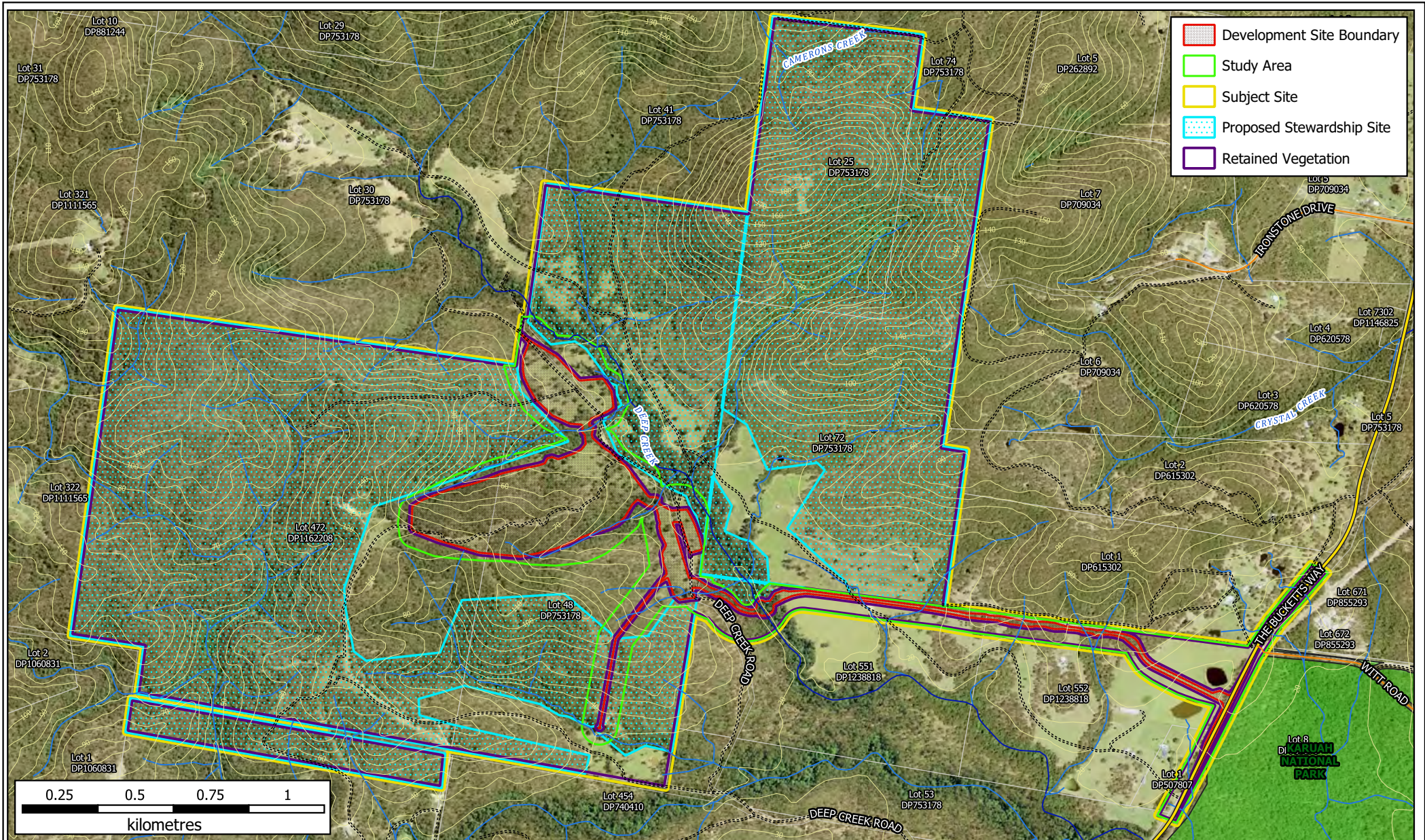
Locality

Ironstone Developments Pty Ltd
Deep Creek Quarry
Koala Plan of Management
Buckets Way, Limeburners Creek, NSW 2324

Figure:

1





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Date: 05/12/2022



Legend

- Cadastre (White outline)
- National Park (Green fill)
- Major watercourse (Blue line)
- Minor watercourse (Light blue line)
- Contours (10m) (Yellow line)
- Arterial Road (Yellow line)
- Local Road (Orange line)
- Track-Vehicular (Dotted line)

Subject Site and Development Site

Ironstone Developments Pty Ltd
Deep Creek Quarry
Koala Plan of Management
Bucketts Way, Limeburners Creek, NSW 2324

Figure: **2**



2. KOALA HABITAT

A Biodiversity Development Assessment Report (BDAR) was completed for the Deep Creek Quarry project by Kleinfelder including a site-based assessment of koala population and habitat values within the Study Area (Wedgetail 2022). The results of the BDAR were used to provide an assessment of koala habitat values within the Study Area and locality and threats considered relevant to this management plan.

2.1 EXISTING KOALA HABITAT VALUES

Habitat for the Koala (*Phascolarctos cinereus*) is highly variable across the species' broad geographic range spanning coastal and inland areas from far-north Queensland to the south-east corner of South Australia. Koala habitat suitability is regionally variable and influenced by the availability and nutritional quality of food trees, presence of suitable resting trees and microclimates, age structure of habitat, management history, and barriers to dispersal (DAWE 2021). As such, the value of koala habitat within the Study Area is considered within the following subsections regarding existing vegetation (**Section 2.1.1**), and koala population status and landscape connectivity within the Study Area and the locality (**Section 2.1.2**).

2.1.1 Vegetation

Detailed vegetation surveys were conducted within the Study Area in 2017 and revised/validated in 2022 (Wedgetail 2022). Surveys involved the delineation of vegetation communities with Plant Community Types (PCTs) selected for each vegetation community based on floristic and structural similarity, the landscape position, soil type and other diagnostic features. Following stratification of vegetation communities and condition classes within the Study Area plots/transects were undertaken to collect data representative of composition, structure and function condition attributes.

A total of four (4) PCTs were identified within the Study Area, these include:

- PCT 1590: Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest.
- PCT 1619: Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands.
- PCT 1567: Tallowwood - Brush Box - Sydney Blue Gum moist shrubby tall open forest on foothills of the lower North Coast.
- PCT 1556: Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast.

Additionally, the site contains areas of non-native vegetation, including exotic grasslands, dams, and cleared land (existing roads/ tracks).

Koala Habitat (Food Resource Availability)

The koala is a specialist herbivore feeding almost entirely on the leaves of eucalypts, across a variety of vegetation types ranging from tropical forests to semi-arid woodlands throughout their geographic range. In New South Wales (NSW) alone, koalas have been recorded to use 66 eucalypt species and seven (7) non-eucalypts (DECC 2008, Phillips 2000). However, species selection is highly dependent on the region, with koalas in any one area feeding almost exclusively on a small number of preferred species (preferred food trees). Koalas are also known to use a number of tree and shrub

species for purposes other than primary food species, including supplementary food species and shelter. *The Review of Koala Tree Use Across New South Wales* (OEH 2018) provides a summary of koala use species including ‘regional high use’, ‘local high use’, ‘significant use’, ‘irregular use’, and ‘low use’ species, for each Koala Management Area (KMA).

An assessment of the koala resource availability within each vegetation community identified at the Study Area was based on the availability/dominance of the abovementioned koala use tree categories (OEH 2018) for the North Coast KMA and ranked as High, Moderate, or Low resource availability accordingly. Site-specific resource availability ranks used for this KPOM are described below:

- **High** – A dominance of ‘Regionally High Use’ tree species,
- **Moderate** – A dominance of ‘Locally High Use’ and/or ‘Significant Use’ tree species,
- **Low** – Dominance of ‘Irregular Use’ tree species or highly reduced koala habitat
- **None** – No existing habitat for koalas

Koala resource availability within each vegetation community is summarised in **Table 1** and mapped across the Study Area in **Figure 3**.

Table 1: Koala Habitat Suitability and Resource Availability within the Study Area.

Plant Community Type (PCT)	Koala Resource Availability	Resource Availability	Habitat area (ha) within the Study Area
<i>PCT 1590: Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest</i>	Co-dominance of ‘significant use’ species <i>E. siderophloia</i> , <i>E. acmenoides</i> and <i>Syncarpia glomulifera</i> Sub-dominance of ‘regional high use’ species <i>Eucalyptus microcorys</i> Occurrence of ‘irregular use’ species <i>Corymbia maculata</i> and <i>E. canaliculata</i>	Moderate	36.73 ha
<i>PCT 1619: Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands</i>	Dominance of a ‘local high use’ (<i>Angophora costata</i>) and ‘significant use’ species (<i>Corymbia maculata</i>) Occurrence of a ‘local high use’ species (<i>Eucalyptus resinifera</i> subsp. <i>resinifera</i>) Occurrence of ‘significant use’ species <i>Eucalyptus eugenioides</i> and <i>Syncarpia glomulifera</i> Occurrence of ‘irregular use’ species <i>Corymbia maculata</i> and <i>E. capitellata</i> Occurrence of ‘low use’ species <i>Eucalyptus umbra</i>	Low	13.39 ha
<i>PCT 1567: Tallowood - Brush Box - Sydney Blue Gum moist shrubby tall open forest on foothills of the lower North Coast</i>	Dominance of ‘regional high use’ species <i>Eucalyptus microcorys</i> Co-dominance ‘significant use’ species <i>Syncarpia glomulifera</i> Occurrence of ‘significant use’ species <i>Eucalyptus saligna</i> Occurrence of ‘irregular use’ species	High	10.71 ha

Plant Community Type (PCT)	Koala Resource Availability	Resource Availability	Habitat area (ha) within the Study Area
<i>PCT 1556: Tallowood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast.</i>	<p>Dominance of 'regional high use' species <i>Eucalyptus microcorys</i></p> <p>Co-dominance 'significant use' species <i>E. siderophloia</i>, <i>E. acmenoides</i> and <i>Syncarpia glomulifera</i></p> <p>Occurrence of 'irregular use' species <i>Lophostemon confertus</i></p>		1.74 ha

Koala Habitat (Other Factors)

Koala habitat suitability is a product of several factors in addition to that of preferred feed tree occurrence with the core drivers of habitat suitability varying at different scales, including at the site level (e.g. food, shelter, breeding needs), to the broader landscape (e.g. climate, habitat connectivity). The Koala Habitat Information Base (DPIE 2019) provides a series of spatial datasets detailing koala habitat suitability and occupancy across New South Wales. The Koala Habitat Information Base datasets reviewed in relation to koala habitat within the Study Area are presented in **Appendix A** and include the following:

- The Koala Habitat Suitability Model (KHSM)
- The Koala Tree Index (KTI)
- Koala Likelihood Map (1999 – 2018)
- Areas of regional koala significance (ARKS)

The Koala Habitat Suitability Model

The Koala Habitat Suitability Model (KHSM) provides a measure of koala habitat suitability at any location. The model predicts the likelihood of finding habitat that is ecologically similar to where koalas have been observed over the past 40 years. The model predicts the spatial distribution of potential koala habitat across NSW using a value between 0 and 1 (i.e. a higher value represents a higher probability that a specific location will contain habitat suitable for koalas). The Koala Habitat Suitability Model (**Figure A1**) indicates that the development site comprises vegetation with koala habitat suitability ranging from 0.21 to 0.85. Areas of higher habitat suitability occur to the south of the proposed quarry pit, with the majority of the Development Site mapped as between 0.3 and 0.55. This indicates that whilst the vegetation within the Study Area is mapped as containing highly suitable koala habitat, the higher suitability habitat occurs outside of the proposed development site.

The Koala Tree Index

The Koala Tree Index (KTI) provides a measure of the probability of finding a tree species that koalas are known to prefer for food or shelter. The Koala Tree Suitability Index (**Figure A2**) indicates the development site comprises vegetation within tree suitability ranging from 0.31 to 0.9.

Koala Likelihood Map (1999 – 2018)

The Koala Likelihood Map (KLM) provides the likelihood of koalas occurring across a 10-square-kilometre grid covering NSW, based on available arboreal mammal records from the past 20 years. The Koala Likelihood Map and Koala Likelihood Confidence Map (**Figure A3**) indicates that the

likelihood of finding a koala within the development site ranges between 0.26 to 0.50 (within a moderate confidence area).

Areas of regional koala significance (ARKS)

This dataset provides mapping of regions that have high known koala occurrence using analysis of koala observation densities. The Study Area is within Wang Wauk State Forest ARKS (**Figure A4**) which identifies regions mapped as having key koala populations with potential for long-term viability. The ARKS extends from Hexham in the south to Nabiac in the north and has an area of 174,864 ha. Proportionally, the ARKS is comprised of 32% high functional habitat, 35% moderate function habitat, 24% low functional habitat and 9% very low functional habitat. The ARKS is noted to have moderate resilience, high fragmentation risk, high wildlife risk, moderate vehicle strike risk, moderate heat stress risk, moderate disease risk, high dog attack risk and moderate climate change risk. In total, there are 418 koala records from within the ARKS.

Koala Habitat (SEPP 2020)

An Assessment of koala habitat under the Koala SEPP 2020 was completed within the BDAR (Kleinfelder 2021) regarding the presence of 'Potential Koala Habitat' and 'Core Koala Habitat' the following conclusions were made:

Potential Koala Habitat

Potential Koala Habitat: means areas of native vegetation where trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. All PCTs within the Development Site are dominated by Koala Feed tree species listed under Schedule 2 of the Koala SEPP. These species constitute over 15% of the total number of trees within each Vegetation Zone. As such, the vegetation within the Development Site constitutes "Potential Koala Habitat" as defined under the SEPP.

Core Koala Habitat

Core Koala Habitat: means an area of land with a resident population of koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population. Evidence of Koalas were recorded at six locations in four areas within the Study Area, an additional 39 Koala records occur within a 5 km of the Study Area. As such, the vegetation within the Development Site constitutes "Core Koala Habitat" as defined by the SEPP.

2.1.2 Koala Population

Koala Records within the Study Area

Evidence of Koalas were recorded at six locations, in four areas within the Study Area via opportunistic sighting, remote camera survey and scat detection (SAT Assessment). The four areas included:

- Mid-way along the access road (opportunistic sighting and camera);
- Near Deep Creek crossing (opportunistic sighting and SAT Assessment);
- In the gully near the southern side of the quarry pit (SAT Assessment); and
- Within the riparian corridor below the main stockpile area (SAT Assessment).
- Multiple locations within the proposed offset areas to the West (opportunistic scat detection and sightings).

All detections tended to be within the lower slopes and gullies. Four Koala detections occurred within the Development Site. All koala records within the Study Area recorded during targeted surveys completed for the BDAR (Wedgetail 2022), through additional surveys for other species within the proposed offset areas and from further surveys completed by Biolink (Biolink 2022) within the Study Area and are identified in **Figure 3**.

Regional Koala Population

Review of the NSW BioNet Atlas (DPIE 2021) shows that 40 records of Koala exist within 5 kms of the Study Area, 32 of these records are considered to be recent (<18 years old), eight (8) are historic records (>18 years).

Population Connectivity

A review of the distribution of koala records within the locality and within the Study Area, and habitat suitability modelling have allowed for the identification of several potential koala movement corridors within the vicinity of the Study Area. These corridors are primarily within intact vegetation alongside watercourses (see **Figure 3**). Three potential koala corridors intersect the Study Area at creek locations associated with koala records.

Measures to reduce impacts to these potential koala movement corridors are detailed in **Section 3**.

Local Koala Population (Biolink 2022)

Targeted surveys completed by Biolink (2022) who characterised the koala population and location and extent of koala habitat on site as the following:

- Seven (7) Spot Assessment Technique (SAT) sites were assessed (five within the quarry pit footprint, two within the buffer).
- The presence of *Corymbia maculata* (Spotted Gum) and *Corymbia gummifera* (Red Bloodwood) allowed Biolink to characterise the greater portion of the quarry pit area as having a 'low nutrient soil landscape'.
- Four (4) of the seven (7) SAT sites contained Preferred Koala Feed Trees (PKFTs)
- Two (2) of the seven (7) SAT sites contained evidence of habitat utilization by koalas (faecal pellets). Both sites returned measures of habitat utilization indicative of *transient use* (i.e. both returned koala activity levels of less than 10%) based on the activity thresholds in Table 2 of Phillips and Callaghan (2011).
- Higher koala habitat suitability and use outside of the development footprint, within vegetation to the south of the proposed quarry pit area: *"The presence of a south-easterly trending koala activity gradient implied the likelihood of significant levels of habitat use by resident animals immediately to the south of the peripheral buffer area adjoining the quarry pit in the south"* (Biolink 2022) (see **Plate 1**)
- A sparse distribution of PKFTs within the proposed haul road

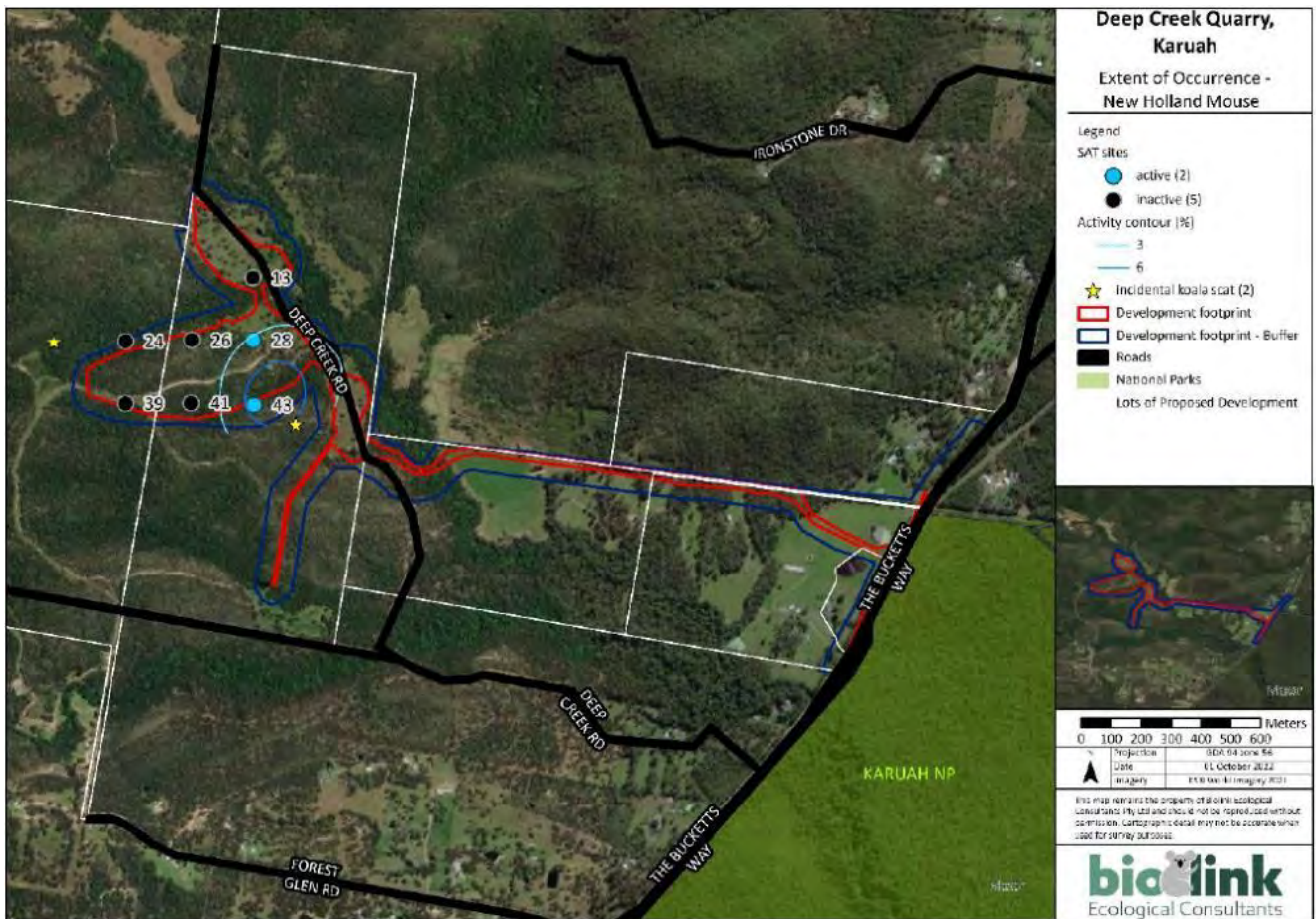
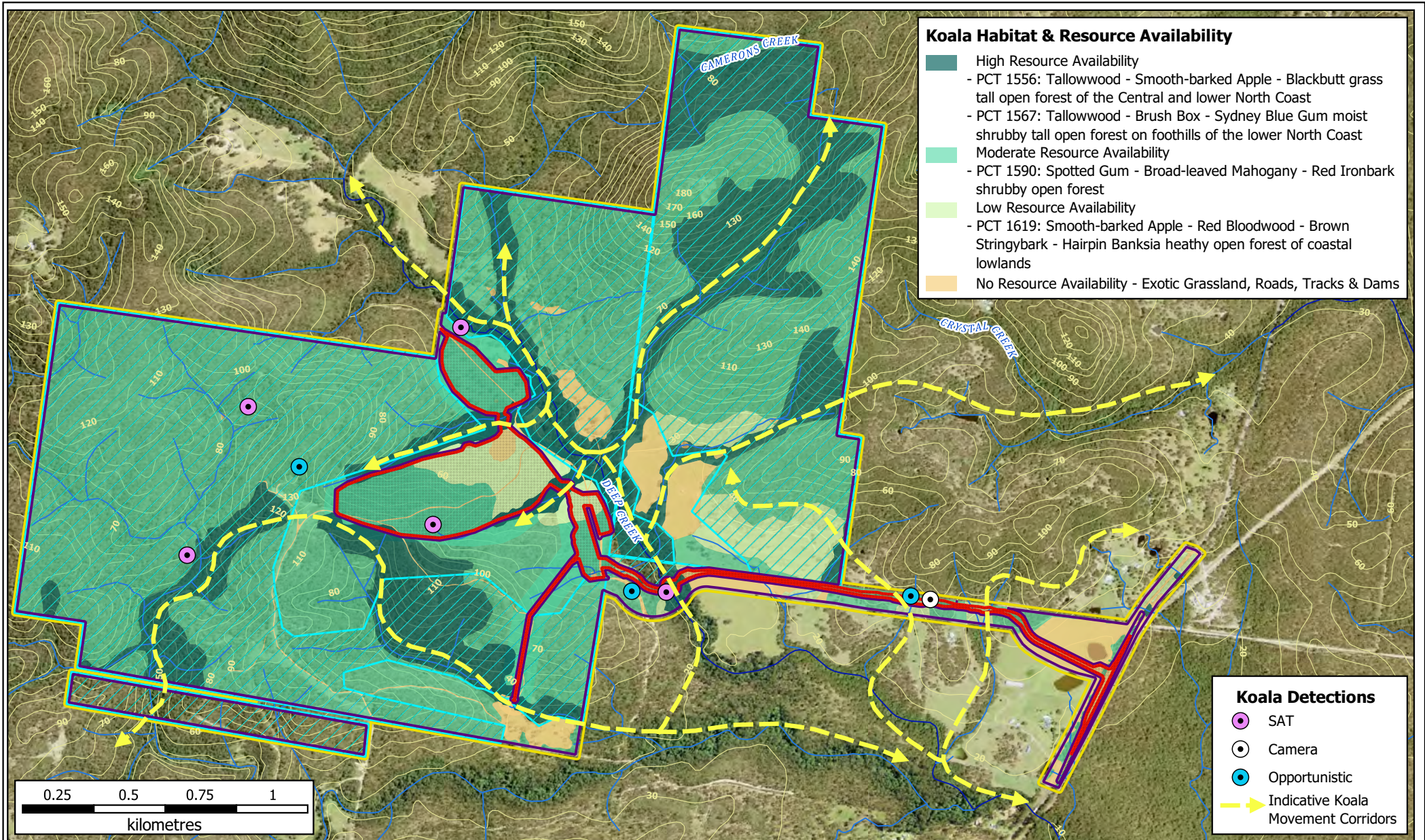


Plate 1: Biolink SAT survey results and indicative koala population activity.

Inactive SAT sites (black circles) (n=5), Active SAT sites (blue circles) (n=2) based on the presence of koala faecal scats. Interpolated activity contours illustrate increasing activity to the south of the proposed quarry pit area (blue lines, darker colour indicative of increasing activity).

The results from Biolink surveys indicate that koala activity within the development site is largely **“transient”** in nature and concentrated to the south of the proposed quarry pit area. The report also highlights the importance of areas of higher PKFT concentrations on alluvial soils located primarily at haul road creek crossings. These conclusions support the koala habitat mapping shown in **Figure 3**, which illustrates higher koala resource availability and koala movement corridors within Vegetation Zones 8 and 9.



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Legend

- Subject Site
- Proposed Stewardship Site
- Development Site Boundary
- Retained Vegetation
- Major watercourse
- Minor watercourse
- Contours (10m)

Koala Habitat and Resource Availability

Ironstone Developments Pty Ltd
Deep Creek Quarry
Koala Plan of Management
Bucketts Way, Limeburners Creek, NSW 2324

Figure: **3**



2.2 KEY THREATS

Threats to koala populations throughout NSW are identified by the NSW Recovery plan for the koala (DECC 2008), and the *Draft National Recovery Plan for the Koala Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (DAWE 2021). Key threats relevant to the proposed development and management of koalas within the Study Area are detailed in the following subsections.

2.2.1 Habitat loss and fragmentation

Land-use practices causing the loss and fragmentation of koala habitat is considered the primary ecological threatening process for the species (DAWE 2021). The loss of high-quality koala habitat through historical land clearing of forests on more fertile soils for agriculture, urban development, forestry and infrastructure has resulted in the restriction of koalas over time to lower quality habitat, supporting lower densities of the species overall (DECC 2008). Fragmentation of koala habitat can result in the isolation of animals, and reduction in dispersal and recruitment between populations, resulting in genetic bottlenecks and exacerbating other threats to koalas such as road mortalities, predation, and disease (DECC 2008).

Construction Phase

The proposed development will result in the clearing of 29.16 ha of koala habitat within the Development Site, this includes 2 ha of habitat considered to have High resource availability, 18.42 ha of habitat with Moderate resource availability, and 8.74 ha of habitat with Low resource availability. Impact mitigation measures relevant the Study Area are provided in **Section 3**.

Connectivity of retained koala habitat within the Study Area with similar vegetation within the locality will largely be maintained, ensuring minimal habitat fragmentation as a result of the proposed works. A number of potential koala movement corridors were identified within the locality based on habitat suitability and koala records. Suitable management of these movement corridors is detailed within **Section 3** of this plan.

2.2.2 Habitat degradation

The degradation of remnant habitat as a result of weed invasion, tree dieback and changes in species composition is a threat to koalas (DECC 2008). Dense weed cover (e.g. thickets of lantana) can reduce the ability of koalas to move freely within the landscape, whilst a change in tree species composition from dieback or dominance of exotic tree species can result in a reduction of preferred koala feed trees and therefore habitat suitability (DECC 2008).

Construction Phase

Construction activities occurring on site as part of the proposed development, namely vehicle movements and transport of materials (i.e. soil and mulch) have the potential to facilitate the spread of exotic flora species within the Study Area.

Erosion resulting from earthworks such as the operation of machinery during the construction phase may facilitate the movement of water-borne sediments that have the potential to adversely impact important biodiversity values on site. This may include impacts on the condition of native vegetation, hence koala food tree resources.

Operational Phase

The operation of the DCQ may further exacerbate local weed incursions or facilitate the introduction of novel weed species from heavy vehicle traffic. The generation of dust from heavy vehicles also has the potential to impact vegetation adjacent to proposed haul roads and surrounding crushing and stockpiling facilities. Dust generation and movement onto plants within retained areas can lead to vegetation dieback. Measures to mitigate these threats to koala habitat are outlined in **Section 3**.

2.2.3 Vehicle Strike

Roads are a significant cause of koala death and injury throughout their distribution. There is the potential for an elevated risk of injury from vehicles within the Study Area during both the construction and operational phases of the development. These include the movement of heavy construction vehicles and the regular use of haul roads for heavy vehicles during the quarry's operation. Mapped potential movement corridors within the Study Area represent the areas of highest risk of vehicle strike (see **Figure 3**). Impact mitigation measures for the management of road-kill risks for koalas within the Study Area are detailed in **Section 3**.

2.2.4 Dog attacks

Wild and domestic dog (*Canis lupus familiaris*) attacks are a recognised threat to the Koala (DAWE, 2020). The existing weed and feral animal threat levels are unlikely to change significantly due to the proposed Action. The proposed development is not anticipated to result in the increased occurrence of dogs or lead to an increase in the occurrence of dog attacks on koalas within the Study Area or locality. Although unlikely to increase feral species activity within the area opportunistic sightings or evidence of use in the Study Area (i.e.. Scats and tracks) will be noted and feral species control will be assessed within the Study Area.

2.2.5 Disease

Koala populations in NSW carry the pathogens *Chlamydia spp.* However, clinical signs of this infection (commonly conjunctivitis and urogenital tract infections), chlamydiosis, are expressed when animals are exposed to environmental stresses such as loss of habitat, harassment by predators, nutritional stress or overcrowding (DECC 2008). *Chlamydia* is a recognised threat to the koala within the Study Area. However, the proposed development and its operation is unlikely to include activities that are likely to directly increase the occurrence of this disease.

Mitigation measures for stresses to koalas including habitat loss, that have the potential to indirectly result in increased occurrence of disease within the population are detailed in **Section 3**.

3. KOALA MANAGEMENT PLAN

3.1 KOALA MANAGEMENT ZONES

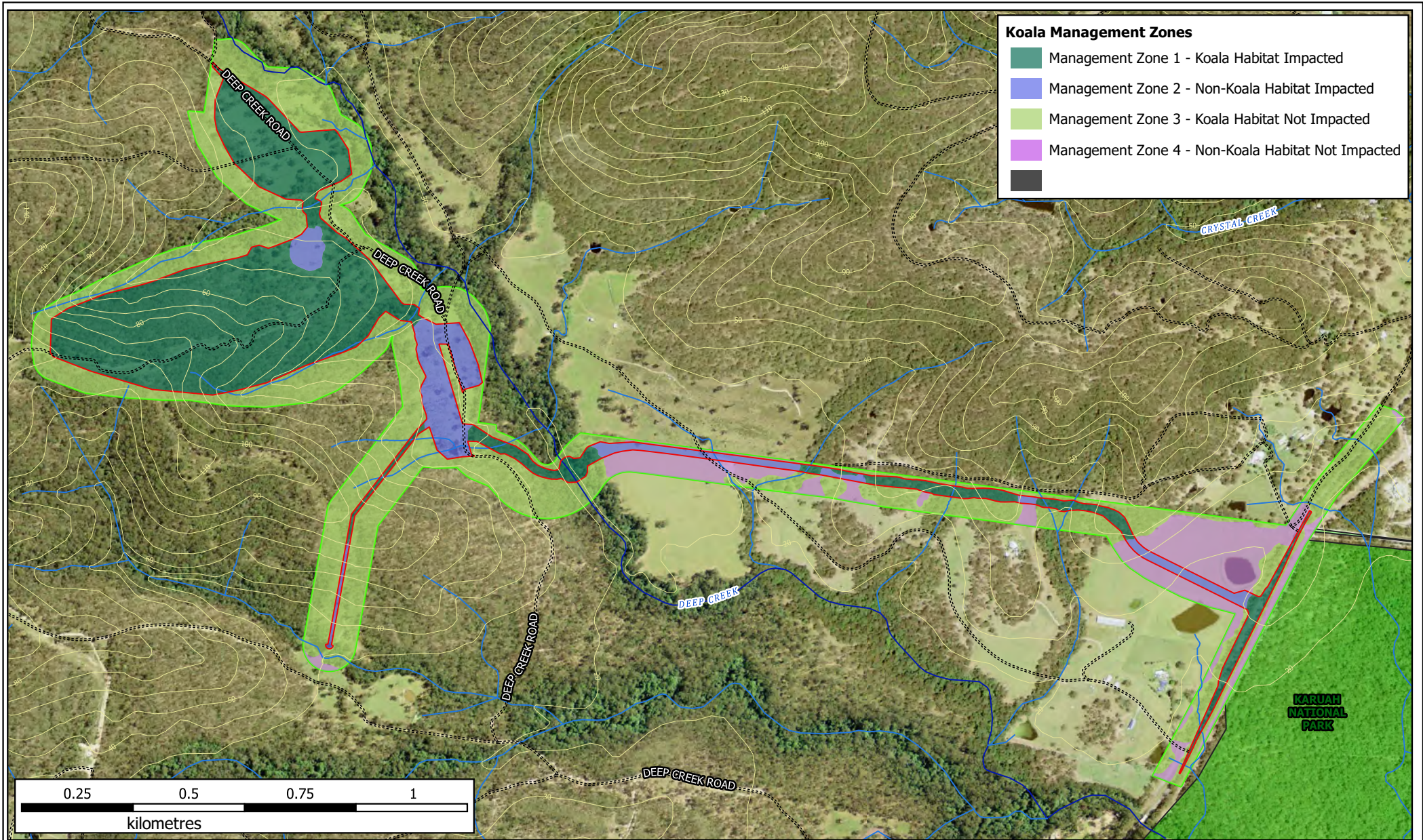
Four Koala Management Zones pertain to the Study Area based on the presence of koala habitat, current condition/status, management requirements, and proposed future land use. The management zones are shown in **Figure 4** and detailed in **Table 2**.

- **Management Zone 1:** Koala Habitat (Impacted)
- **Management Zone 2:** Non-Koala Habitat (Impacted)
- **Management Zone 3:** Koala Habitat (Retained)
- **Management Zone 4:** Non-Koala Habitat (Impacted)

Table 2: Koala Management Zones within the Study Area

Management Zone	Description
Management Zone 1: Koala Habitat (Impacted)	<p>Total area within Study Area: 29.16 ha</p> <p>Vegetation: Koala Habitat (Low-High Resource Availability) within the Development Site, including:</p> <p><i>PCT 1556: Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast – Area: 0.17 ha</i></p> <p><i>PCT 1567: Tallowwood - Brush Box - Sydney Blue Gum moist shrubby tall open forest on foothills of the lower North Coast – Area: 1.83 ha</i></p> <p><i>PCT 1590: Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest – Area: 18.42 ha</i></p> <p><i>PCT 1619: Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands – Area: 8.74 ha</i></p> <p>Disturbances: Historic vegetation clearing, grazing, and minor weed invasion. This Management Zone will be subject to vegetation clearing and development. The zone will be subject to ongoing use as a quarry during the predicted 30-year operation period.</p> <p>Management Goals: The main goals for this Koala Management Zone will be impact mitigation during vegetation clearing and management of ongoing threats to koala habitat and populations resulting from the operation of the DCQ.</p>
Management Zone 2: Non-Koala Habitat (Impacted)	<p>Total area within Study Area: 2.74 ha</p> <p>Vegetation: Non-Koala Habitat within the Development Site, including:</p> <p><i>Dams – Area: 0.08 ha</i></p> <p><i>Exotic Grassland – Area: 1.60 ha</i></p> <p><i>Existing Tracks and Infrastructure – Area: 1.06 ha</i></p> <p>Disturbances: Historic vegetation clearing, grazing, and minor weed invasion. This Management Zone will be subject to vegetation clearing and development. The zone will be subject to ongoing use as a quarry during the predicted 30-year operation period.</p> <p>Management Goals: The main goals for this Koala Management Zone will be impact mitigation during construction and vegetation clearing (i.e. management of vehicle impacts etc) and the ongoing management of threats to koala habitat and populations resulting from the operation of the DCQ.</p>
Management Zone 3: Koala Habitat (Retained)	<p>Total area within Study Area: 33.43 ha</p> <p>Vegetation: Koala Habitat (Low-High Resource Availability) within the Study Area, outside of Development Site (i.e. not directly impacted by development), including:</p>

Management Zone	Description
	<p><i>PCT 1556: Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast – Area: 1.58 ha</i></p> <p><i>PCT 1567: Tallowwood - Brush Box - Sydney Blue Gum moist shrubby tall open forest on foothills of the lower North Coast – Area: 8.88 ha</i></p> <p><i>PCT 1590: Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest – Area: 18.32 ha</i></p> <p><i>PCT 1619: Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands – Area:4.66 ha</i></p> <p>Disturbances: Historic vegetation clearing, grazing, and minor weed invasion. This Management Zone will be retained as part of the proposed DCQ development. Ongoing threats to this vegetation zone include edge effects from Management Zones (i.e. weed invasion, dust, and pollution).</p> <p>Management Goals: The main goals for this Koala Management Zone will be impact mitigation during vegetation clearing and management of ongoing threats to koala habitat and populations resulting from the operation of the DCQ.</p>
<p>Management Zone 4: Non-Koala Habitat (Retained)</p>	<p>Total area within Study Area: 10.71 ha</p> <p>Vegetation: Non-Koala Habitat within the Study Area, outside of Development Site (i.e. not directly impacted by development), including:</p> <p><i>Dams – Area: 0.53 ha</i></p> <p><i>Exotic Grassland – Area: 8.69 ha</i></p> <p><i>Existing Tracks and Infrastructure – Area: 1.48 ha</i></p> <p>Disturbances: Historic vegetation clearing, grazing, and minor weed invasion. This Management Zone will be retained as part of the proposed DCQ development; however, it does not represent koala habitat. Ongoing threats to this vegetation zone include edge effects from Management Zones (i.e. weed invasion, dust, and pollution).</p> <p>Management Goals: The main goals for this Koala Management Zone will be impact mitigation during construction and vegetation clearing (i.e. management of vehicle impacts etc) and the ongoing management of threats to koala habitat and populations resulting from the operation of the DCQ.</p>



Koala Management Zones

- Management Zone 1 - Koala Habitat Impacted
- Management Zone 2 - Non-Koala Habitat Impacted
- Management Zone 3 - Koala Habitat Not Impacted
- Management Zone 4 - Non-Koala Habitat Not Impacted
-

Created by: KBlundell
Date: 05/12/2022

WEDGETAIL
PROJECT CONSULTING PTY LTD
<https://wedgetail.com.au>

Legend

- Development Site Boundary
- National Park
- Contours (10m)
- Major watercourse
- Track-Vehicular
- Minor watercourse
- Cadastre

Koala Management Zones

Ironstone Developments Pty Ltd
Deep Creek Quarry
Koala Plan of Management
Bucketts Way, Limeburners Creek, NSW 2324

Figure: **4**

3.2 KEY MANAGEMENT ACTIONS

Table 3 Summary of Koala Threats and Actions

Key Threats	Description	Actions	Section
Habitat loss and Fragmentation	Loss and fragmentation of koala habitat is considered the primary ecological threatening process for the species.	The implementation of a Biodiversity Stewardship Agreement (BSA) for an onsite offset. The construction of habitat corridors throughout the development site to assist koala movements.	Section 3.4.4 Section 3.6
		Preferred Koala Feed Tree (PKFT) Planting Offsets. A total of 450 PFFTs will be planted on a 2:1 offset ratio (loss of 225 PKFTs) across an area of 2.8 ha.	Section 3.6.1
		The installation of exclusion fencing and koala underpasses at key movement corridors within the Study Area.	Section 3.4.4
Habitat Degradation	The degradation of remnant habitat as a result of weed invasion, tree dieback and changes in species composition is a threat to koalas	The implementation of a weed control program before and during operations. Monitoring program to be established to monitor vegetation conditions adjacent to the operation areas.	Section 3.4.7 Section 3.5.4
Vehicle Strike	Roads are a significant cause of koala death and injury throughout their distribution.	Fencing, signs and speed humps are to be installed to reduce the risk of vehicle strike. Quarry operation times will further reduce the risk of animal injury/fatalities.	Section 3.4.3 Section 3.4.4
Dog Attacks	Wild and domestic dog (<i>Canis lupus familiaris</i>) attacks are a recognised threat to the Koala	Monitoring program for feral dogs, cats and foxes. If present within the Study Area baiting programs to follow to control feral species.	Section 3.5.4
Disease	Koala populations in NSW carry the pathogens <i>Chlamydia</i> spp.	No actions	Not Applicable

3.2.1 Management Stages

The KPOM will be implemented throughout the construction and operational periods of the DCQ (expected to be a 30-year period). The timing of management tasks and performance criteria are based on Management Stages defined by the progress of the proposed development. The stages are defined as the following:

- **Pre-Construction Phase:** Between development approval and the initiation of construction works on site. Baseline assessments are based within this period.
- **Construction Phase:** Period between the commencement of works and the general operation of the DCQ
- **Adaptive Management/Operational Phase:** Between the first monitoring event and the end of the implementation period (operational period of the DCQ).

3.2.2 Performance Criteria

The overall performance criterion of this KPOM relate to:

- **Vegetation Extent:** There will not be a net decline in the area of suitable koala habitat retained within the site (i.e. Koala Management Zones 3 and 4) within the Study Area.
- **Vegetation Condition:** The condition of the koala habitat within Koala Management Zones 3 & 4 will be maintained. Variables used as a measure of vegetation condition include the following:
 - o The maintenance of Koala Feed Tree Cover (projective foliage cover (PFC)) and condition (no signs of dieback).
 - o The maintenance of other vegetation components within the koala habitat (i.e. native shrub and groundcover species cover and diversity).
 - o Absence of Priority Weeds, Weeds of National Significance (WoNS), and High Threat Weeds (HTWs).
- Koala Population Condition
 - o Evidence of continued utilization of koala habitat on site.
 - o No signs of mortality resulting from DCQ construction or operations (i.e. no road kill)
- Maintenance of impact controls
 - o Signs, fencing and mitigation measures to be maintained throughout the implementation period.

3.2.3 Responsibilities

Implementation and funding of the KPOM is the responsibility of the proponent (Ironstone Developments Pty Ltd). The KPOM will be implemented throughout the DCQ construction and operational periods (estimated at 30 years). Management of the koala habitat values are to adopt an adaptive management process and may be subject to review, based on monitoring results and recommendations.

Strategies outlined in the KPOM will be undertaken by suitably experienced and qualified persons or companies engaged by the proponent. Any vegetation restoration works (including weed management, plantings and landscaping) will be undertaken by a suitably qualified and experienced professional bush regeneration contractor. The minimum qualifications and experience required for the bush regeneration contractor are a TAFE Certificate IV in Conservation and Land Management (or equivalent) and three years demonstrated experience (for site supervisor) and a TAFE Certificate 2 in Conservation and Land Management and one year demonstrated experience (for other personnel). Monitoring and reporting will be undertaken by suitably qualified Ecologists.

3.3 PRE-CONSTRUCTION PHASE

3.3.1 Establishment of Monitoring Program

Floristic monitoring plots and photo monitoring points are to be established within the retained vegetation within the Study Area (Management Zones 3 and 4) in accordance with monitoring program detailed in **Section 3.5.4**. Baseline monitoring is to be completed within one (1) month, prior to the commencement of construction works within the Study Area.

3.4 CONSTRUCTION PHASE

The following measures will be adhered in the construction phase of the project, that being immediately prior to, during and immediately after completion of clearing, earthworks and construction. All contractors, sub-contractors, and personnel must be notified of these measures.

3.4.1 Construction Impact Mitigation

The procedures and mitigation measures detailed below are to be followed/implemented to minimize direct and indirect impacts to biodiversity values within the Study Area:

- Vegetation may only be removed from the approved development footprint.
- Exclusion fencing or demarcation will be installed around the boundaries of vegetation to be retained. The exclusion fencing will extend out to at least 5 m from trees and native vegetation.
- Trees to be retained within the Development footprint will have bunting installed around their drip line, to prevent any disturbance that may impact on their health; this must remain around the tree until all construction activities have been completed.
- The areas of retained vegetation within the exclusion fencing shall be marked as **'No-Go' zones**. All vehicles, construction materials and refuse will be prohibited from these areas. Compaction and the placement of fill within 5 metres of trees and native vegetation will be prohibited.

3.4.2 Vegetation Clearing Supervision

The following procedures in relation to vegetation clearing are to be followed to minimise impacts to koalas within the Study Area.

- Preclearing surveys will be conducted by the project ecologist and will include the following procedures:
 - o The project ecologist will inspect vegetation within the clearing footprint and advise the site manager and tree clearing staff of any habitat potential and precautions necessary during vegetation removal. (see general vegetation management requirements in the BDAR [Kleinfelder 2021]). Nocturnal surveys the night prior to clearing will ensure Koalas are not inhabiting vegetation to be cleared.
 - o The location and number of koala feed trees will be recorded.
- All clearing of native vegetation will be supervised by the project ecologist to ensure koalas are not impacted by clearing activities.
- All handling of fauna species should be conducted by a suitably trained Ecologist. Displaced fauna species are to be relocated to adjacent bushland.
- If fauna are detected within the development site during any works involving machinery works (outside supervised clearing of fauna habitat features detailed above), works are to stop immediately. The animal is to be allowed to leave the site without coercion. Alternatively, a local wildlife rescue service or other suitably qualified/experienced person is to be contacted to facilitate the safe removal of the animal from the worksite.

- If any injured fauna species are found during the construction period, construction must stop immediately so that the injured animal is to be taken to a vet or wildlife carer.

3.4.3 Management of Road Impacts to Koalas

Vehicles are to maintain a speed limit of no more than 40 km whilst on site to reduce the incidence of koala road mortality during construction. All staff/contractors within the Study Area are to be notified about recent records/sightings of koalas within the Study Area including location and behaviour at the time, allowing for increased caution whilst carrying out works/traversing these areas. All koala road mortalities are to be reported and recorded for annual reporting.

3.4.4 Management of Koala Movement and Safety

The following measures have been recommended by Biolink (2022) and will be implemented within the Study Area:

- Exclusion Fencing is to be installed where the haul road intersects sections of Koala habitat.
 - Chain mesh 'floppy top' fencing or 1.5m high chain-mesh fence with a 600mm wide metal flashing.
 - For long stretches of exclusion fencing it is recommended to install escape ramps and/or poles to help Koalas and other fauna to escape to the correct side of the fence.
- Underpasses
 - Under road traverse required for koalas when <35m a reinforced box culvert with minimum dimensions of 1.2m x 1.2m (larger if possible) will suffice.
 - Underpasses will be required to contain 'wildlife furniture' such as a timber post and rail to allow and alternative instead of walking on the ground and will also provide refuge in the case of a dog/fox attack.
- Koala Grids
 - Koala-grids are constructed based on a typical cattle-grid design but otherwise use 50mm round pipe at 100mm centres. Provision should be made to install koala-grids at the end of each exclusion fence section and on any fence breaks required to afford access to properties adjoining the final haul road alignment and quarry design.

Please see **Appendix B** for further photos on the abovementioned measures.

3.4.5 Management of Erosion and Sedimentation

Hydrological and erosion / sediment controls must be implemented to maintain the quality and quantity of pre-development water flows into adjacent vegetation and waterways.

Measures to reduce soil erosion and pollutant run-off during construction activities include:

- Installation of erosion and sediment control measures (including silt fencing) adjacent to new haul roads and along the boundary of retained vegetation considered likely to be impacted by erosion and sedimentation
- Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality.
- Management of excavated materials to reduce the movement of sediments during high wind or rainfall events.

- Appropriate maintenance of stockpiles adjacent to retained vegetation (Koala Management Zones 3 and 4).
- Undertake maintenance of silt fences and other mitigation measures to isolate runoff.

Erosion and sediment control measures should be designed and installed following the Guidelines for Erosion and Sediment Control on Building Sites (DLWC 2001). Useful information can also be found within the Blue Book (Landcom 2004).

3.4.6 Management of Dust

Road surfaces are to be maintained as to minimize the creation and movement of dust into adjacent vegetation.

3.4.7 Weed Management During Construction

Appropriate weed control measures must be implemented during the construction phase, including the following:

- All weeds removed from the site must be transported in a sealed container or bag and disposed at a waste management facility licensed to accept green waste.
- Vehicles, machinery and equipment used during construction must be free from weed material (including seeds) before entering the construction corridor.

3.5 ADAPTIVE MANAGEMENT/OPERATIONAL PHASE

Adaptive management will be undertaken across all four (4) Koala Management Zones within the Study Area throughout the implementation period, with monitoring and report recommendations used to continually inform management strategies. Monitoring and reporting requirements under this Plan of Management are detailed below.

3.5.1 Vehicle Strike

Vehicles are to maintain a speed limit of no more than 40 km/h whilst on site to reduce the incidence of koala road mortality during construction. All staff/contractors within the Study Area are to be notified about recent records/sightings of koalas within the Study Area including location and behaviour at the time, allowing for increased caution whilst carrying out works/traversing these areas. All koala road injuries/mortalities are to be reported and recorded for annual reporting.

Koala warning signs are to be used throughout the haul road to alert drivers of the risk to koalas and speed limit requirements (see **Plate 2**). Roadside vegetation adjacent to conservation areas (1-2m) will be managed to minimise the height of ground cover and therefore increase the visibility of any roadside fauna.



Plate 2: Koala Road Signs

Images courtesy Campbelltown City Council Koala Management Plan (2018)

3.5.2 Management of Dust

Road surfaces are to be maintained as to minimize the creation and movement of dust into adjacent vegetation throughout the operational period of the DCQ.

3.5.3 Management of Noise and Light impacts

The installation of lighting along the haul road adjacent to Koala Management Zone 3 will be prohibited to minimize the impacts of lighting on vegetation and suitability of koala habitat. Any lighting required within the operational areas of the DCQ must be implemented in a way as to reduce the incidence of artificial light within retained vegetation (i.e. direct lighting away from vegetation).

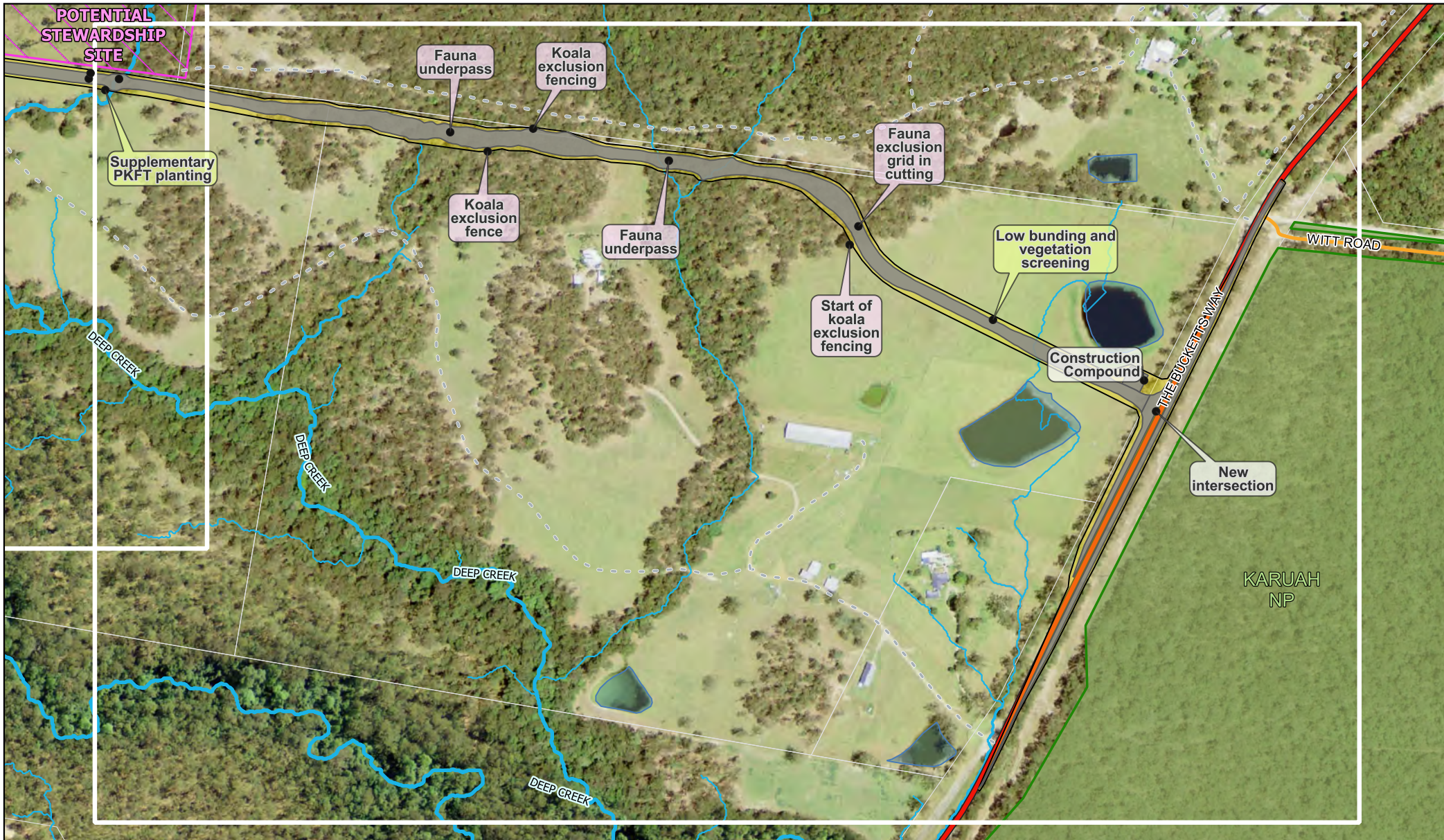
3.5.4 Monitoring Programme

A monitoring programme will be implemented to ensure that the measures detailed within this KPOM are implemented and successful. The programme will be completed throughout the implementation period, a summary of key monitoring events and deliverables are shown in **Table 4**. Monitoring programme methods are detailed below. Reporting requirements are detailed in **Section 3.5.5**.

Table 4: Monitoring and Reporting Summary

Monitoring Event	Timing	Scope	Deliverable
Baseline Monitoring Survey	Completed within one (1) month prior to construction	Establishment of permanent vegetation monitoring plots and completion of the Monitoring Programme	Baseline Monitoring Report
Pre-clearance Survey	Prior to vegetation clearing	Assessment of habitat features to be removed.as per Section 3.4.2	Pre-Clearance Letter Report

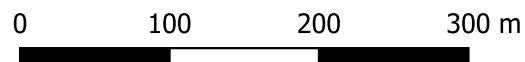
Monitoring Event	Timing	Scope	Deliverable
Clearance Supervision	During vegetation clearing	Supervision of native vegetation clearing as per Section 3.4.2	Clearance Supervision Letter Report
Annual Monitoring Survey	Completed one (1) month following the completion of construction and start of operational phase of the DCQ. Completed annually thereafter for entire implementation period.	Completion of the Monitoring Programme	Annual Monitoring Survey Report
Final Summary Report	Completed at the end of the implementation period.	Summary of the Monitoring Programme throughout implementation period.	Final Summary Report



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 Version: A



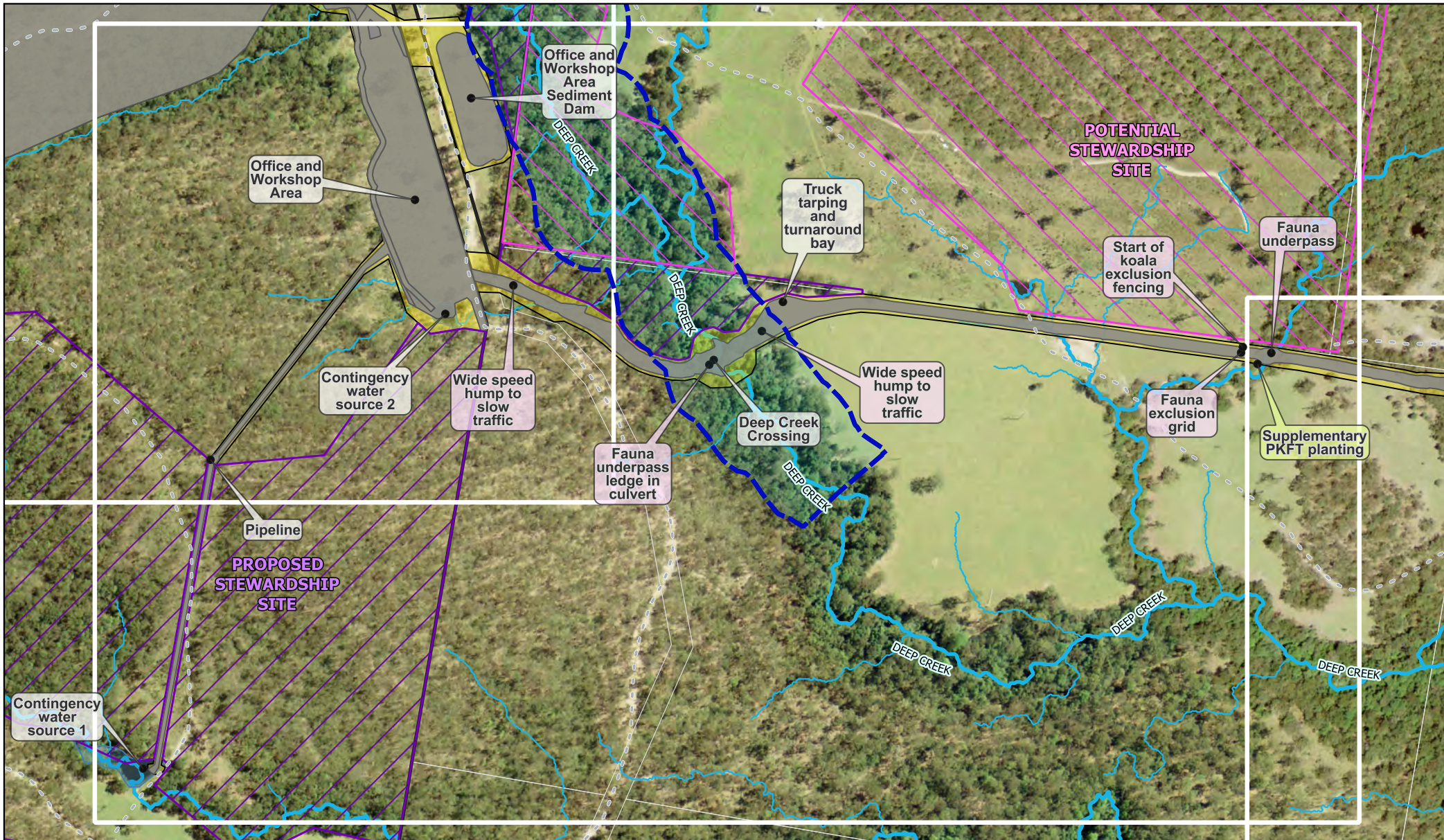
- Project Application Extent (31.9 ha)
- Approximate Disturbance Footprint (~28 ha)



Quarry Site Plan East - The Bucketts Way Intersection

Figure:
5-A

Deep Creek Quarry Project
 Ironstone Developments Pty Ltd
 Deep Creek Road, Limburners Creek NSW



Created by: J.Berry
 Date: 21 December 2022
 Version: A



- Project Application Extent (31.9 ha)
- Approximate Disturbance Footprint (~28 ha)

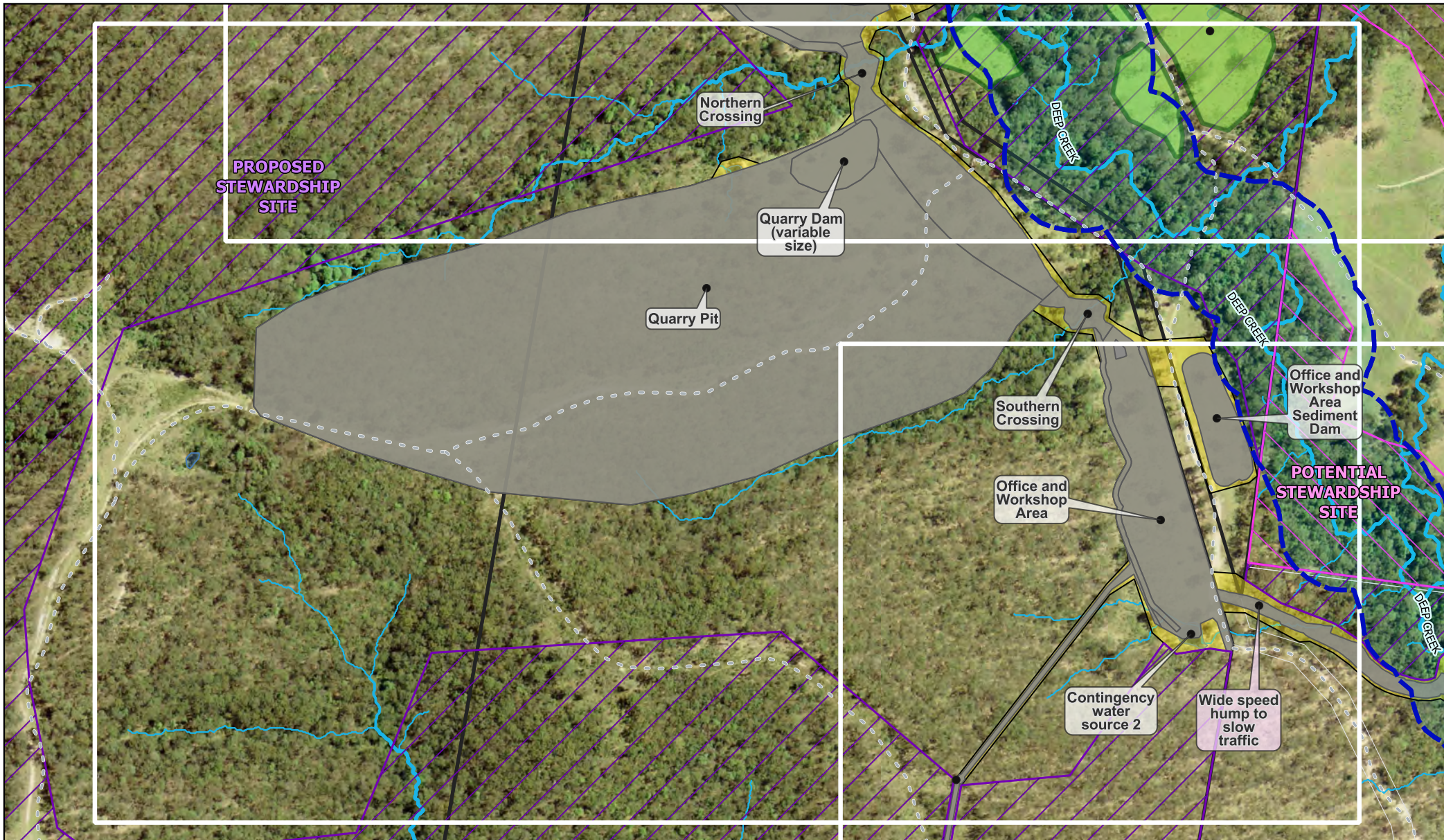
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Quarry Site Plan South West - Office and Workshop

Figure:
5-B

Deep Creek Quarry Project
 Ironstone Developments Pty Ltd
 Deep Creek Road, Limburners Creek NSW



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 Date: 21 December 2022
 Version: A



- Project Application Extent (31.9 ha)
- Approximate Disturbance Footprint (~28 ha)

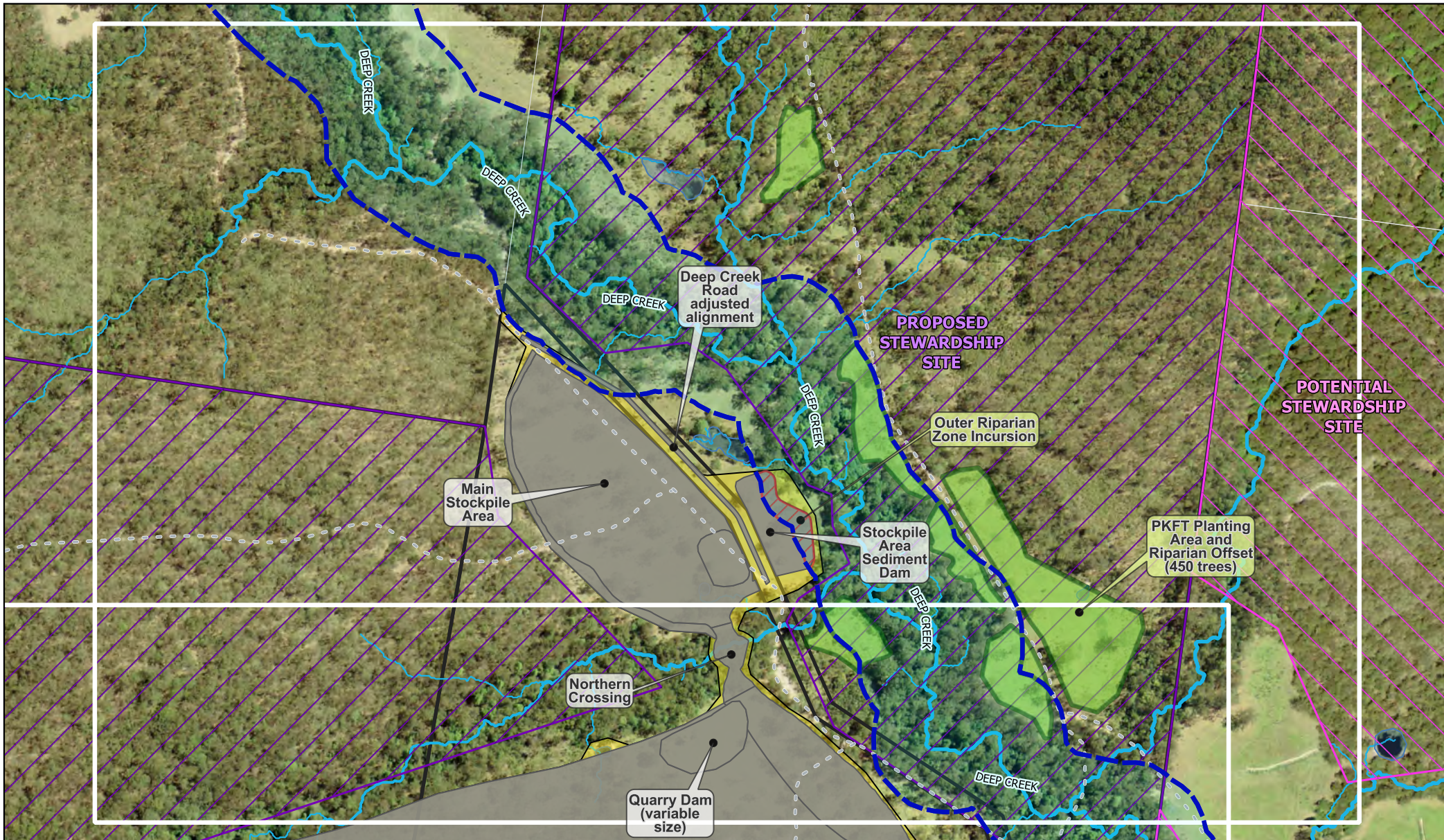
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Quarry Site Plan Central - Quarry Pit

Figure:
5-C

Deep Creek Quarry Project
 Ironstone Developments Pty Ltd
 Deep Creek Road, Limburners Creek NSW

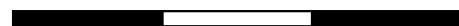


Created by: J.Berry
 Date: 21 December 2022
 Version: A



- Project Application Extent (31.9 ha)
- Approximate Disturbance Footprint (~28 ha)

0 100 200 300 m



Quarry Site Plan North - Stockpile Area

Figure:
5-D

Deep Creek Quarry Project
 Ironstone Developments Pty Ltd
 Deep Creek Road, Limburners Creek NSW

Monitoring Programme Methods

Monitoring will be completed within the Study Area throughout the implementation period as per the schedule detailed in **Table 4**. Monitoring methods address key performance criterion listed in **Section 3.2.2**, and are informed by the following resources:

- The Biodiversity Assessment Method 2020 (known hereafter as “BAM 2020”) (DPIE 2020),

The Monitoring Programme is comprised of four (4) key components: *Vegetation Extent*, *Vegetation Condition*, and *Koala Population and Maintenance of impact controls* detailed below.

Vegetation Extent

The mapped extent of retained koala habitat (Management Zone 3) and any weed infestation are to be updated during every monitoring event using a hand-held GPS.

Vegetation Condition

A total of two (2) 20 m x 50m quadrats are to be established within Management Zone 3 during baseline monitoring. The quadrats are to be sampled as per Section 5.3.4 of the NSW Biodiversity Assessment Method (BAM) (DPIE, 2020), with a 20 m x20 m nested quadrat and a central 50 m north-south bearing transect. Quadrats are to be marked at the start and end of the 50 m transect with permanent markers. Location and bearing of transects are to be recorded to ensure accuracy of repeat monitoring.

Within each plot the following metrics are collected:

- Floristic diversity (number of native and exotic species within the nested 20 m x 20 m quadrat)
- Floristic cover and abundance for each species within the nested 20 m x 20 m quadrat
- Stem size classes and the presence of native canopy regeneration (as per BAM 2020) (within the 20 m x 50 m quadrat)
- Cover of litter and bare ground (as per BAM 2020) (within the 20 m x 50 m quadrat)
- Total length of fallen logs (dbh <10 cm) (as per BAM 2020) (within the 20 m x 50 m quadrat)
- Photo monitoring: a single photo is to be taken at the start and end of the 50 m transect looking into the quadrat.

A general meander will be conducted during every annual monitoring event to note any signs of vegetation dieback and/or signs of dust accumulation on vegetation adjacent to haul roads and quarry operational areas.

Koala Population

The monitoring programme will aim to assess the condition of the koala population through the monitoring of koalas using the following methods:

- Completion of Spot Assessment Technique (SAT) surveys (as per Phillips and Callaghan, 2011)
- The completion of one (2) night of nocturnal surveys and/or remote cameras during each monitoring event.
- Recording of koala road (and other) mortalities (to be collected by the proponent throughout operations)

- The monitoring of feral species within the Subject Area either by opportunistic sightings and/or use of remote cameras in strategic locations to determine their presence within the site. If feral species are identified within the property a baiting program will be designed to control the species found.

Maintenance of Impact Controls

A general meander will be completed throughout the Study Area noting on the following features:

- Condition of boundary fencing, culverts (fauna crossings) and signage adjacent to Koala Management Zone 3
- Signs for firewood collection, dumping of waste (inc. garden waste)

3.5.5 Reporting

Reporting requirements and timing of deliverables are summarised within **Table 4**, all monitoring and reporting will be completed by a suitably qualified person (i.e. Ecologist), content of reporting deliverables will be detailed below:

- **Baseline Monitoring Survey Report:** This report will provide details on location of monitoring points, baseline measurements of key extent and condition variables within the Study Area
- **Pre-clearance Survey Report:** This report will detail the results of the pre-clearance survey, including identification of any koalas detected within the Development Site or recent signs of use. The letter will provide advice regarding the safe clearing of vegetation within the Study Area.
- **Clearance Supervision:** This report will detail the results of the clearance supervision including identification of any koalas recorded during clearing works and any actions taken by the project ecologist.
- **Annual Monitoring Survey Report:** This report will detail the results of annual monitoring, with comparison to baseline results and preceding survey events. Reporting will provide recommendations for future monitoring and management within the Study Area.
- **Final Summary Report:** Summary of the Monitoring Programme throughout the implementation period.

3.6 CONSERVATION OF KOALA HABITAT

3.6.1 Compensatory Plantings of Preferred Koala Feed Trees (PKFT)

The proposed development will result in clearing of approximately 1.3 ha of PCT 1567. Density of Preferred Koala Feed Trees (PKFT) within PCT 1567 were estimated to range between 1 tree per 65 m² and 1 tree per 200 m². As such, an estimated 225 PKFTs within alluvial and non-alluvial soils are estimated to be removed under the proposed development. Employing a 2:1 PKFT replacement ratio, the proponent intends to offset the loss of PKFTs with the planting of 450 PKFTs within riparian areas adjacent to Deep Creek. The location of offset plantings are shown in Appendix C.

Management Target: To achieve 90% survival rate of all tubestock planted at year 5

3.6.2 Establishment of Stewardship Sites

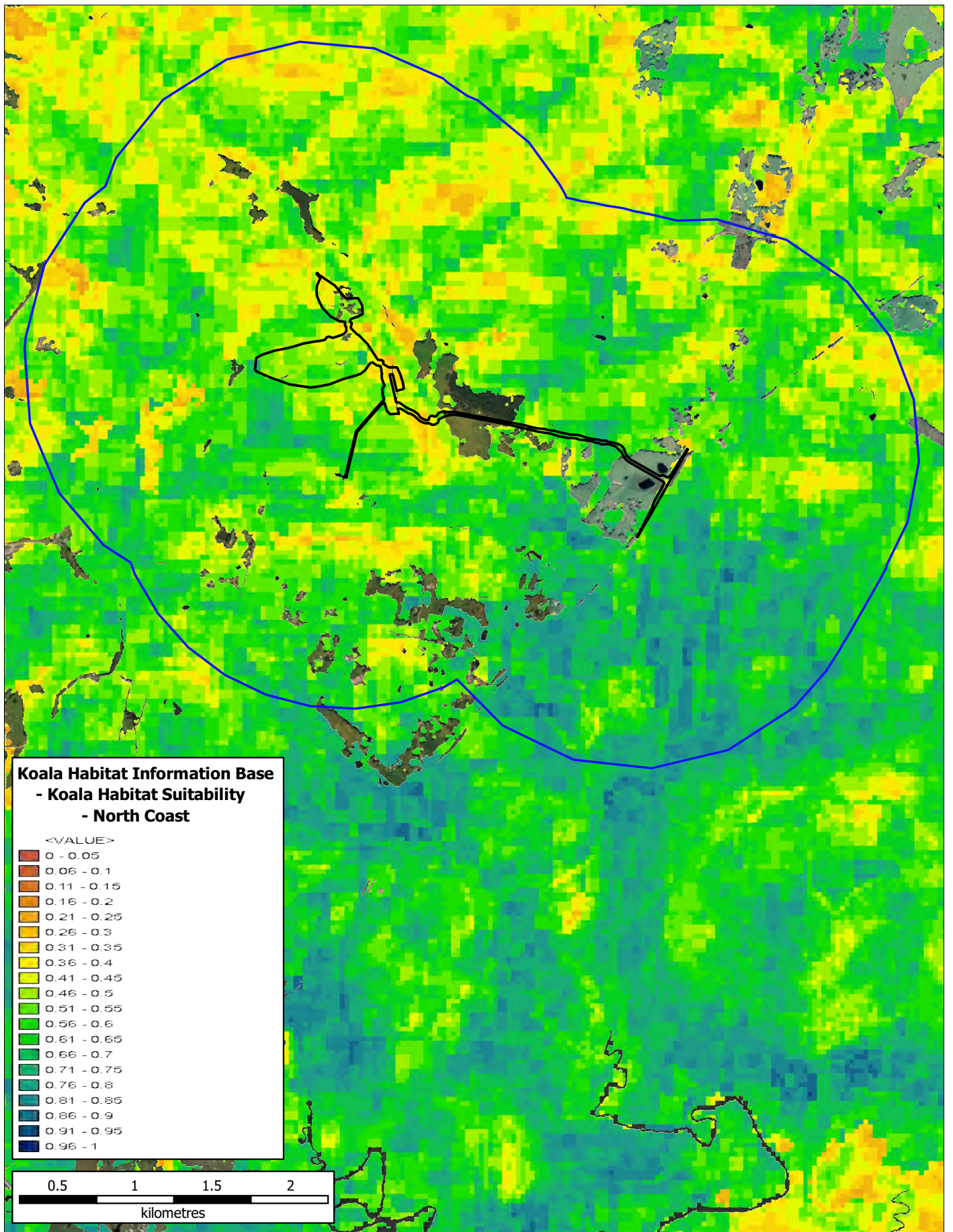
The proponent will be establishing a Biodiversity Stewardship Agreement (BSA) for an onsite offset (directly adjacent to the west and north of the development site) along with the acquisition of an

additional offset site located directly to the north-east of the development site (**Figure 2**). These combined areas are likely to represent a total of 271 ha of koala habitat (118 ha onsite offset, 153 ha offsite offset). Further management actions within the BSA will be detailed within the BSA Report which will further support the management measures detailed within this KPOM.

4. REFERENCES

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APPENDIX A: KOALA INFORMATION BASE MODELLING DATA



Created by: KBlundell
Date: 08/12/2022



<https://wedgetail.com.au>

Legend

- Development Site Boundary
- 1500m Buffer

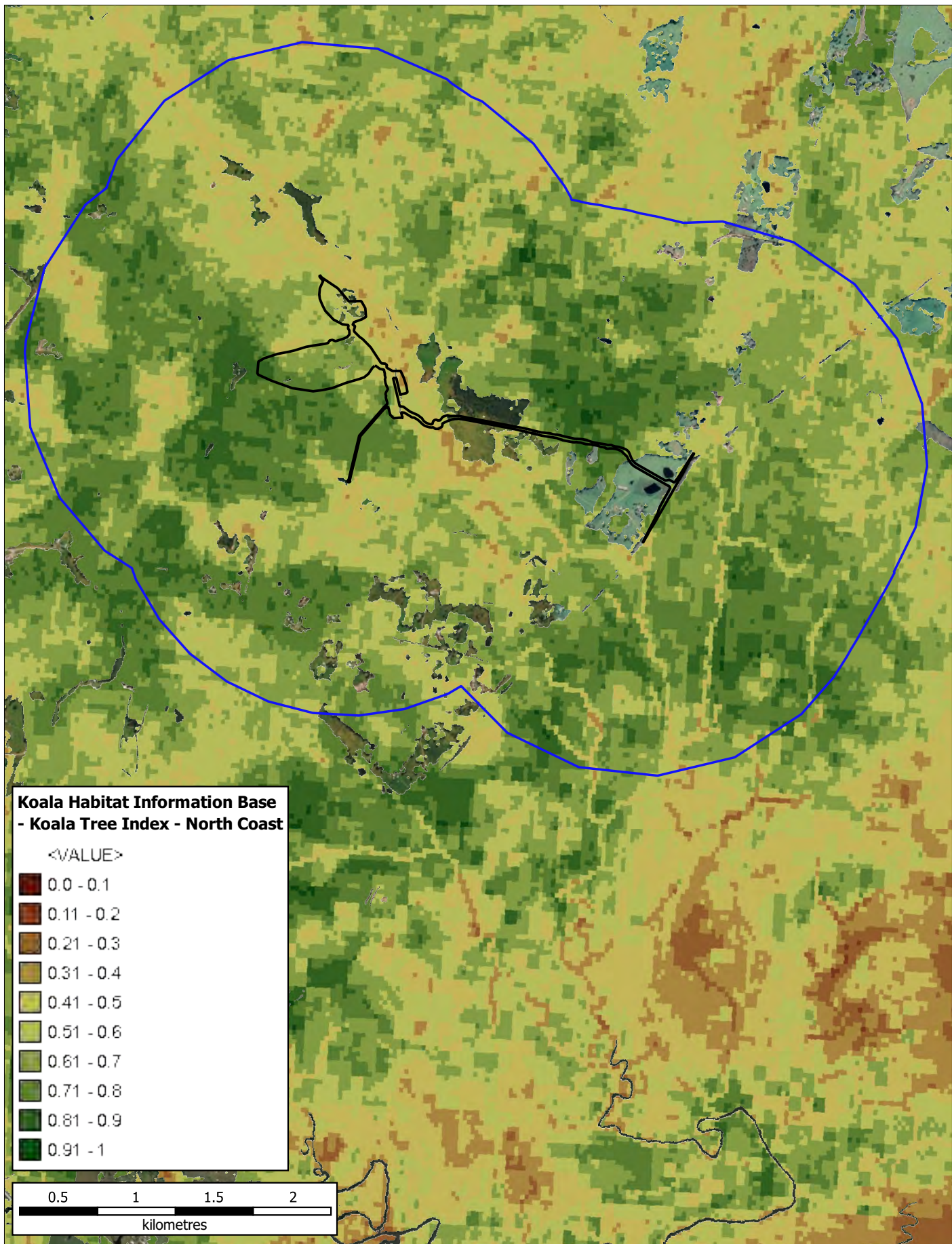
**Koala Habitat
Suitability Model**

Figure:

A1

Ironstone Developments Pty Ltd
Deep Creek Quarry
Koala Plan of Management
Bucketts Way, Limeburners Creek, NSW 2324





Created by: KBlundell
Date: 08/12/2022



<https://wedgetail.com.au>

Legend

- Development Site Boundary
- 1500m Buffer

**Koala Tree
Suitability Index**

Figure:

A2

Ironstone Developments Pty Ltd
Deep Creek Quarry
Koala Plan of Management
Bucketts Way, Limeburners Creek, NSW 2324





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Legend

- Development Site Boundary
- 1500m Buffer

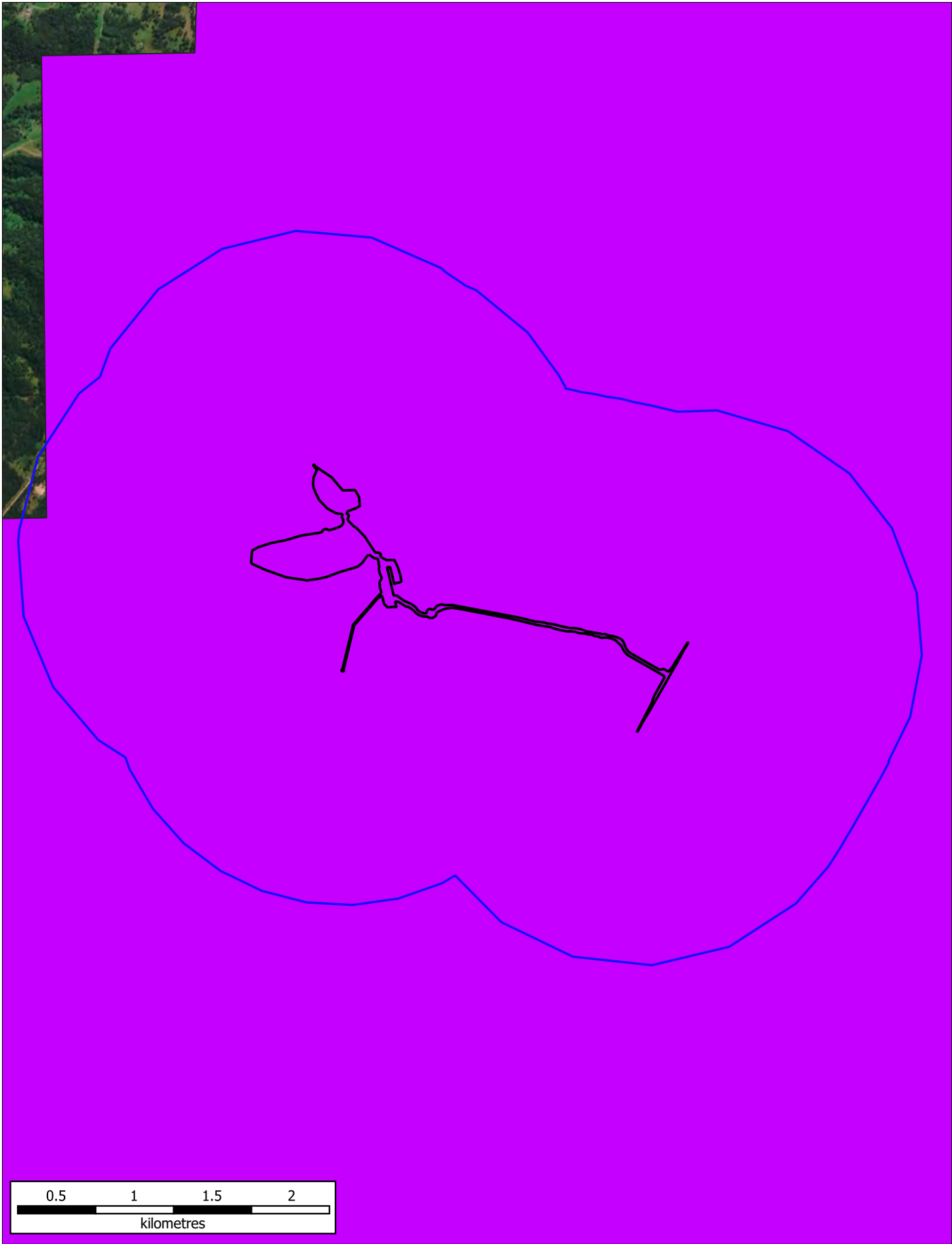
Koala Likelihood Map

Figure:

A3

Ironstone Developments Pty Ltd
 Deep Creek Quarry
 Koala Plan of Management
 Bucketts Way, Limeburners Creek, NSW 2324








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<https://wedgetail.com.au>

Legend

-  Development Site Boundary
-  1500m Buffer
-  Wang Wauk SF ARKS

Areas of Regional Koala Significance (ARKS)

Figure:

A4

Ironstone Developments Pty Ltd
Deep Creek Quarry
Koala Plan of Management
Bucketts Way, Limeburners Creek, NSW 2324



APPENDIX B: KOALA FENCING AND UNDERPASSES

Koala Fencing and Designs



Plate 3 Example of a Koala Grid and Fencing



Plate 4 Floppy Top Fencing



Plate 5 1.5m Fencing with 600mm metal flashing



Plate 6 Escape ramp with 1.2m drop to not allow Koala access into the fence but can safely drop out to safe area.



Plate 7 Escape pole for Koala from inside the fence into safe areas.

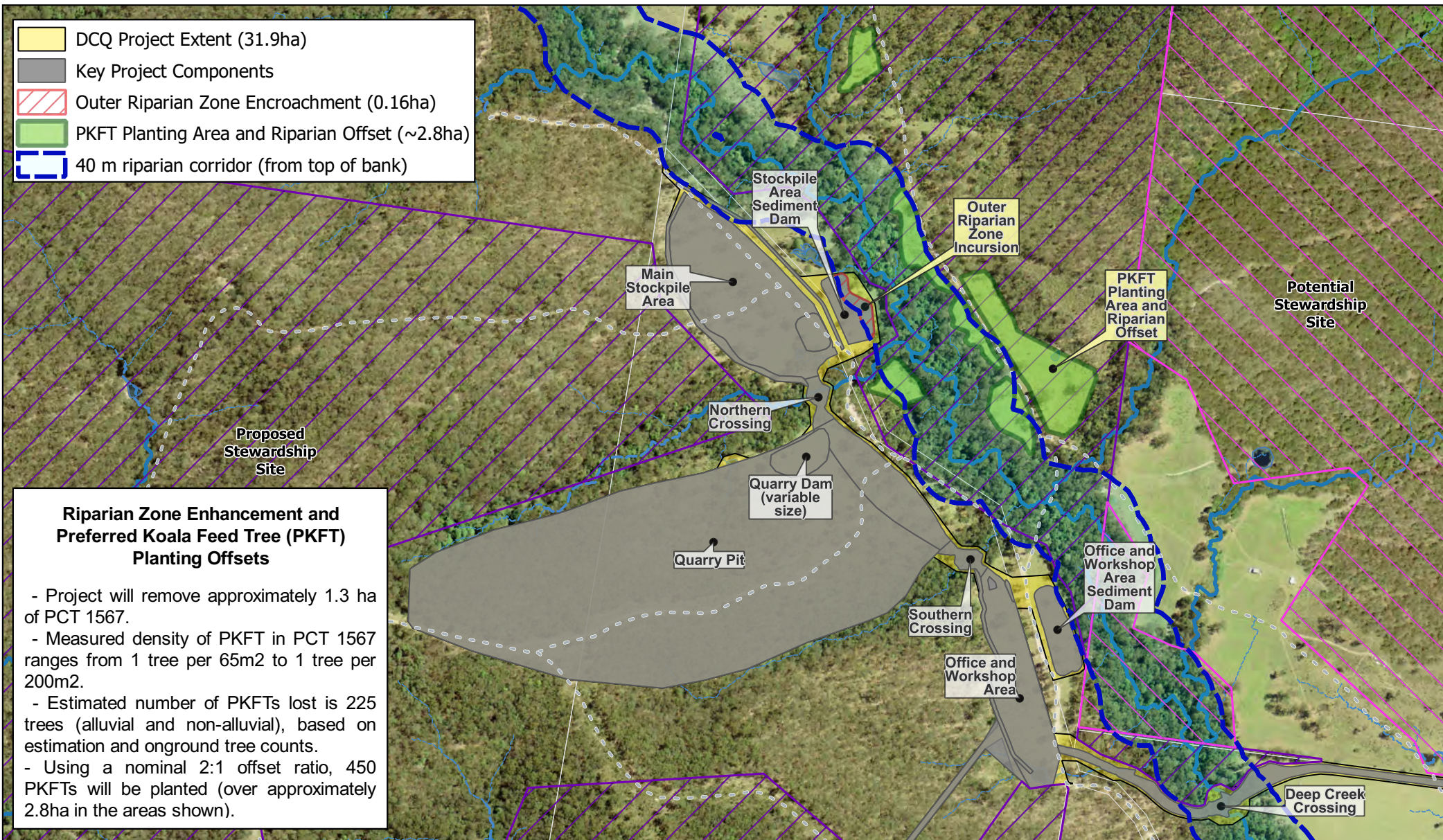


Plate 8 Example of a Koala underpass with timber post and rail furniture.

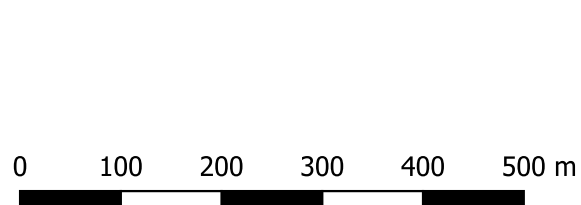


Plate 9 Example of a Koala underpass with timber post and rail furniture.

APPENDIX C: COMPENSATORY PKFT PLANTINGS



Created by: J.Berry
 Date: 6 December 2022
 Version: A



Riparian Zone and PKFT Planting Areas

Figure: **C1**

Deep Creek Quarry Project
 Ironstone Developments Pty Ltd
 Deep Creek Road, Limburners Creek NSW

APPENDIX D: STAFF CONTRIBUTIONS

The following staff were involved in the compilation of this report.

Table D1 Staff Contributions

Name	Qualification	Title/Experience	Contribution	Organisation
David Martin	MSc, BEnvSc & Mgt Accredited BAM Assessor (BAAS21021)	Senior Ecologist	Report Review, fauna and flora surveys	Wedgetail Project Consulting and Kleinfelder
Mark Dean	BEnvSc&Mgt	Senior Ecologist	Fauna and flora surveys, fauna reporting	Wedgetail Project Consulting, and Kleinfelder
Samara Schulz	BEnvSc & Mgt (Hons) Accredited BAM Assessor (BAAS17039)	Principal Ecologist	Flora Surveys, report review	Wedgetail Project Consulting, and Kleinfelder
Kane Blundell	Grad Dip Spatial Sc (in progress)	Ecologist	GIS data management and figure preparation	Wedgetail Project Consulting

Table D2 Suitably Qualified Persons – Koala Habitat Protection SEPP 2020

Name	Qualification	Title/Experience
David Martin Ecologist (Botanist)	Bachelor of Environmental Science and Management. Master of Science (First Class Honours) – Management of the overabundant koala population on French Island, Victoria.	Has lead research on the overabundant Koala population on French Island, undertaking hundreds of Koala population surveys, Spot Assessment Technique surveys, and assessments on Koala feed tree condition. Has completed Koala surveys locally in the Port Stephens LGA and the Central Coast of NSW with familiarity of suitable Koala habitat and the identification of Koala scats. Has a botany background and completed vegetation mapping and assessments throughout NSW and Victoria, including the identification of Koala feed trees.