Koala Fencing Strategy

Clarke Road, Park Ridge

EPBC 2017/8090

Prepared for Pointcorp Heritage Park Pty Ltd
24 February 2021

8392 E

Document Control

Document: Koala Fencing Strategy for Park Ridge residential, mixed use and medium impact industry precinct, Park Ridge (EPBC 2017/8090), prepared by Saunders Havill Group for Pointcorp Heritage Patk Pty Ltd

Document Issue

Issue	Date	Prepared By	Checked By
A	24.02.2021	LT	AR

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Reports and plans by others may be included in this document.

Table of Contents

Figures

Tables

Reference Documents

TMR 2010 Queensland Department of Transport and Main Roads (2010), Fauna Sensitive Road Design Guidelines Volume 2 (TMR 2010)

DES 2020 Queensland Department of Environment and Science (2020), Koala Sensitive Design Guidelines Version 2 (DES, 2020).

Acronyms

DAWE	Department of Agriculture, Water and the Environment
DES	Department of Environment and Science (Qld)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
km	kilometres
LCC	Logan City Council
LGA	Local Government Area
m	metres
m^2	square metres
MHQA	Modified Habitat Quality Assessment
MNES	Matters of National Environmental Significance
NCA	*Nature Conservation Act 1992* (Qld)
PMST	Protected Matters Search Tool
RE	Regional Ecosystem
SAT	Spot Assessment Technique
SEQ	South East Queensland
SHG	Saunders Havill Group
TMR	Department of Transport and Main Roads (Qld)
VMA	*Vegetation Management Act 1999* (Qld)

1. Introduction

Saunders Havill Group (SHG) was engaged by Pointcorp Heritage Park Pty Ltd to prepare a Koala Fencing Strategy for the development located at Clarke Road, Park Ridge, within the Logan City Council (LCC) Local Government Area (LGA) and Park Ridge Structure Plan Area.

Contextually, the project site is located within South East Queensland (SEQ), approximately 25 kilometres south of Brisbane and 30 kilometres east of Ipswich City. High-density urban development exists directly to the north and west of the site in the suburbs of Heritage Park and Crestmead. A new high-density urban development is also currently under construction on the south-western boundary of the project. Other properties adjacent to the east and southern site boundaries are mostly rural residential and generally less than 10 hectares (ha) in size, all of which are zoned for high-density residential or industrial development. The site context is displayed in **Figure 1 & 2.**

The approved industrial, mixed use and residential development area covers 116.35 ha and is comprised of multiple rural residential allotments bounded by Green Road to the north and Clarke Road to the west. A power easement and future major transport corridor traverse the centre of the site, running north-south.

The development has received approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (ref. EPBC2017/8090). This Koala Fencing Strategy (the Strategy) has been prepared to address the relevant approval conditions by providing temporary and permanent Koala exclusion fencing specifications and phasing details.

Condition 3a
Prior to any clearing within the development area, submit to the Department and publish a Koala fencing strategy prepared by an independent expert to be implemented for the duration of the approval to guide the approval holder in achieving the outcomes required under condition 3b.

The aim of this Strategy is to detail the design, location and installation/removal timeframe of temporary and permanent fencing throughout all clearing, construction and operation phases of the Park Ridge residential, mixed use and medium impact industry precinct, Park Ridge, Queensland (EPBC Reference number 2017/8090).

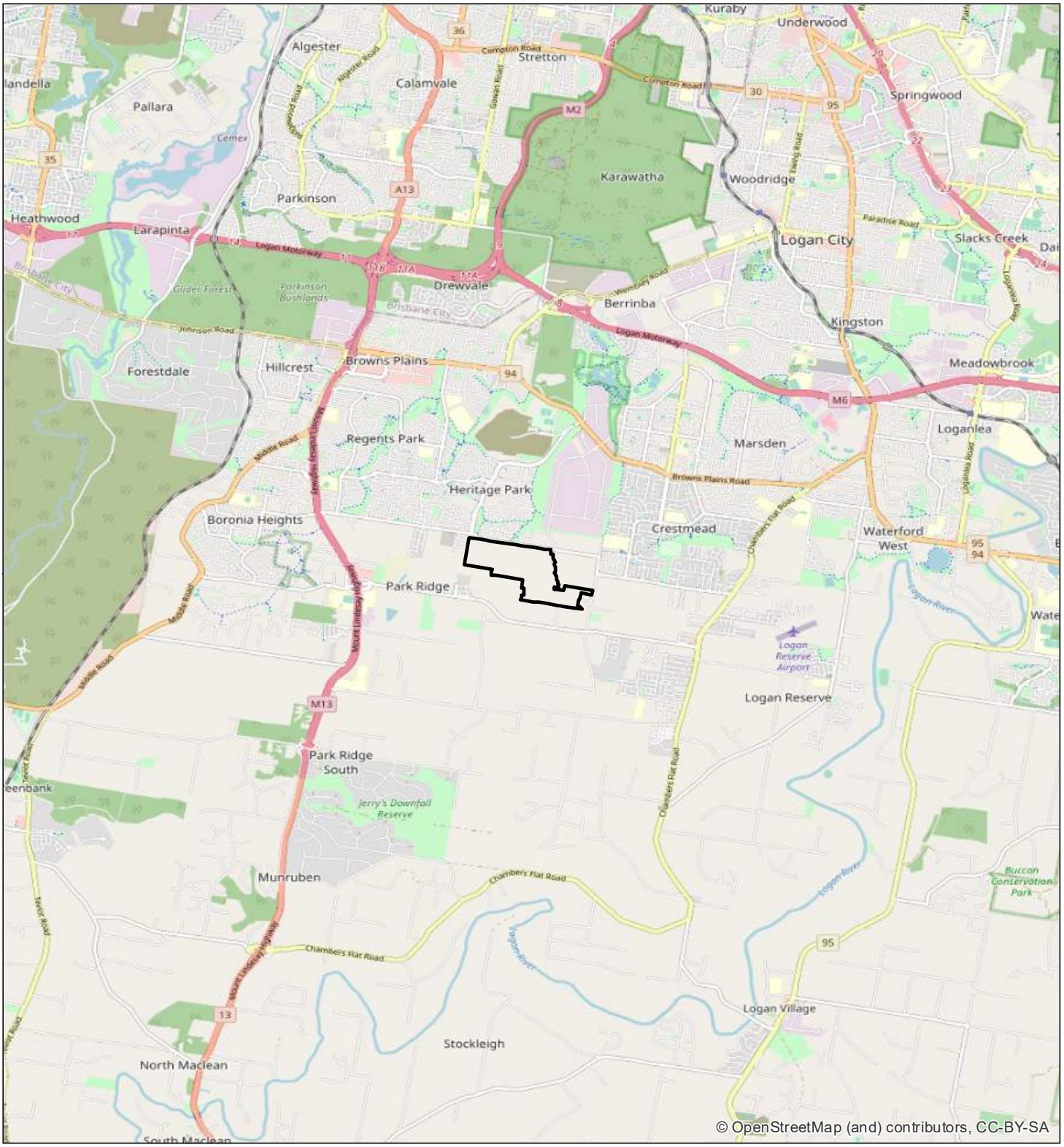
This Koala Fencing Strategy has been prepared to control and mitigate the impacts of the vegetation clearing and construction activities specifically for the Koala (*Phascolarctos cinereus*). However, the implementation of this strategy will inadvertently reduce impacts to other fauna.

1.1. Key Site Details

Key site details are provided in **Table 1**.

Table 1: Key Site Details

Address	Clarke Road and Green Road, Park Ridge, Queensland
RPD	Lot 1 on SP310681 Lot 2 on SP310681 Lot CRP on 214291 Lot ARP on 214271 Lot 1 on RP96003 Lot 11 on RP96003 Lot 12 on RP96003 Lot 13 on RP96003 Lot 14 on RP96003 Lot 12 on RP857321
Referral Site Area	116.35 hectares
Action Summary:	Develop a mixed use, medium impact industry and residential, with conservation and open space land in Park Ridge, Queensland.
Tenure	Freehold
Local Government Area	Logan City Council
Planning Scheme (Zoning)	Logan Planning Scheme 2015 (Medium Impact Industry, Mixed Use and Environmental Management and Conservation)
Local Plan (Zoning)	Park Ridge Structure Plan (Commercial, Industrial and Greenspace Network)



Legend

Referral area boundary

Figure 1

Site Context

Pointcorp Heritage Park Pty Ltd

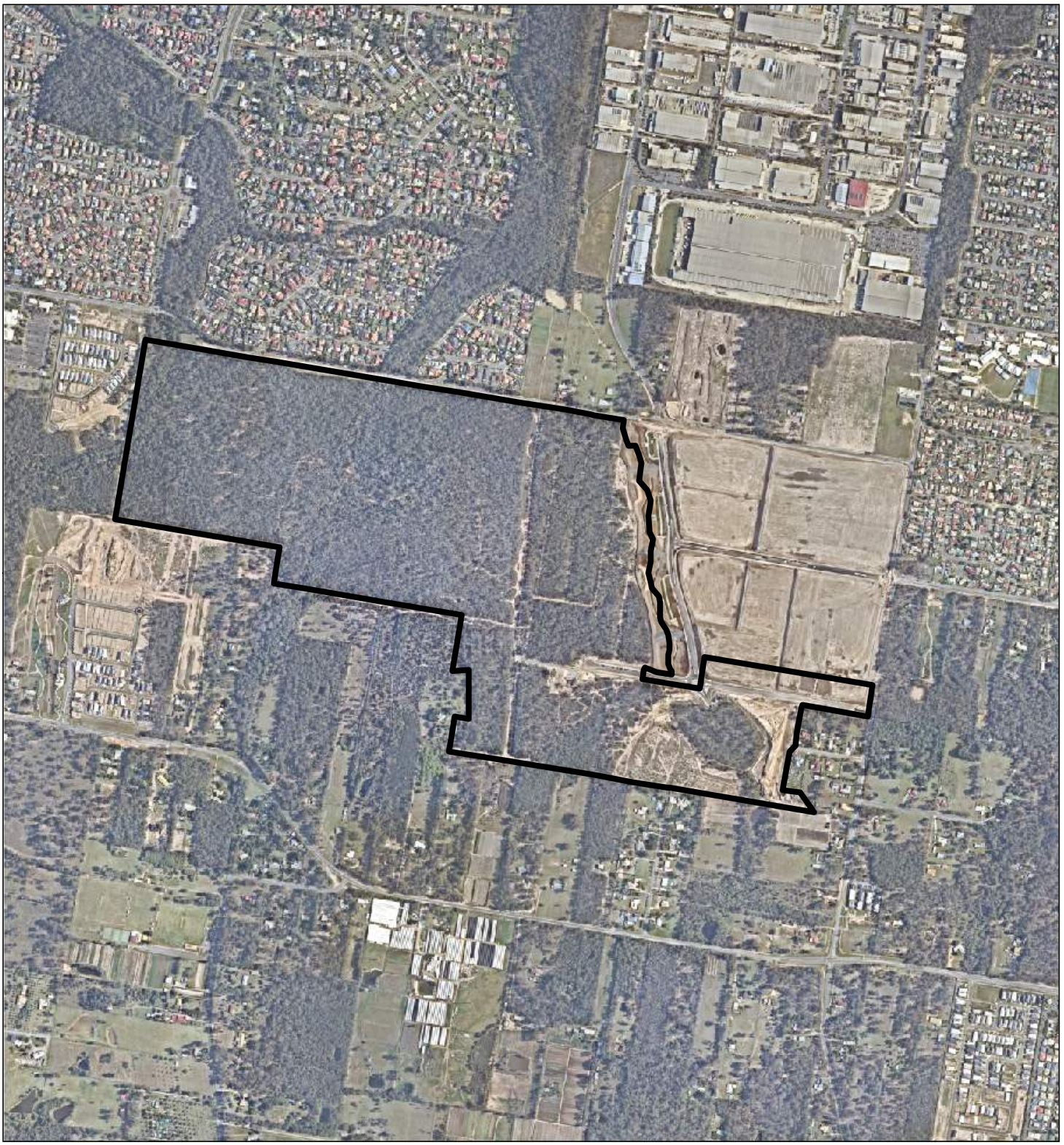
File ref. 8392 E Figure 1 Site Context A
Date *23/02/2021*
Project *Clark Road, Park Ridge*

0 0.5 1 2 3 4 *km*

N

Scale (A4): 1:100,000 [GDA 1994 MGA Z56]

Layer Sources QLD GIS Layers (QLD Gov. Information Service 2018)



Legend

Referral area boundary

Figure 2

Site Aerial

Pointcorp Heritage Park Pty Ltd

File ref. 8392 E Figure 2 Site Aerial A
Date *22/02/2021*
Project *Clarke Road, Park Ridge*

0 50 100 200 300 400 500 600 *m*

Scale (A4): 1:15,000 [GDA 1994 MGA Z56]

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Legend

- Referral area boundary
- Excised area
- Mixed use
- Mixed use (enterprise & technology precinct)
- Medium impact industry
- Low-medium density residential Low-medium density residential
- Recreation & open space
- Environmental management & conservation

Figure 3

Proposed Land Use Master Plan

File ref. 8392 E Figure 3 Proposed land use masterplan A
Date *22/02/2021*
Project *Clarke Road, Park Ridge*

0 50 100 200 300 400 500 600 *m*

Scale (A4): 1:15,000 [GDA 1994 MGA Z56]

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2. Ecological Values

2.1. Vegetation Values

The vegetation values across the site are diverse due to historical land uses and vegetation clearing. The project site is made up of ten (10) individual allotments totalling an area of 116.35 hectares, and is made up of a mosaic of cleared property boundaries, access roads and easements, and remnant and regrowth vegetation.

The Regulated Vegetation Map shows the site contains a mix of Category X (non-remnant), Category B (remnant) and Category C (regrowth) vegetation (refer **Figure 4**). Expanding on this, Regional Ecosystem (RE) Mapping shows that the site contains some areas of remnant vegetation described as Least Concern RE12.9-10.4 and RE12.9-10.17, Of Concern RE12.3.11 and Endangered RE12.5.3 and RE12.9-10.12. These REs are described below.

2.1.1 Regional Ecosystem Descriptions

RE12.3.11 (Remnant) – Of Concern
Eucalyptus tereticornis +/- *E. siderophloia* and *Corymbia intermedia* open forest to woodland. *Corymbia tessellaris, Lophostemon suaveolens* and *Melaleuca quinquenervia* frequently occur and often form a low tree layer. Other species present in scattered patches or low densities include *Angophora leiocarpa, E. exserta, E. grandis, C. trachyphloia, C. citriodora subsp. variegata, E. latisinensis, E. tindaliae, E. racemosa* and *Melaleuca sieberi. E. seeana* may be present south of Landsborough and Livistona decora may occur in scattered patches or low densities in the Glenbar SF and Wongi SF areas. Occurs on Quaternary alluvial plains and drainage lines along coastal lowlands. Rainfall usually exceeds 1000mm/y. (BVG1M: 16c)

RE12.5.3 (Regrowth) – Endangered
Eucalyptus racemosa subsp. racemosa woodland with *Corymbia intermedia, E. siderophloia +/- E. tindaliae, E. resinifera, E. pilularis, E. microcorys, Angophora leiocarpa. Melaleuca quinquenervia* is often a prominent feature of lower slopes. Minor patches (<1ha) dominated by *Corymbia citriodora subsp. variegata* sometimes occur. Occurs on complex of remnant Tertiary surfaces +/- Cainozoic and Mesozoic sediments. (BVG1M: 9g)

RE 12.9-10.4 (Remnant) – Least Concern
Eucalyptus racemosa subsp. racemosa woodland to open forest. Other species can include *Angophora leiocarpa, Eucalyptus seeana, E. siderophloia, Corymbia intermedia, E. tindaliae, with Lophostemon suaveolens, Melaleuca quinquenervia, E. tereticornis* common on lower slopes. Occurs on Cainozoic and Mesozoic sediments +/- remnant Tertiary surfaces. (BVG1M: 9g)

RE12.9-10.12 (Remnant & Regrowth) – Endangered
Corymbia intermedia, Angophora leiocarpa, Eucalyptus seeana +/- E. siderophloia, E. tereticornis, E. racemosa subsp. racemosa, C. citriodora subsp. variegata woodland to open forest. *E. seeana* and *Lophostemon suaveolens*

are often present as sub-canopy or understorey trees. Occasional Melaleuca quinquenervia on lower slopes. Does not include areas dominated by *Eucalyptus racemosa subsp. racemosa*. Occurs on Cainozoic and Mesozoic sediments. (BVG1M: 9g)

RE12.9-10.17 (Regrowth) – Least Concern
Open forest to woodland complex generally with a variety of stringybarks, grey gums, ironbarks and in some areas spotted gum. Canopy trees include *Eucalyptus siderophloia, E. propinqua* or E. *major, E. acmenoides or E. portuensis, E. carnea* and/or *E. microcorys* and/or *Corymbia citriodora subsp. variegata*. Other species that may be present locally include *Corymbia intermedia, C. trachyphloia, Eucalyptus tereticornis, E. biturbinata, E. moluccana, E. longirostrata, E. fibrosa subsp. fibrosa* and *Angophora leiocarpa. Lophostemon confertus* or Whipstick *Lophostemon confertus* often present in gullies and as a sub-canopy or understorey tree. Mixed understorey of grasses, shrubs and ferns. Hills and ranges of Cainozoic and Mesozoic sediments. (BVG1M: 9a).

2.2. Koala Assessment

2.2.1 Koala Occurrence

The Protected Matters Search Tool (PMST) identified the Koala (*Phascolarctos cinereus*) as a potential occurrence within the project site. A review of WildNet database identifies two (2) Koala records within 1km of the project site.

The project site has undergone numerous surveys between 2016-2020. These assessments have included:

- Random diurnal meanders (direct and indirect observations);
- Nocturnal surveys (spotlighting);
- Scat meanders; and
- Spot Assessment Technique (SAT).

Although these surveys did not record Koalas through direct observation, presence was established through indirect methods. Results of Koala specific SAT surveys documented in the Ecological Assessment Report (SHG 2017) note that a total of eight (8) SAT surveys were completed across the impact site by SHG (2017). The SAT results were supplemented with contemporary surveys in conjunction with the MHQA indicate that there were only low levels of Koala activity

2.2.2 Koala Habitat Values

Additionally, under the Queensland Nature Conservation Act 1992, the majority of the site, excluding the existing power easement and Category X vegetation, is mapped as Essential Habitat for the Koala

Koala Habitat Assessment Tool
Surveys undertaken for the referral to the Department of Agriculture, Water and the Environment (DAWE) under the EPBC Act (ref. EPBC2017/8090) determined that the project site contained habitat critical to the survival of the Koala. In accordance with the *EPBC Act Referral Guidelines for the Vulnerable Koala* (Koala Referral

Guidelines), habitat which receives a score of 5 or more using the Koala Habitat Assessment Tool is considered to be critical habitat. The Koala Habitat Assessment Tool assesses Koala attributes including Koala occurrence, vegetation composition, habitat connectivity, key existing threats and recovery value. Koala occurrence was established across the site through a desktop review, scat meanders and Spot Assessment Technique (SAT). The assessment provided within the EPBC Act referral awarded the project site a value of 5/10.

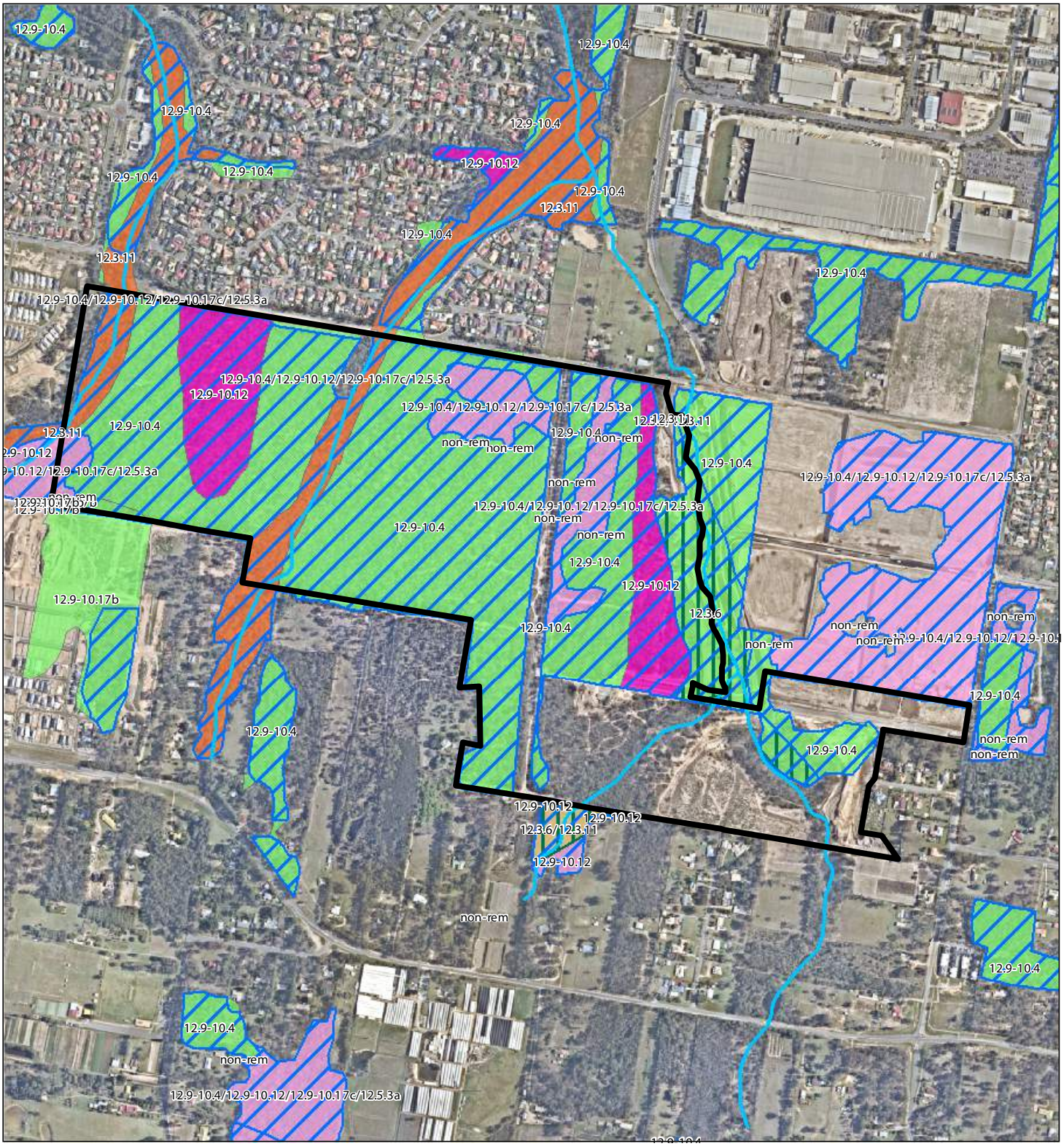
Koala Modified Habitat Quality Assessment (MHQA)

The site was assessed using a modified version of the Queensland State Governments "Guide to determining terrestrial habitat quality: A toolkit for assessing land-based offsets under the Queensland Environmental Offsets Policy". The variance in quality of habitat on a site is accounted for by delineating sites into assessment units (AUs). AUs are mapped to determine where the sample sites will be and how many are required to adequately assess the site's condition. AUs can be defined using desktop information but can be refined during field surveys where appropriate. In general, they should be relatively homogenous, defined by a distinct regional ecosystem or habitat type and distinct from other patches of vegetation on the site.

For the purposes of assessment, the habitat critical to the survival of the Koala vegetation has been separated into four assessment units based on the remnant status and regional ecosystem best describing the vegetation present (**refer Table 2).** Modified Habitat Quality Assessments (MHQA) were undertaken within each of the assessment units following survey effort guideline.

Table 2: Koala MHQA Results Summary

Assessment Unit	Vegetation Status	Regional Ecosystem	Area (ha)	# of Assessment Transects	Score (/100)
AU1	Remnant	12.9-10.4	69.48	3	60
AU2	Remnant	12.9-10.12	5.13	2	55
AU3	Remnant	12.3.11	3.12	2	62
AU4	Non-remnant	12.9-10.4	40.12	4	58



Legend

- Referral area boundary
- VM Watercourses
- VM Essential Habitat
- VM Wetland

Regional Ecosystems mapping

- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem

Figure 4

Regulated Vegetation Supporting Map

Pointcorp Heritage Park Pty Ltd

File ref. 8392 E Figure 4 RVSM A
Date *23/02/2021*
Project *Clarke Road, Park Ridge*

0 50 100 200 300 400 500 600 *m*

N

Scale (A4): 1:12,381 [GDA 1994 MGA Z56]

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Layer Sources

3. Koala Fencing Strategy

The aim of this Strategy is to detail the design, location and installation/removal timeframe of temporary and permanent fencing throughout all clearing, construction and operation phases of the Park Ridge residential, mixed use and medium impact industry precinct, Park Ridge, Queensland (EPBC Reference number 2017/8090).

This Strategy includes a staged fencing plan which aligns with specific development phases to reduce potential impacts to Koalas and other fauna from vegetation clearing and construction areas. Temporary fencing specifications and details, generally in accordance with accepted permanent Koala exclusion fencing specifications.

As a result of the surrounding environment and proposed vegetation clearing direction (refer **Plan 1**), only permanent and temporary Koala exclusion fencing is considered necessary for the project site during the vegetation clearing and construction activity phases. Therefore, this Strategy has not considered Koala friendly fencing. The standard requirements and guidelines for permanent and temporary Koala exclusion fencing are discussed below.

3.1. Strategy Objectives

The aim of this Strategy is to detail the design, location and installation/removal timeframe of temporary and permanent fencing throughout all clearing, construction and operation phases of the Park Ridge residential, mixed use and medium impact industry precinct, Park Ridge, Queensland (EPBC Reference number 2017/8090).

The Koala fencing strategy is to be implemented for the duration of the approval to guide the approval holder in achieving the outcomes required under EPBC Act approval condition 3b:

1. *Within 6 months of the date of this approval decision, prohibit any vehicles or unleashed domestic pets entering the onsite conservation corridor;*
2. *Prior to commencing clearing in the third stage of development, enable safe movement of Koala between adjacent Koala habitat and the on-site conservation corridor;*
3. *Prior to the installation of safe fauna movement solutions, no Koalas killed or injured while crossing or attempting to cross Green Road from the development area; and*
4. *Following the installation of safe fauna movement solutions, any wildlife attempting to cross Green Road from the development area are prevented from crossing except by use of a safe fauna movement solution located where shown on Attachment D.*
5. *Within 3 months of completion of all clearing, prohibit feral animal access into the onsite conservation corridor.*
6. *Within 3 months of completion of all clearing, prevent access of Koalas into the development area from the onsite conservation corridor.*

Additionally, this Strategy is to operate in conjunction with the conditions related to clearing within the development area and the implementation of the Koala Sensitive Road Design Plan and safe fauna movement solutions. Prior to commencing the third stage of clearing, the Sensitive Road Design Plan is to be prepared and submitted for approval by the Minister. Although, this Strategy will be in operation prior to the preparation and submission of the Koala Sensitive Road Design Plan, the Strategy has considered development staging and fencing phases to ensure they align with future actions proposed within the Koala Sensitive Road Design Plan.

3.2. Koala Exclusion Fencing Guidelines

Koala exclusion fencing stops Koalas moving between areas. It reduces permeability so should only be used where there is a direct threat to Koala safety. Koala exclusion fencing provides a barrier to most fauna species and guides fauna towards safe crossing sites, fauna corridors and/or conservation areas.

Permanent Koala exclusion fencing has become a standard inclusion for many projects. Types and fencing specifications have been detailed in a number of reliable guidelines, including:

- Queensland Department of Transport and Main Roads (2010), Fauna Sensitive Road Design Guidelines Volume 2 (TMR 2010); and
- Queensland Department of Environment and Science (2020), Koala Sensitive Design Guidelines Version 2 (DES, 2020) (refer **Appendix A**).

A summary of Koala exclusion fencing specifications are provided in Table 3 below.

Table 3: Koala Exclusion Fencing Specifications Summary

Materials	Fence: • Brick • Metal sheeting • Perspex • Timber fencing (without gaps) • Chain wire fencing material with a floppy top or metal/perspex sheeting at least 600mm wide on top of the fence Footing: • Concrete
Measurements	The top of the unclimbable section of the fence is to be at least 1.5m from the ground.
Exclusion elements	• 600mm wide (minimum) exclusion material on the top of the fence (if using chain wire fencing without floppy top). • Extend to ground level along uneven or undulating ground. • Ensure fence bracing or supports of on the site of the fence that is away from Koala access. • Install fence returns (if required). • Construct metal flaps at the base of fencing where the fence crosses drainage lines to ensure faun cannot pass under the fence (if required)

Maintenance requirements	• Exclude trees and shrubs from within 3m of the fence • Keep canopy trees trimmed to remove links to tree canopies on the other side of the fence. • Remove fallen branches and vines growing on the fence which Koalas may use to climb over the fence.

Examples

Metal Sheeting

Chain wire with floppy top

Chain wire with 600mm exclusion element

Standard Drawings (Refer **Appendix B)**	TMR – Fencing – Koala Proof Fence and Gate – Standard Drawing No. 1603 Brisbane City Council – Fence – Natural Area – Chain wire Fauna Exclusion Fence – Standard Drawing No. BSD-7009

As demonstrated by **Table 3**, permanent Koala exclusion fencing has been well documented and implemented regularly. Standard fencing typically uses concrete footings, making the fencing permanent and stable.

The use of temporary exclusion fencing is less common and therefore, standards and guidelines have not been established. The temporary Koala exclusion fencing recommended within this Strategy has been adapted from standard permanent Koala exclusion guidelines summarised above, thus achieving the EPBC Act approval conditions.

The proposed temporary exclusion fencing is to be generally in accordance with the options summarised below (refer **Table 4**).

Table 4: Temporary exclusion fencing options (adapted from permanent examples)

Type	Specifications	Image
Chain wire and picket fence with floppy top	• Chain wire • Star pickets • install star pickets on construction area side of fence	
Chain wire panel fencing with exclusion elements	• Chain wire panels • Plastic footings • Dog Proofing • 600mm sheet metal/Perspex top	

Type	Specifications	Image
Exclusion elements (required for chain wire panel fencing option)		
Sheet metal panel	600mm sheet metal panel installed along top of chain wire fencing	
Dog proofing	Additional chain wire skirting installed along the bottom of the chain wire panel between plastic footings to extend fence to ground level.	

3.3. Koala Exclusion Fencing Phases

Given the size of the approved development, the vegetation clearing and construction is proposed to be staged. The development has been proposed over three (3) construction stages, occurring in an east to west direction to guide native fauna progressively towards the on-site conservation corridor (refer EPBC Act Approval Attachment A (EPBC2017/8090)).

To align with the construction stages the temporary and permanent Koala exclusion fencing has been divided into four (4) phases. These phases are outlined within **Table 5** and shown within the Detailed Plans (refer **Section 4**).

Table 5: Koala Exclusion Fencing Phases

Phase	Fencing Type	Timing		Clearing/ Construction Stage	Location	Detailed Plan Page No. (refer to **Section 4**)
		Installation	**Removal**			
1	Temporary Koala exclusion fencing (refer **Table 4**)	Immediately	Following Phase 2 fencing is installed.	1	Along the boundary of existing cleared areas and current construction activities.	Page 3
2	Temporary Koala exclusion fencing (refer **Table 4**)	Following vegetation clearing prior to construction activities in Phase 2.	Following Phase 3 fencing is installed.	1	Phase 1 alignment with the addition of vegetation cleared south of Mercantile Drive.	Page 4
3	Temporary Koala exclusion fencing (refer **Table 4**)	Following vegetation clearing prior to construction activities in Phase 3.	Following Phase 4 fencing installation.	2	1. Either side of the future infrastructure easement, and 2. Within the Residential and Recreation/ open space zones interface illustrated within the Proposed Land Use Master Plan (refer **Figure 3)**.	Page 5
4	Permanent Koala exclusion fencing	Following the final stage of vegetation clearing & prior to construction activities.	N/A. To remain for the life of the approval.	3	1. Conservation corridor and ultimate development extent interface (refer **Figure 3**) and 2. Conservation corridor northern boundary and Green Road.	Page 6

3.4. Roles and Responsibilities

The following subsection details the key roles and responsibilities associated with Precinct 2 works.

3.4.1 Approval holder

Pointcorp Heritage Park Pty Ltd is the approval holder for the works.

3.4.2 Environmental Coordinator

SHG is the Environmental Coordinator for the project and is responsible for the development of this Strategy and documentation for overarching environmental management. SHG will be responsible for managing non-compliance by appointed contractors and sub-contractors, including establishing additional management procedures, corrective actions and determining if a non-compliance notification to DAWE should be made.

3.4.3 Site Supervisor

The Site Supervisor is a representative of the Construction Contractor and responsible for overseeing all pre-clearing, clearing and construction activities are undertaken in accordance with the approved management plans (i.e. site based management plans, vegetation management plans, fauna management plans, erosion and sediment control plans, etc.) and subsequent environmental management documentation. The Site Contractor will be responsible for installation of the temporary and permanent Koala exclusion fencing.

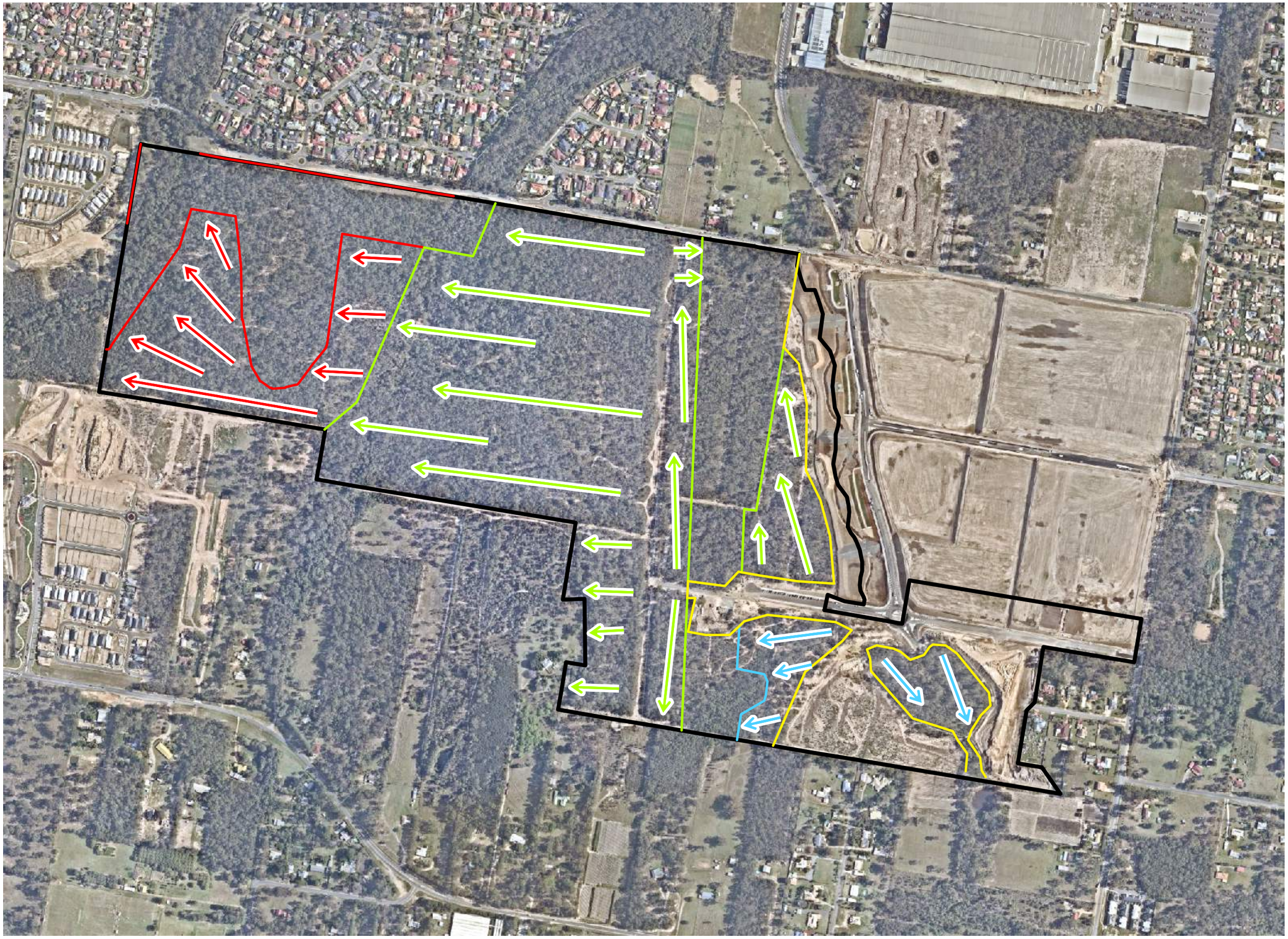
4. Strategy Specifications

Management Item	Responsibility	Timing	Reporting
Staging / Clearing Direction			
The development and clearing is to be staged in an east to west direction, ensuring fauna are dispersed towards the on-site conservation corridor.	Approval holder / Site Supervisor / Contractor	Throughout the life of the approval.	Site Supervisor / Approval holder / Environmental Coordinator
Vegetation clearing activities must be in accordance with the Direction of Clearing Plan (as shown in the site specific vegetation management plans) which directs clearing towards vegetation to be retained.	Site Supervisor / Earthworks Contractor / Sub Contractor.	As part of clearing earthworks operations.	Site Supervisor / Approval holder / Environmental Coordinator
Minimise Construction Impacts			
Construction activities pose threats to native fauna including direct loss of habitat, entrapment vehicle strike, etc. To reduce impacts to native fauna temporary and permanent fencing is to be installed following staged vegetation clearing and construction activities. Installation must occur prior to the commencement of construction activities. Fences must remain in place until construction activities are complete or the Koala exclusion fence for the next phase has been installed. Detailed further below.	Site Supervisor / Earthworks Contractor / Sub Contractor.	Throughout the life of the approval.	Site Supervisor / Approval holder / Environmental Coordinator
Temporary Fencing			
Following vegetation clearing and prior to the commencement of construction activities, the approval holder must install Koala exclusion fencing along the extent of vegetation clearing/construction extents for each stage of the development. This fencing shall be inspected	Site Supervisor	Install each phase of fencing prior to commencement of the	Inspected by Approval holder, the Environmental

Management Item	Responsibility	Timing	Reporting
by the Environmental Coordinator. Fencing shall be in accordance with the specifications provided in **Section 3.2** of this *Koala Fencing Strategy*. • Fencing shall be Koala exclusion fencing and erected to direct fauna towards intact vegetation to the east. • Fencing shall be erected prior to the commencement of construction activities and remain in place until construction activities are complete or the Koala exclusion fence for the next phase has been installed. • Only approved weed management, landscape and revegetation works are to occur beyond the temporary Koala exclusion fencing. • Fencing shall be reinstated immediately if damaged or knocked down.		relevant stage of construction activities. Each phase must remain in place until the fence for the next phase has been installed.	Coordinator, or Site Supervisor.
Permanent Fencing			
Prior to the commencement of the final development stage, the approval holder must install permanent Koala exclusion fencing along the on-site conservation corridor and ultimate development extent interface (refer to **Figure 3** and Attachment D of EPBC Act Approval (EPBC2017/8090)). This fencing shall be inspected by the Environmental Coordinator. Fencing shall be in accordance with the specifications provided in **Section 3.2** of this *Koala Fencing Strategy*. • Fencing shall be erected to exclude Koala and other native fauna from the project site and direct fauna towards intact vegetation and wildlife movement solutions. • Fencing shall be erected prior to the commencement of stage 3 construction activities and remain for the life of the approval. • The following activities are not permitted within the on-site conservation corridor: storage and mixing of materials, vehicle parking, liquid disposal, machinery repairs and/or refuelling, construction of site office or shed, combustion of any material,	Site Supervisor	Installed prior to commencement of Stage 3 construction activities. To remain in place for the life of the approval.	Inspected by Approval holder, the Environmental Coordinator, or Site Supervisor.

Management Item	Responsibility	Timing	Reporting
stockpiling of soil, rubble or debris, any filling or excavation including trenching, topsoil skimming and/or surface excavation, unless otherwise approved. • Only approved weed management and revegetation works are to occur within the on-site conservation corridor. • Fencing shall be reinstated immediately if damaged or knocked down.			
Contractor Education and Awareness			
All site contractors and sub-contractors will be made aware of their responsibilities to protect native fauna. This Strategy is provided as a working document to assist on-site management and protection of native animals. This Strategy will generally form part of education and training in a broader Construction Environmental Management Plan but as a minimum will include: • A copy of this Strategy kept on site (Site Office). • General education and awareness notification of contractors and sub-contractors involved in activities potentially impacting native animals as part of site induction and pre-starts.	Site Supervisor / Approval holder.	Prior to the commencement of construction and as part of the site induction for new staff and sub-contractors.	Site Supervisor
Koala Sensitive Road Design Plan			
The Koala Fencing Strategy is to operate in conjunction with the conditions related to clearing within the development area and the implementation of the Koala Sensitive Road Design Plan and safe fauna movement solutions. Prior to commencing the third stage of clearing, the Sensitive Road Design Plan is to be prepared and submitted for approval by the Minister. The plan must detail the design, location and installation timeframe for safe fauna movement solutions, traffic calming features and Koala awareness signage along roads within the development area and adjacent to the onsite conservation corridor.	Approval holder / Site Supervisor	Prior to the commencement of the third stage of clearing.	Inspected by Approval holder, the Environmental Coordinator, or Site Supervisor.

Page 1: Context Plan



Notes:
This plan was prepared as a desktop assessment tool. The information on this plan is not suitable for any other purpose. Property dimensions, areas, numbers of lots and contours and other physical features shown have been compiled from existing information and may not have been verified by field survey. These may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill Group therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of the Saunders Havill Group. Unless a development approval states otherwise, this is not an approved plan.

Layer Sources
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Legend

- Qld DCDB
- Referral area

Koala fence locations

- Phase 1 temporary koala exclusion fence
- Phase 2 temporary koala exclusion fence
- Phase 2 clearing direction
- Phase 3 temporary koala exclusion fence
- Phase 3 clearing direction
- Phase 4 permanent koala exclusion fence
- Phase 4 clearing direction

Issue	Date	Description	Drawn	Checked
A	24/02/2021	Preliminary	TC	LT

0 100 200 300 m

Transverse Mercator | GDA 1994 | Zone 56 | 1:7,500 @ A3

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Pointcorp Heritage Park Pty Ltd

Clarke Road, Park Ridge

Address / RPD: Clarke Road, Park Ridge

24/02/2021 | 8392 E 01 Context A

Page 2: Koala Exclusion Fencing Notes

INTRODUCTION

The Environmental Management Division of the Saunders Havill Group was engaged by Pointcorp Heritage Park Pty. Ltd. To prepare a Koala Fence Strategy detailing the design, location and installation/removal timeframe of temporary and permanent fencing throughout all clearing, construction, and operation phases of the Heritage Park project.

This Koala Fencing Strategy has been prepared in accordance with EPBC Act approval condition 3a and is to be implemented for the duration of the approval to guide the approval holder in achieving the outcomes required under condition 3b (ref. EPBC 2017/8090).

The development has been proposed over three (3) construction stages, occurring in an east to west direction to guide native fauna progressively towards the on-site conservation corridor. To align with the construction stages the temporary and permanent Koala exclusion fencing has been divided into four (4) phases (refer Section 3.3).

The Koala fencing strategy provides the details of the design and location of the Koala fencing and the timeframe of installation and operation in conjunction with conditions within the EPBC approval related to clearing within the development area and the implementation of the Koala sensitive road design plan and safe fauna movement solutions.

FENCE DESIGN

The fence Koala fence design is either temporary Koala exclusion fencing or permanent Koala fencing as specified within **Section 3.2**. Koala exclusion fencing is to be generally in accordance with accepted permanent Koala exclusion fencing detailed within Fauna Sensitive Road Design Guidelines Volume 2 (Department of Transport and Main Roads, 2010) and Sensitive Design Guidelines Version 2 (Department of Environment and Science, 2020). The proposed temporary exclusion fencing is to be generally in accordance with the options summarised within **Section 3.2.** Temporary Koala exclusion fencing specifications have been adapted from standard permanent Koala exclusion guidelines, thus achieving best practice standards.

LOCATION

Phase 1

Temporary Koala exclusion fencing installed along the boundary of existing cleared areas and current construction activities (refer Page 3). This phase is to occur within Stage 1 of clearing/ construction activities illustrated within Attachment A of the EPBC Act approval (ref. EPBC2017/8090). Temporary Koala exclusion fencing to remain in place until Phase 2 fencing has been installed.

Phase 2

Temporary Koala exclusion fencing is Phase 1 alignment with the addition of vegetation clearing south of Mercantile Drive (refer Page 4). This phase is to occur within Stage 1 of clearing/ construction activities illustrated within Attachment A of the EPBC Act approval (ref. EPBC2017/8090). Temporary Koala exclusion fencing to remain in place until Phase 3 fencing has been in installed.

Phase 3

Temporary Koala exclusion fencing installed either side of the future infrastructure easement and within the Residential and Recreation/open space land sue interface illustrated within the Proposed Land Use Master Plan (refer Page 5). This phase is to occur within Stage 1 of clearing/construction activities illustrated within Attachment A of the EPBC Act approval (ref. EPBC2017/8090). Temporary Koala exclusion fencing to remain in place until Phase 4 fencing has been installed.

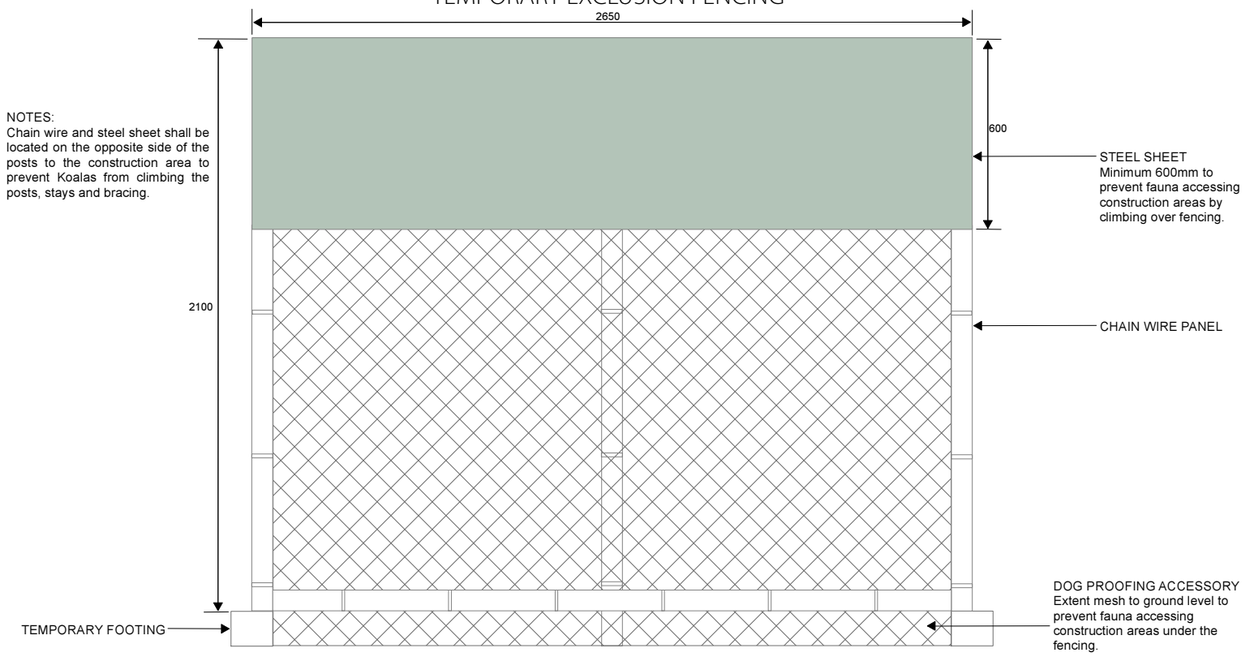
Phase 4

Permanent Koala exclusion fencing installed within on-site Conservation corridor and ultimate development extent interface and on-site Conservation corridor northern boundary and Green Road (refer Page 6). This phase is to occur within Stage 1 of clearing/construction activities illustrated within Attachment A of the EPBC Act approval (ref. EPBC2017/8090). Permanent Koala exclusion fencing is to remain in place for the life of the approval.

INSTALLATION AND REMOVAL TIMEFRAMES

Installation must occur prior to the commencement of construction activities. Fences must remain in place until construction activities are complete or the Koala exclusion fence for the next phase has been installed. Refer to **Section 3.3** for specific Fence Phase installation and removal timeframes.

TEMPORARY EXCLUSION FENCING



PERMANENT EXCLUSION FENCING (EXAMPLE)

Issue	Date	Description	Drawn	Checked
A	24/02/2021	Preliminary	TC	LT

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24/02/2021 | 8392 E 02 Fencing Notes A

Page 3: Phase 1 Details

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Legend

- Qld DCDB
- Referral area
- Phase 1 temporary koala exclusion fence - current edge of construction

Issue	Date	Description	Drawn	Checked
A	24/02/2021	Preliminary	TC	LT

0 50 100 150 m

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Page 4: Phase 2 Details

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Legend

- Qld DCDB
- Referral area
- Phase 1 temporary koala exclusion fence to be removed
- Phase 1 temporary koala exclusion fence to remain in place - current edge of construction
- Phase 2 temporary koala exclusion fence
- Phase 2 clearing direction

Issue	Date	Description	Drawn	Checked
A	24/02/2021	Preliminary	TC	LT

0 20 40 60 80 m

Transverse Mercator | GDA 1994 | Zone 56 | 1:2,000 @ A3

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24/02/2021 | 8392 E 04 Phase 2 Details A

Page 5: Phase 3 Details

Notes:
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Legend

- Qld DCDB
- Referral area
- Phase 1 temporary koala exclusion fence to be removed in Phase 3
- Phase 1 temporary koala exclusion fence to remain in place - current edge of construction
- Phase 2 temporary koala exclusion fence to remain in place for Phase 3
- Phase 3 temporary koala exclusion fence
- Phase 3 clearing direction
- Phase 3 clearing access point to utilise existing internal tracks

Issue	Date	Description	Drawn	Checked
A	24/02/2021	Preliminary	TC	LT

0 100 200 m

Transverse Mercator | GDA 1994 | Zone 56 | 1:5,000 @ A3

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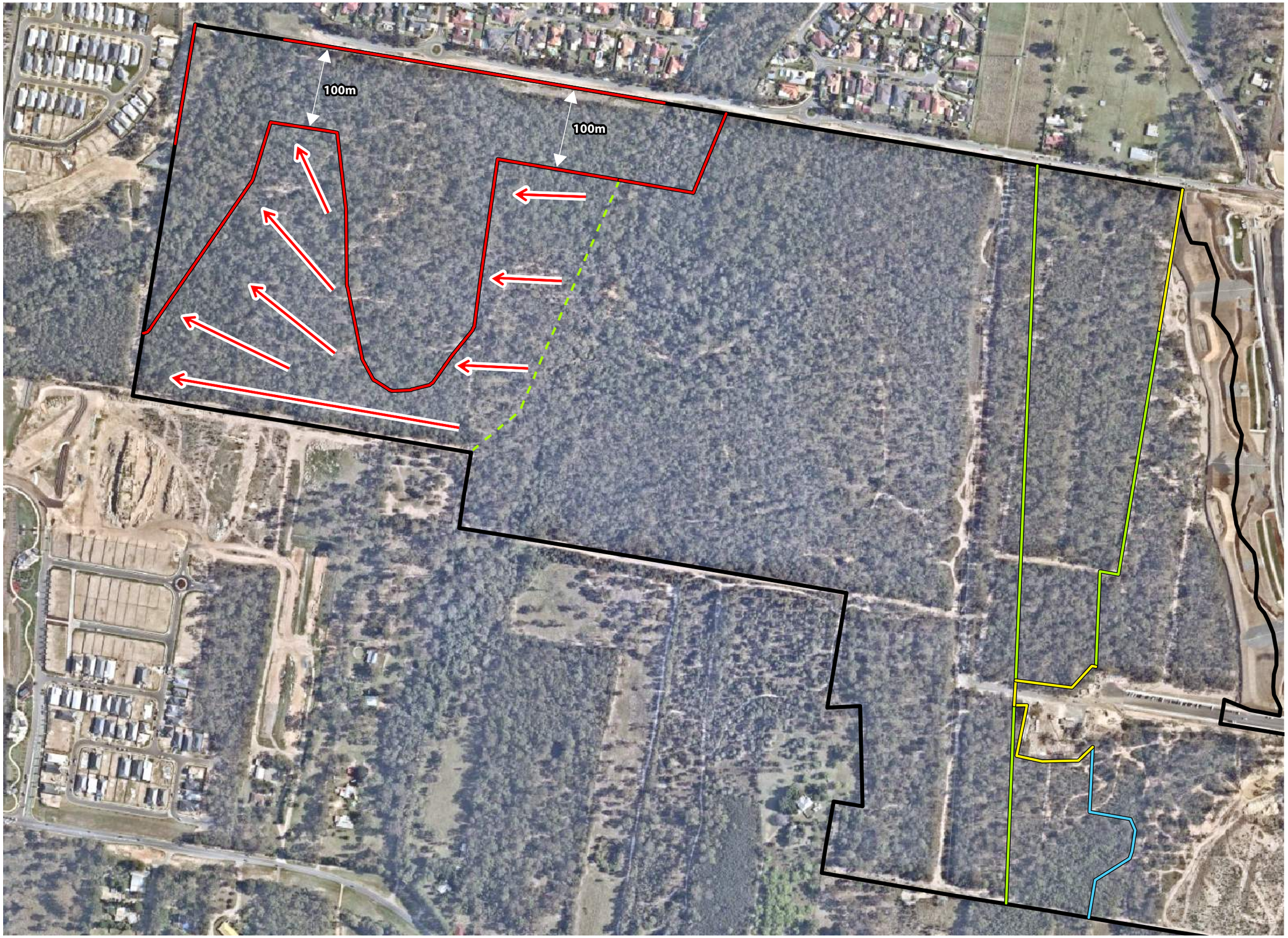
24/02/2021 | 8392 E 05 Phase 3 Details A

Page 6: Phase 4 Details



Notes:
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Legend

- Qld DCDB
- Referral area
- Phase 1 temporary koala exclusion fence to remain in place - current edge of construction
- Phase 2 temporary koala exclusion fence to remain in place for Phase 4
- Phase 3 temporary koala exclusion fence to remain in place for Phase 4
- Phase 3 temporary koala exclusion fence to be removed in Phase 4
- Phase 4 Permnant Koala exclusion fence
- Phase 4 clearing direction

Issue	Date	Description	Drawn	Checked
A	24/02/2021	Preliminary	TC	LT

0 100 200 m

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5. Conclusion

This Koala Fencing Strategy has been prepared in accordance with EPBC Act approval condition 3a and is to be implemented for the duration of the approval to guide the approval holder in achieving the outcomes required under condition 3b (ref. EPBC 2017/8090).

The Strategy details the design, location and installation/removal timeframe of temporary and permanent fencing throughout all clearing, construction and operation phases of the Park Ridge residential, mixed use and medium impact industry precinct, Park Ridge, Queensland (EPBC Reference number 2017/8090).

The development has been proposed over three (3) construction stages, occurring in an east to west direction to guide native fauna progressively towards the on-site conservation corridor. To align with the construction stages the temporary and permanent Koala exclusion fencing has been divided into four (4) phases (refer **Section 3.3**).

The Koala fencing strategy provides details on the design and location of Koala exclusion fencing the timeframe of installation and will operate in conjunction with conditions related to clearing within the development area and the implementation of the Koala Sensitive Road Design Plan and Safe fauna movement solutions to be prepared prior to commencing the third stage of clearing. As such, this Strategy is considered to achieve the requirements under condition 3a of the EPBC Act approval (EPBC2017/8090).

6. Appendices

Appendix A

Koala-sensitive Design Guidelines

Appendix B

Permanent Koala Exclusion Fence Standard Drawings

Appendix A

Koala-sensitive Design Guidelines

Koala-sensitive Design Guideline

A guide to koala-sensitive design measures for planning and development activities

EPP/2019/5154

Queensland Government

Prepared by: Environmental Planning and Policy, Department of Environment and Science

Version	Effective date	Description of changes
1.00	1/11/2012	
2.00	01/02/2020	Update to reflect policy and legislation changes. Updated Government template and style.

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January 2020

Contents

Overview

1. Explanatory statement

1.1 Purpose of guideline

The *Koala-sensitive Design Guideline* provides advice and information for managers, land-use planners, infrastructure providers and development applicants to determine appropriate measures to help avoid and minimise the impact of development and land-use planning on koala populations. It can be used by government and non-government organisation, developers, private consultants and community members.

The guideline also provides information on what is needed to meet the requirements of the *State code 25: Development in South East Queensland koala habitat areas* (koala SDAP) and *State Planning Policy* (Biodiversity) (SPP) in relation to:

- ensuring that koala safety and movement are maximised through design and layout of development
- ensuring koala safety and movement are maximised through design and layout of development
- managing risks to koalas on-site during construction phases.

1.2 Koala-sensitive design principles

Measures in this guideline are based on koala sensitive design principles that help development:

- retain and protect koala habitat values in their natural state to allow koalas to feed, rest and move around
- achieve permeability for koalas through the landscape to ensure the safe movement of koalas within and across a site
- reduce threats to resident and transient koalas.

1.3 Use of guideline

This guideline can be used to:

- identify threats that development activities have on safe koala movement
- identify appropriate koala-sensitive design measures to avoid and minimise those threats
- provide principles and techniques to inform the planning, design and layout stages of development for retaining koala populations and providing for koala safety and movement
- apply the SPP and koala SDAP outcomes for assisting the retention of viable koala populations and providing koala safe movement opportunities.

2. Development planning, design and layout principles

2.1 Threats to koalas

The movement of individual koalas to different populations and territories allows important genetic exchange which is essential for koala population viability. High rates of development in South East Queensland (SEQ) are removing and fragmenting koala habitat and increasingly threatening the safe movement of koalas across the landscape. Koala mortality can be a direct result of human-induced threats from urbanisation and development. Specific threats to koalas from urban development activities include:

- loss of habitat
- habitat fragmentation
- vehicle strike (koala injury or death)
- domestic dog attacks (koala injury or death)
- increased prevalence of disease (increased susceptibility to disease due to stress caused by the above-mentioned threats).

2.2 Habitat connectivity value for koala movement

Koala habitat connectivity value for koala movement should be determined and used in development planning, design and layout.

To determine the habitat connectivity values of the site, with regards to facilitating koala movement through the

landscape, the following factors should be taken into consideration:

1. The site's location with regards to the following:

    - areas identified as koala habitat area
    - areas that are other remnant or regulated regrowth regional ecosystems where koalas are known to occur
    - areas of environmental significance
    - waterway and ecological corridors.

2. The attributes of the site, including the following:

    - presence of koalas
    - condition of the habitat
    - the presence of any of the following on the site:
        - waterway and ecological corridors
        - areas that are remnant or regulated regrowth regional ecosystems where koalas are known to occur.

3. Any factors which diminish the site's habitat connectivity value for koala movement, including:

    - edge effects and other indirect impacts of development on ecological features
    - the presence of infrastructure and services, such as roads, which present barriers for koala movement and dispersal.

In summary, the site's location and attributes with regards to the presence of koalas, location and condition of habitat, waterways and ecological corridors and any factors impacting on these values should be taken into consideration for planning and development.

An assessment for koala habitat connectivity value should include:

- the use or potential use of the site and areas adjacent to the site by koalas
- a plan of koala habitat (including bushland, groups of trees or individual trees)
- a plan of movement corridors (connectivity) including regional and local-scale movement corridors and existing and potential links between koala habitat within and external to the site.

Figures 1 to 4 below provide examples of considerations for assessing koala habitat and habitat connectivity value for a given parcel of land and of koala habitat features to incorporate into development design.

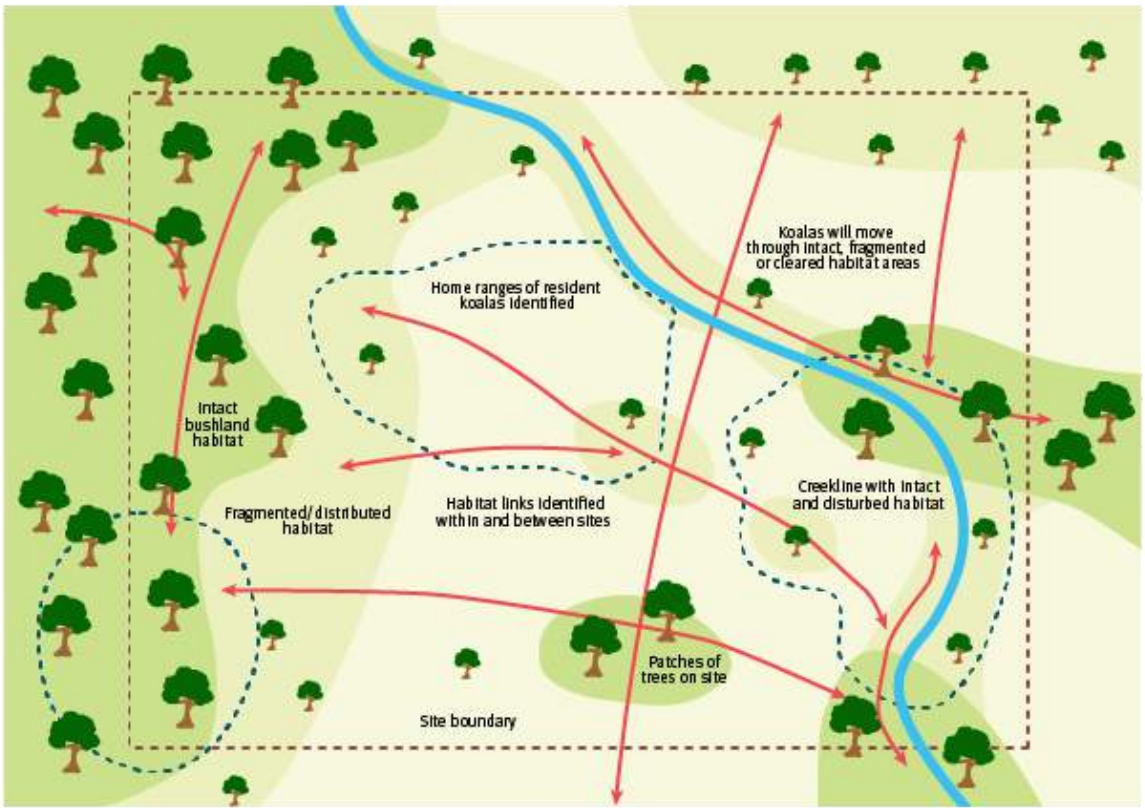


Figure 1. Example of determining koala habitat and connectivity value for koala movement

2.3 Planning, design and layout principles for koala conservation

Following an assessment of koala habitat and habitat connectivity values, the planning, design and layout of the development should incorporate the following principles:

- Ensure areas of koala habitat values and habitat connectivity are protected and enhanced by:
  - retaining, enhancing or creating large contiguous patches of koala habitat
  - avoiding clearing non-juvenile koala habitat trees on the site, including individual, isolated trees
  - linking on-site koala habitat to koala habitat located external to the site
  - identifying rehabilitation areas on site and revegetating consistent with densities, composition and distribution of native koala habitat vegetation based on the pre-clearing regional ecosystems
  - securing the long-term conservation of koala habitat areas using covenants or other private or public ownership arrangements.

- Locate and design the development to avoid adverse impacts on koalas, koala habitat values and habitat connectivity by:
  - selecting sites that will have least impact on koalas if developed, such as cleared land that has low koala habitat connectivity value
  - minimising the size and scale of the developable area in the development footprint and of individual buildings (e.g. higher densities, multi-storey buildings)
  - using development envelopes that are shaped and located to:
    - co-locate all associated activities, infrastructure and access strips
    - be within the least valued area of koala habitat on the lot
    - minimise the footprint of the development envelope area
    - minimise edge effects to areas external to the development envelope
  - ensuring enough area is maintained between development buildings and koala habitat trees to ensure trees will not be removed for safety (fire and falling).

- Locate and design transport routes (roads and rail lines) to avoid fragmentation and clearing of koala habitat and to retain connectivity, including:
  - ensuring transport routes do not cross through large contiguous areas of koala habitat or cleared land with potential as koala habitat through rehabilitation
  - using speed reduction devices such as speed bumps and speed warning sign on roads
  - incorporating koala crossings (over and underpasses) and using koala exclusion fencing to ensure koalas are funnelled towards koala crossings and away from busy transport routes.

- Use native vegetation in landscaping activities that provides food, shelter and movement opportunities for koalas.

Figure 2 illustrates how these planning, design and layout principles for koala conservation can be incorporated to enable efficient use of available land and infrastructure that is sensitive to koala habitat and connectivity.

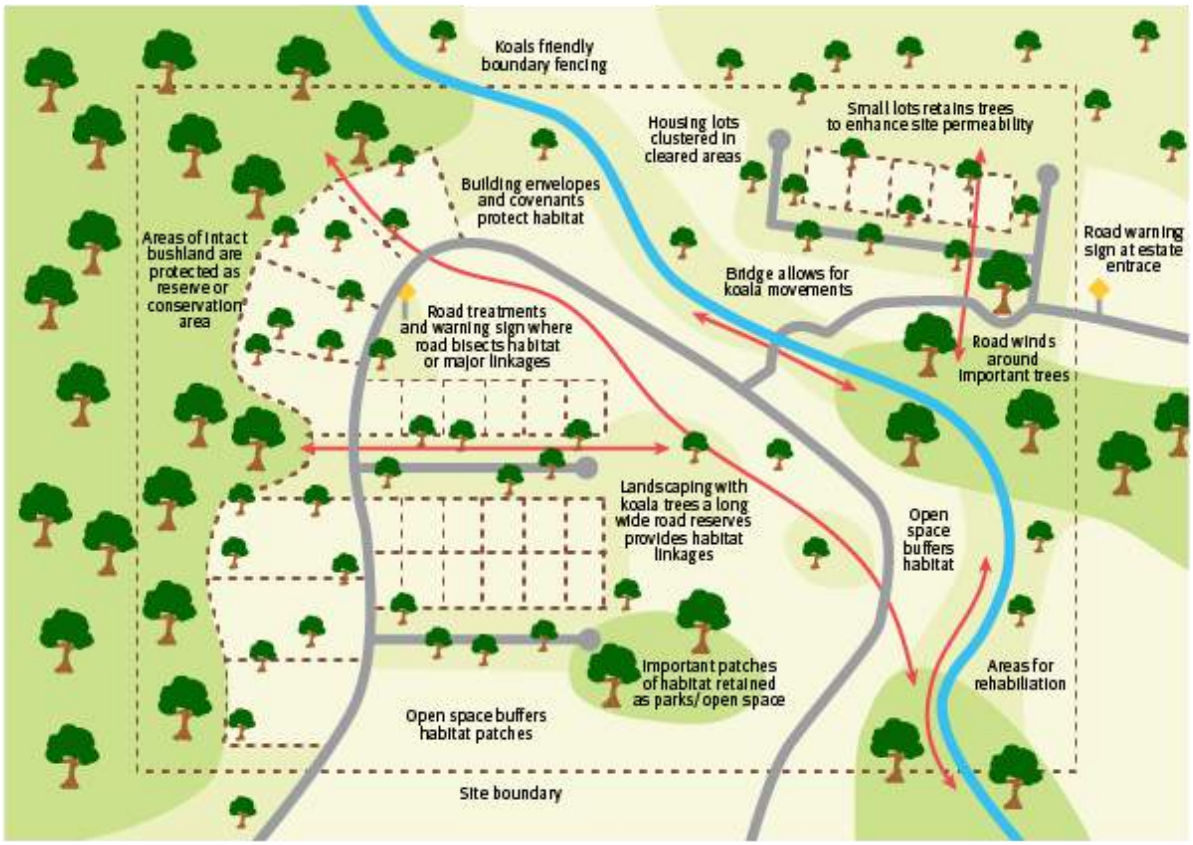


Figure 2. Koala-sensitive urban development

Figures 3 and 4 illustrate two options on how the koala-sensitive planning, design and layout principles above can be used at a lot scale for standard single dwelling housing.

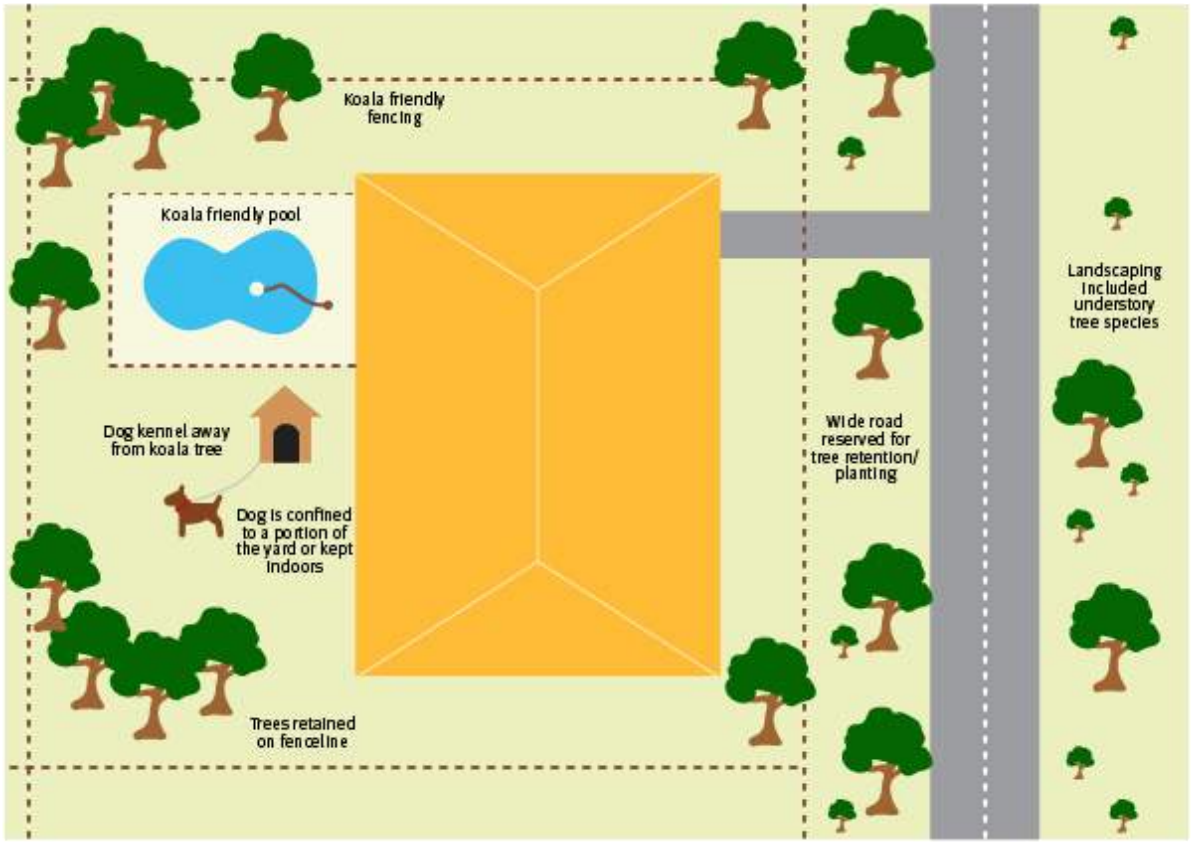


Figure 3. Use of koala-friendly fencing

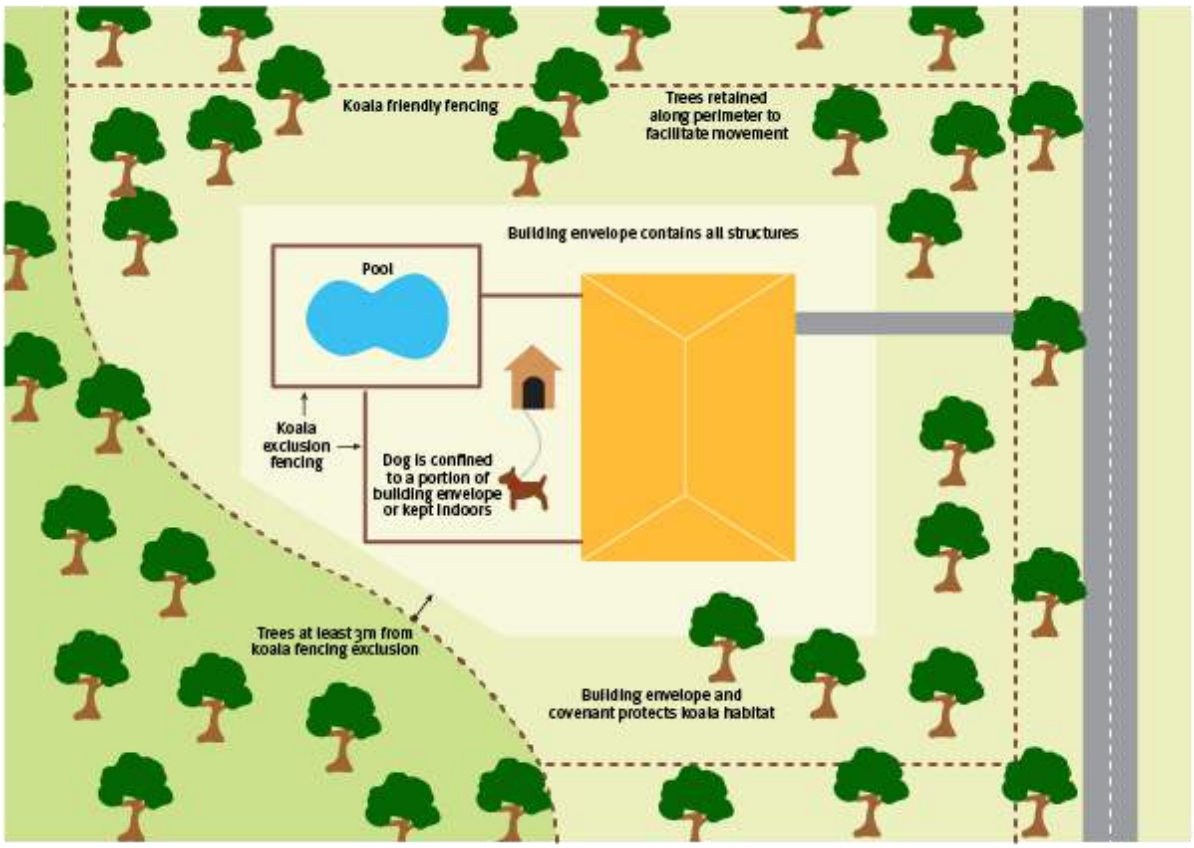


Figure 4. Use of a development envelope and koala exclusion fencing

3. Design guide for koala safety and movement

This guideline describes measures which can be used to avoid, minimise and mitigate the impacts of development on koalas and allow safe koala movement. These are:

- koala-friendly fencing
- koala-safe road design and placement
- koala-safe pools
- mitigation of threats from dogs
- community awareness.

Measures should be chosen to achieve the best outcome for maintaining koala permeability and koala safety. It is likely that several of each type of measure will need to be used to maximise koala safety and movement solutions into the design and layout of development. The five koala safety and movement design and layout measures are described below.

3.1 Koala-friendly fencing

Development that incorporates koala-friendly fencing helps koala movement and dispersal within and across the development site. Inappropriate fencing reduces koala permeability across the landscape. Koala-friendly fencing can be used to allow koala movement between areas of habitat and can be built within properties or on lot boundaries.

In some cases, the use of koala exclusion fencing may be appropriate to prevent koalas from entering an area that poses a threat, such as across busy roads. Exclusion fencing is often used to guide koalas towards koala-safe crossing points such as fauna movement underpasses or overpasses.

3.2 Koala-safe road design and placement

Correct road design and placement can reduce the threat of vehicle strike and habitat fragmentation to koalas. Traffic flow design (number of vehicles and speed) as well as the location and design of roads are critical to avoid or minimise the fragmentation of habitat and allow koalas to safely move throughout the landscape. In areas of high traffic flow where risks to koalas are high, koala crossing infrastructure should be incorporated and exclusion fencing to separate koalas and traffic.

3.3 Koala-safe pools

Development that incorporates koala-sensitive pool design helps reduce the number of koalas drowning in pools. This includes features that allow koalas to easily exit the pool or prevents koalas accessing the pool.

3.4 Mitigation of threats from domestic dogs

Development that reduces the threat to koalas from domestic dogs requires measures to limit the interaction between dogs and koalas. Threats and risks from dogs include injury and deaths caused by dog attacks and increased stress on koalas.

Mitigation measures may occur on individual lots or public open space.

3.5 Community awareness

Community education and cooperation is required to successfully protect koalas. Community awareness and support can help protect koala habitat and prevent disease caused by stress. Community awareness can also help reduce the number of koalas killed on roads, attacked by dogs and drowned in backyard swimming pools.

4. How to implement koala-safe movement solutions

The following section contains guidance on how to implement koala sensitive design approaches.

It provides practical details and examples on how to design koala safe options for fencing, navigating transport corridors, pools and dogs and raising community awareness. These options can be applied to a range of management, planning or development scenarios at strategic and/or site level.

Table 1: Guide to Koala Sensitive Design - koala friendly fencing

Design specification	Additional supporting information
Use koala-friendly fencing material *Allow koalas to easily climb through or under a fence.* Build using minimal materials such as post and rail or other fencing material with a minimum gap of 300 mm between rails. Alternately use solid fencing material that cannot be climbed by koalas but has a minimum gap of 300 mm between the ground and the lowest rail to allow koalas to move underneath the fence.  *Allow koalas to easily climb over a fence.* Use rails or slats that have spaces of at least 10 mm between vertical slats and 20 mm between horizontal rails that koalas can climb. Alternately use materials such as timber posts or chain wire that a koala can easily grip and climb  	Koalas try to go through, under and then around a structure before attempting to climb over. Fencing raised off the ground is the best option for koalas. Koalas can become trapped in fencing as they try to squeeze through palings and rails. Fence design needs to ensure that gaps in the fence are: • large enough to allow easy access to pass through • of a size (less than 10 cm) to allow koalas to climb over, but prevent koalas climbing through and getting stuck in the fence.

Incorporate koala-friendly fencing additions

Build the fence to incorporate existing vegetation or trees.

Leave vegetation on either side of the fence with canopies or trunks extending beyond the height of the fence and where canopies are connected or tree trunks are less than 1 m apart.

Install a timber post or log (of at least 125 mm in width or diameter) leaning against the top of the fence but positioned at an angle to the fence so that the log is not flush with the fence (i.e. the space between the base of the log and the bottom of the fence is at least 400 mm (Figure7))

Install ladders of the following dimensions and design:

- Timber ladder rungs are at least 300 mm in width, 50-100mm in height and a minimum of 20mm in depth to provide grip for koalas.
- Rungs are spaced horizontally with a 150-300mm gap between rungs for ease of climbing.
- Webbed or latticed material is attached to provide additional footholds for koalas.

Incorporate structures or designs in association with fencing material that provide a means for koalas to climb over fences, retaining walls or other structures.

If installing koala-friendly fencing additions they should be used at the following frequencies:

- At least once within a backyard to allow animals to exit a property.
- At least once every 50 m where the length of the impassable barrier or fencing is greater than 200 m.

Ladder rungs need to be solid and firmly attached to the structure.

Install a simple koala bridge (particularly suited to security fences) using timber logs of at least 125 mm in diameter of the following design:

- Timber logs are positioned adjacent to and within 1 m of each other on either side of the fence and extend for at least 1m above the fence.
- A cross piece of similar diameter to the logs connects the two vertical timber posts that are within 1-4m of each other on either side of the fence.

Koala exclusion fencing

Install fencing material that is unclimbable such as:

- brick, metal sheeting, perspex or timber fencing without gaps between palings.

Koala exclusion fencing stops koalas moving between areas. It reduces permeability so should only be used where there is a direct threat to koala safety. The following situations are suitable for using koala exclusion fencing:

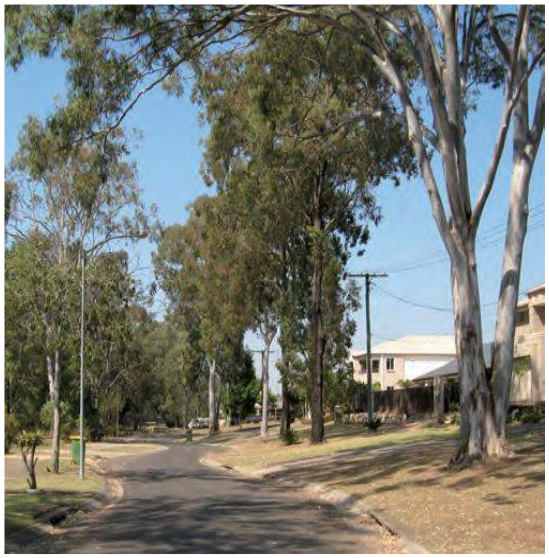
- Domestic dog enclosures in larger properties (greater than 800 m^2). Smaller properties should use other measures to reduce dog and koala interactions.
- High speed/volume roads or train lines - fencing funnels koalas to safe crossing structures (underpasses or overpasses).
- Swimming pools where pool design is unsafe for koalas.
- Areas where construction activities may cause harm to koalas such as pits or trenches. Temporary fencing that stops koala access would be appropriate.

- chain wire fencing material with a floppy top that falls in the direction that the koala will attempt to climb the fence or that has a smooth metal or perspex sheets of at least 600 mm wide on the top of the fence

Additional requirements for koala exclusion fencing are:

- Fence bracing or supports are on the side of the fence that's away from koala access.
- The top of the unclimbable section of fencing is at least 1.5 m from the ground to prevent koalas jumping and gripping the top of the fencing.
- Fencing should extend to ground level along uneven or undulating ground.
- Vegetation beside the fence is regularly maintained to:
  - exclude trees and shrubs from within 3 m of the fence
  - keep canopies of trees trimmed to remove links to tree canopies on the other side of the fence
  - remove fallen branches and vines growing on the fence which koalas may use to climb over the fence.

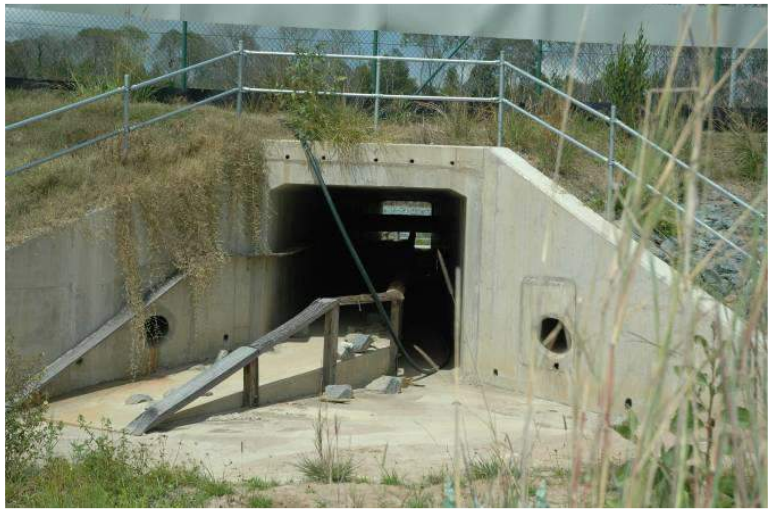
Table 2: Guide to Koala Sensitive Design - koala safe transport infrastructure design and placement

Design specification	Additional supporting information
Road design and features Design roads near identified koala crossing points and limit traffic speeds by incorporating features that slow traffic down such as narrowing roads, curves or other speed reduction structures such as speed bumps. Allow minor deviations in roads and driveways to retain important koala habitat trees. Avoid road alignment that intersects or fragments significant koala habitat areas.   Incorporate lighting in new and existing roads, particularly at identified or potential koala crossing points, to reduce koala and vehicle collisions.  Increase the visibility of koalas entering the roadway through managing vegetation and landscaping through: • mowing grassy road edges regularly; • trimming lower branches of vegetation within median strips or within 2 m of the road above 60 cm so that koalas are visible entering the road way; • not planting dense bushes and shrubs to the edge of road. Incorporate trees within traffic islands and streets with wide verges (not wide busy streets), particularly at "go slow" points. Retain or create interlocking tree canopies over roads. Install koala crossing warning signs. 	High-visibility along roadsides is key to limiting and preventing vehicle strike causing death or serious injury to koalas. Appropriate road alignment and design mitigates threats to koala movement by considering and planning for the following: 1. The location of koala habitat and habitat linkages to ensure that significant habitat areas are not dissected or further fragmented. 2. Minimising the loss of habitat. 3. Impacts on koala movement considered in relation to the number of vehicles likely to use the proposed road, anticipated vehicle speeds and the likely volumes of traffic between 6 pm and 6 am. 4. Locating koala road crossing points in reduced speed zones, ideally 40 km/h. 5. Lighting roads at identified or potential koala crossing points. Koalas are most active between dusk and dawn and can move over 1 km per night. 6. Planning road construction to avoid the koala breeding season (August to December) when koalas are most active.

State-controlled roads and rail lines

Minimise the risk to koalas crossing roads and habitat loss by conforming with the State Government Supported Infrastructure - Koala Conservation Policy (https://environment.des.qld.gov.au/wildlife/koalas/legislation/pdf/comm-infrastructure.pdf) or Memorandum of Understanding.

Crossing structures - underpasses



Install one or more underpass/es to enable koalas to cross safely between habitat on either side of a road.

Ensure the underpass is of an appropriate dimension for the width of the road to allow natural night time light into the structure.

Place 'koala furniture' in the crossing structure to assist koala movement designed as follows;

- horizontal logs placed as high off the ground as possible to avoid predators with a minimum space of 600 mm between the top of the horizontal log and the structure's roof;
- horizontal logs are supported by vertical logs at regular intervals (approximately 2–3 m) along the underpass for koalas to ascend or descend the koala furniture as required;
- logs are greater or equal to 150 mm in diameter, or horizontal planks are greater or equal to 150 mm in width;
- koala furniture extends beyond the underpass into koala habitat.

Design underpass floors to remain dry always except in significant rain events where the structure quickly dries out; or incorporate ledges or koala furniture in the underpass to provide a dry path for movement.

Retain vegetation up to the entrance and exit of the underpass without obstructing access to, or view of, the structure.

Install koala exclusion fencing to funnel koalas to the underpass.

Underpasses (e.g. culverts, pipes and bridges or raised structures that allow wildlife movement beneath a road) that are greater than 20m in length have been found to be less effective than those of less than 20m in length. Longer underpasses deter koalas from using them due to a lack of natural light. New or upgraded roads requiring koala movement underpasses should be designed to avoid lengthy underpasses, for example, by using split carriageways.

The dimension of underpasses should be:

- box culvert of 3 m (H) x 3 m (W) – especially for four lanes or more;
- box culvert of 1.5 m (H) x 1.5 m (W) as a minimum for a single or dual carriageway (this size may include koala furniture).

Crossing structures - overpasses

Install one or more overpass/es to enable koalas to cross safely between habitat on either side of a road.

Construct the overpass as wide as possible, with a minimum width of 60 cm to comfortably accommodate the crossing of koalas.

Build the overpass with stable, rigid or semi rigid materials.

Incorporate vegetation or refuge poles if the overpass (particularly if this is a land bridge) is accessible by predators.

Incorporate koala exclusion fencing to funnel koalas to the crossing structure.

Overpasses (e.g. land bridges) provide a more natural avenue for koalas to cross roads and negate the lighting and flooding issues associated with underpasses.

The substrate should resemble forest floor; however, koalas will go across unnatural substrates such as cement.

Overpass designs should conform to road safety standards and prevent koalas and other animals from falling from the overpass onto the roadway and oncoming traffic.

Overpasses should be designed exclusively for wildlife movement and therefore prohibit dual uses such as pedestrian or cyclist crossings.

Natural crossing points under bridge

Design one or multiple under-bridge crossings to facilitate the safe crossing of koalas between habitat on either side of a road.

Set back bridge footings from the creek edge to provide koalas with natural movement opportunities across unsubmerged or non-waterlogged land beneath the bridge.

Manage vegetation along creek lines to reduce weeds or overgrown areas that will restrict movement between habitat areas.

Incorporate koala exclusion fencing to funnel koalas to the natural crossing point.

Natural crossing points are usually associated with pedestrian and vehicle bridges where koalas can move along the ground while traffic is diverted above the habitat.

Additional requirements for all crossing structures

Locate crossing structures at regular intervals along sections of road adjacent to koala habitat or habitat linkages, at a maximum distance of one structure every 2 km.

Locate crossing structures where koala exclusion fencing of adequate length (a minimum of 150 m) can be incorporated on either side of the crossing structure.

Design fencing that has a return at the end of the koala exclusion fencing to encourage koalas to move back into habitat and not directly onto the road.

Incorporate additional features, such as escape poles, koala gates or other designs on the road side of the koala exclusion fencing to allow koalas trapped in the road corridor to exit to habitat.

Vegetated habitat linkages are retained or established by securing habitat on either side of the road.

Roads can be fitted with a range of measures to reduce koala and vehicle collisions, particularly at identified or potential koala crossing points.

Structures to facilitate safe and unimpeded koala movement across roads should be incorporated into road design and layout where roads intersect or fragment koala habitat and major habitat linkages.

Crossing structures should be designed and installed for the specific purpose of facilitating koalas (and other wildlife which have similar requirements) across or under roads and not for dual purposes, such as underpasses used for drainage.

The installation of crossing structures more frequently than one every 2 km will reduce the impact on the resident koalas that may have used both sides of a road.

Table 3: Guide to Koala Sensitive Design - koala safe pools

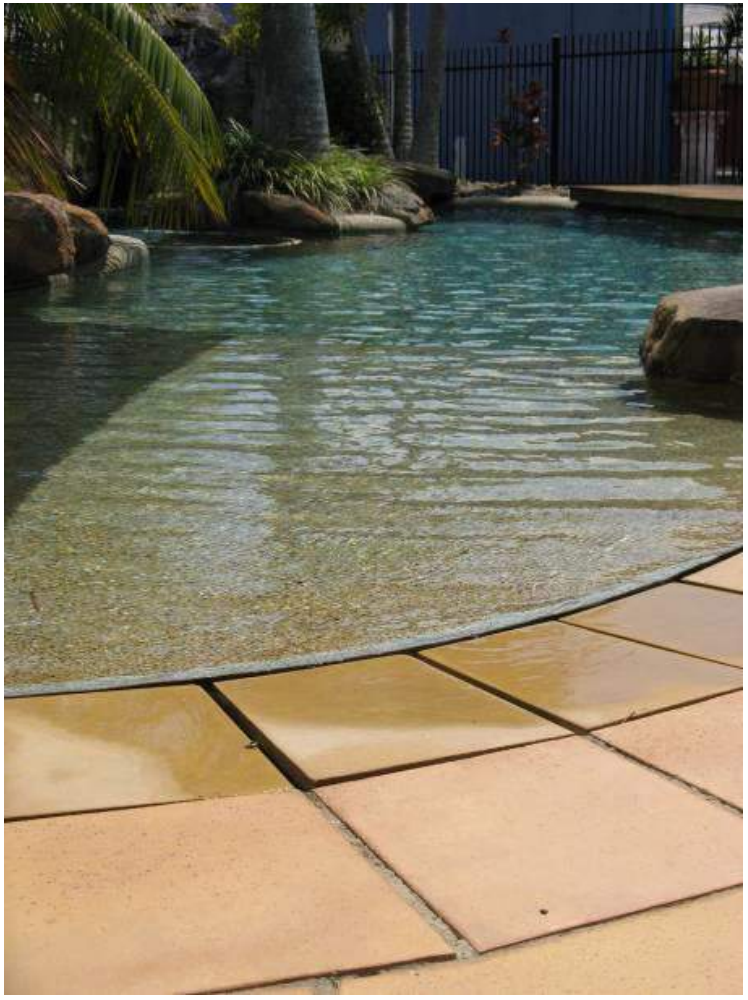
Design specification	Additional supporting information
Koala-friendly pool design Design pools with a shallow lagoon-style entry where the pool water is level with part of the surrounding pavement Incorporate a rope with a floatation device on the end in the pool (Figure 22). The rope should be: • a minimum diameter of 10 cm • anchored securely to a point beyond the pool and close to the ground • long enough to float at least 2 m into the pool. **Koala exclusion pool design** Use koala exclusion fencing around the pool, for example, glass or perspex that has negligible gaps at the bottom and between panels and the gate. Use appropriate landscaping that prohibits koalas entering the pool area on properties where exclusion fencing is used. 	Floatation devices on lengths of rope allow koalas to better find the rope in the pool, while the rope's diameter and its position on the ground allows the koala to easily grip the rope and climb out of the pool.  Koalas drowning in pools can be avoided by preventing them from accessing the pool area. Pool fencing must also comply with Australian Standards and relevant state and local government requirements. If exclusion fencing is used without other koala-friendly design features, landscaping and garden maintenance should ensure that plants and structures do not allow koalas to enter the pool area. (See Koala exclusion fencing – additional requirements).

Table 4: Guide to Koala Sensitive Design - koala safe from dogs

Design specification	Additional supporting information
Dog free development Designate a development dog-free by using a covenant (as part of a condition of approval) to prohibit dogs being kept on the property in perpetuity. **Dog confinement** Dedicate an area of the yard on lots greater than 2000 m2 as a dog enclosure/dog run where dogs are confined between 6pm and 6am. Use koala exclusion fencing around the dog's enclosure (but not the property boundary) to prohibit koala access to the dog's area. Manage vegetation adjacent to fencing to ensure koala exclusion fencing effectiveness. Have dogs tethered or on a run (with access to water and shelter) or confined to the house or veranda/patio between 6pm and 6am on lots less than 2000 m2. Locate the dog enclosure away from koala habitat trees, known koala movement paths or habitat linkages. Use koala-friendly fencing to facilitate koala movement through the rest of the backyard (i.e. the dog free areas). **Signs and management in public places** Use signs in public spaces to inform of koala presence and the need to restrain dogs, particularly between the hours of 6pm and 6am. Have designated dog off leash areas with koala exclusion fencing to separate koalas and dogs. Have management programs that address wild dog attacks.	Dog-free development avoids domestic dog and koala encounters and thereby reduces koala deaths. Domestic dog and koala encounters can be minimised though the confinement of dogs to the house or part of the yard during peak koala activity periods, e.g. between 6pm and 6am. Koalas are most vulnerable to dog attack at night, however, koalas may travel through backyards during daylight hours at any time of the year. Domestic dog and koala encounters can be minimised by using appropriate fencing. Refer to koala fencing section above.

Table 5: Guide to Koala Sensitive Design - community awareness

Design specification	Additional supporting information
Education Install signs to inform residents and the community that koalas are present in an area and of actions that can be taken to protect koalas. Establish and promote programs that raise community awareness on koala presence, protection and safety. Publish easy to read information on websites. 	Measures should be incorporated to educate residents about what things they can do to support koala populations in their area. This may include establishing local area committees to assist with the implementation and monitoring of koala sensitive design objectives.

Definitions

Connectivity means the extent to which individual patches of koala habitat areas are functionally linked to each other in a larger network of koala habitat areas. Connectivity can be achieved in two different ways:

1. structural connectivity which refers to physical connections between koala habitat areas which includes areas of native vegetation;
2. functional connectivity which refers to the ability for koalas to safely move between patches of koala habitat areas without increasing the risk of injury or death of a koala.

'Go slow' point is an area where koalas are expected to cross a road and features have been incorporated to reduce vehicle speed.

Koala furniture are structures that are placed within, or used in association with, road crossing structures that increase the ability of koalas to move through an area. For example, for example, a log may be placed horizontally within a culvert to encourage koalas to pass under a road rather than across it where they may be hit by a car.

Koala habitat means:

- an area of vegetation where koalas live; or
- a partially or completely cleared area used by koalas to cross from an area of vegetation where koalas live to another; or
- an area of vegetation where koalas do not live, if the area primarily consists of koala habitat trees and is reasonably suitable to sustain koalas.

Note: as defined under Nature Conservation (Koala) Conservation Plan 2017.

Koala habitat area means an area shown on the Koala Conservation Plan Map that the chief executive of the *Nature Conservation Act 1992* has determined to be a koala habitat area due to the combination of biophysical measures and suitable vegetation of the area.

Note: as defined under Nature Conservation (Koala) Conservation Plan 2017.

Koala safe infrastructure means infrastructure that provides for safe movement either above or below an area that poses a risk to safe koala movement, such as a fauna overpass or underpass with koala safety fencing associated with a road.

Safe koala movement opportunity is a measure that is intended to:

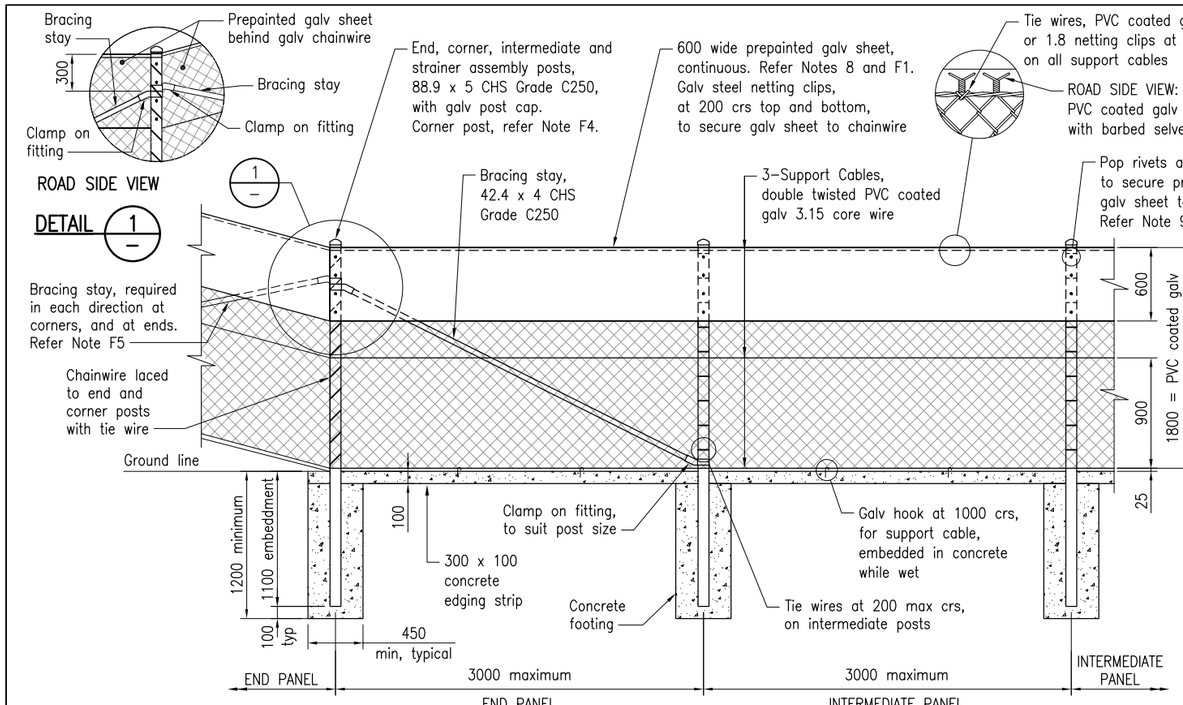
- minimise threats to resident and transient koalas; or
- achieve permeability to provide for the safe movement of koalas within and across a site; or
- provide food or refuge sources for koalas.

Urban purpose means urban purpose as defined in the Planning Regulation 2017.

Appendix B

Permanent Koala Exclusion Fence Standard Drawings

The purpose of This Standard Drawing is to provide typical standard details.
The fitness for purpose of these details for a specific project shall be designed and certified by an RPEQ.
The details specific to the project shall be shown on the project specific drawings.

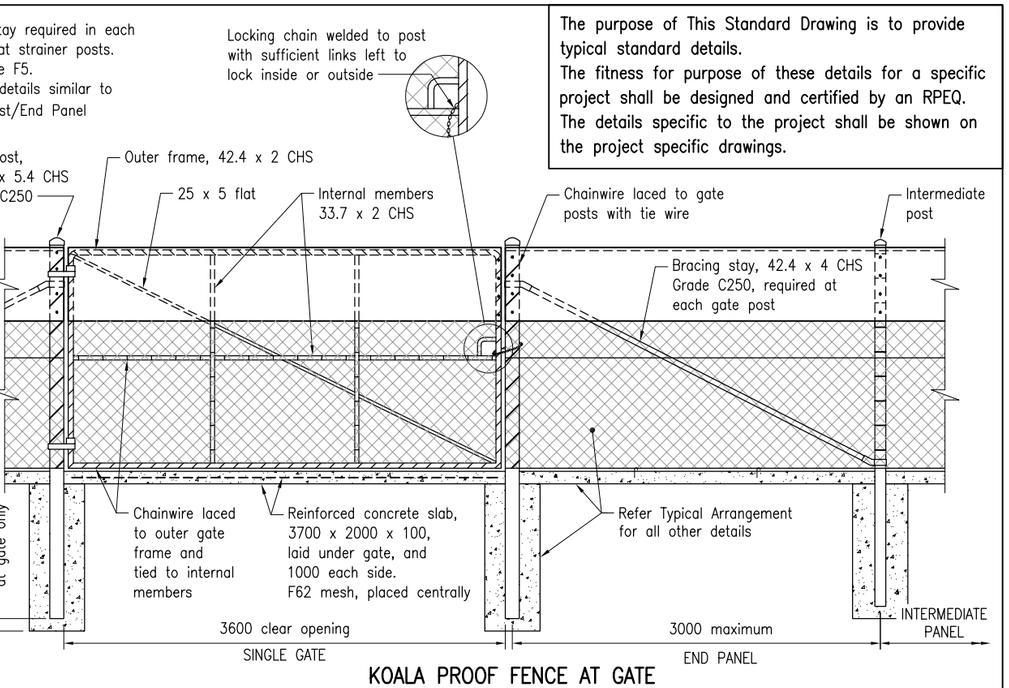


KOALA PROOF FENCE – TYPICAL ARRANGEMENT

Viewed from outside road reserve

TYPICAL INTERMEDIATE STRAINER POST ASSEMBLY

Viewed from outside road reserve

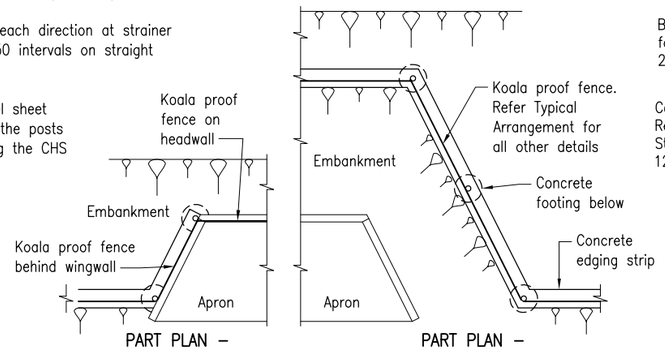


KOALA PROOF FENCE AT GATE

Viewed from outside road reserve

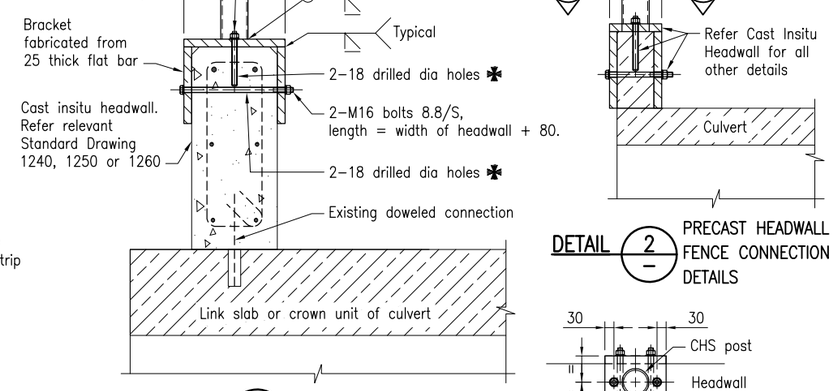
KOALA PROOF FENCE:

F1. PREFINISHED/ PREPAINTED GALVANIZED STEEL SHEET shall be coloured on both sides. The nominated colour to face the road, which shall be approved by the Project Administrator, shall be "Cottage Green" or "Nightsky Black".
F2. SELVEDGES: Barbed selvedges shall be used at top except on gates where knuckled selvedges are used top and bottom.
F3. TIE/LACING WIRE shall be green PVC coated galvanized wire unless specified otherwise.
F4. CORNER POSTS shall be adopted where the change in angle in horizontal alignment exceeds 20 degrees.
F5. STRAINER POST: Provide bracing stays in each direction at strainer post between 2 intermediate panels at 150 intervals on straight lengths of fence.
F6. FENCE INSTALLATION REQUIREMENTS:
Chain wire and prepainted galvanized steel sheet shall be located on the opposite side of the posts to the roadway to prevent koalas climbing the CHS posts, stays, and bracing.
Connection to culvert headwalls:
All dimensions shall be verified on site prior to fabrication of steel components. Connection to bridges shall be as detailed in the bridge drawings.



PART PLAN – FENCE ON HEADWALL

PART PLAN – FENCE ON EMBANKMENT

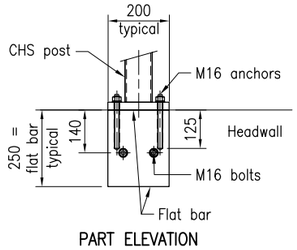


✠ Drilling of holes shall not damage or cut reinforcement in headwall

DETAIL 2 CAST INSITU HEADWALL FENCE CONNECTION DETAILS

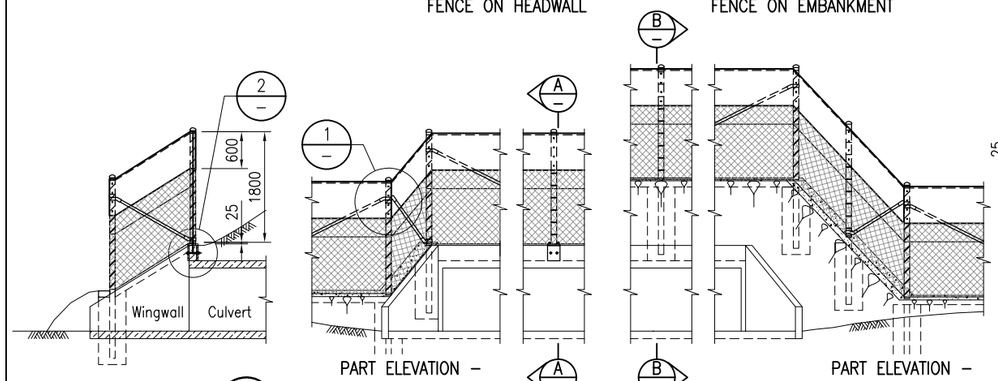
DETAIL 2 PRECAST HEADWALL FENCE CONNECTION DETAILS

SECTION C TYPICAL DETAILS – PART PLAN



PART ELEVATION

FENCE CONNECTION TO HEADWALL



SECTION A

PART ELEVATION – FENCE ON HEADWALL

PART ELEVATION – FENCE ON EMBANKMENT

SECTION B

KOALA PROOF FENCE AT CULVERTS

Viewed from outside road reserve

NOTES:

1. SCOPE: This Standard Drawing provides details of koala proof fencing for TMR projects, and shall be constructed in accordance with MRTS14.
2. WIND DESIGN LOADS shall comply with AS/NZS 1170.2.
   Design ultimate wind load V = 51 m/s.
3. CONCRETE shall be in accordance with MRTS70. Concrete strength N32/20.
4. REINFORCING STEEL shall be in accordance with MRTS71, Standard Drawing 1044 and AS/NZS 4671.
   Mesh Grade D500L.
5. STEELWORK shall be fabricated to the requirements of MRTS78.
   CHS shall be Grade C350, or as noted on the drawing, to AS 1163.
   Flat bar shall be Grade 300 to AS/NZS 3679.1.
   Bolts Class 8.8, nuts Class 8 and washers for Class 8.8 bolts to AS/NZS 1252.
   All nuts shall be snug tight in accordance with AS 4100.
   Galvanized fencing wire, tie/lacing wire and galvanized chainwire shall conform to AS 2423.
   All bolts and nuts shall be hot dip galvanised to AS 1214.
   All other steelwork shall be hot dip galvanized to AS/NZS 4680.
   Prior to galvanizing all weld splatter and welding slag shall be removed.
7. WELDING symbols to AS 1101.3. All welding shall be to AS/NZS 1554.1.
   All welds except location tack welds shall be SP category.
   Welding consumables shall be controlled hydrogen type G493 to AS/NZS ISO 14341–B or T493 to AS/NZS ISO 17632–B.
8. PREFINISHED/ PREPAINTED GALVANIZED STEEL SHEET shall be 0.4mm BMT to AS 2728.
9. POP RIVETS with aluminium shell, steel stem (large flanged) maximum grip 9.5mm, drill bit No 11 (4.9mm), shall be used.
10. DIMENSIONS are in millimetres.

REFERENCED DOCUMENTS:
Departmental Specifications and Technical Notes:
MRTS14 Road Furniture
MRTS70 Concrete
MRTS71 Reinforcing Steel
MRTS78 Fabrication of Structural Steelwork

Department of Transport and Main Roads

FENCING

KOALA PROOF FENCE AND GATE

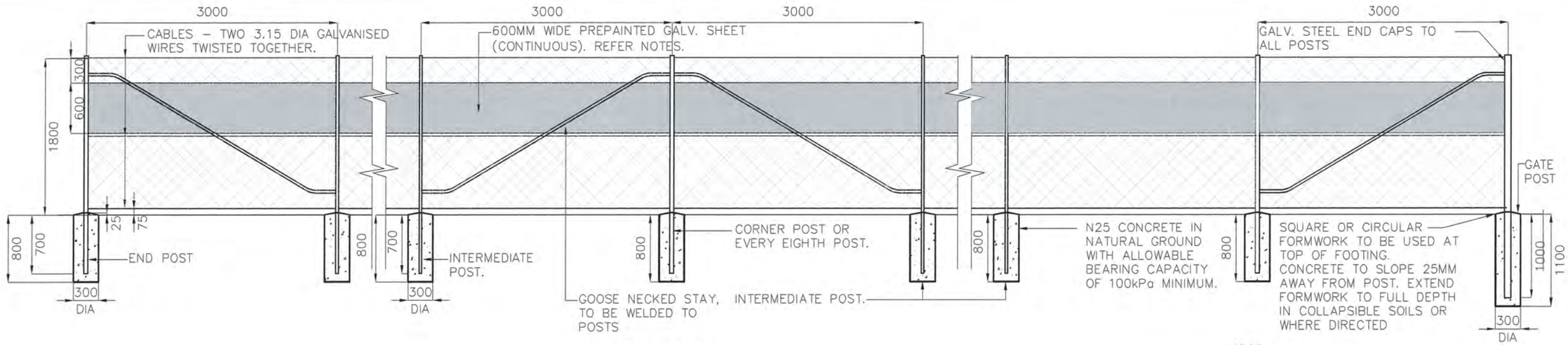
Queensland Government

A3 | Not to Scale

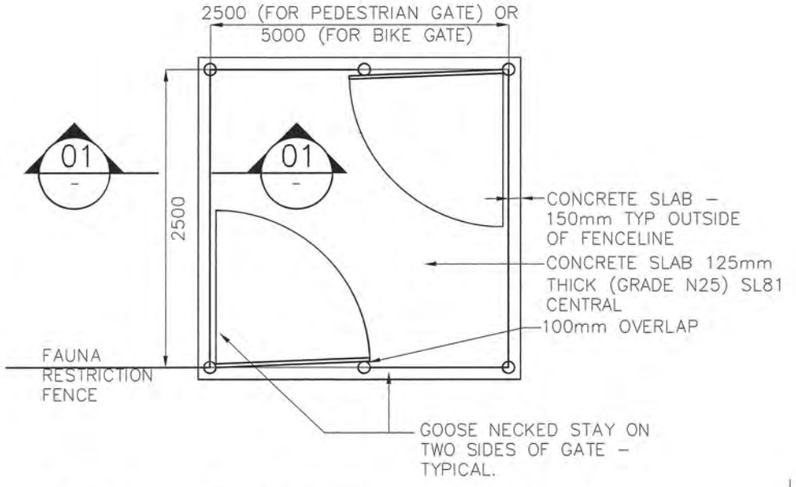
Standard Drawing No 1603

Date 7/19

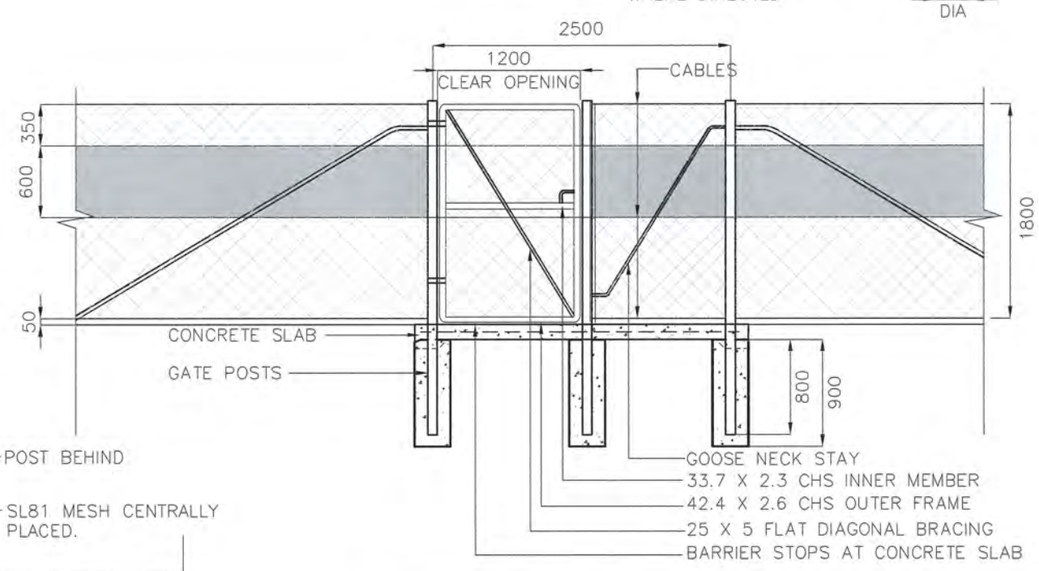
A | B



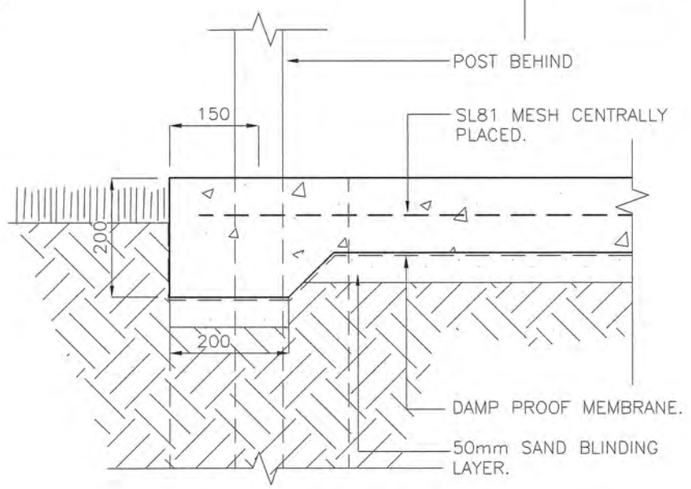
ELEVATION
SCALE: 1:50



TYPICAL PEDESTRIAN/BICYCLE GATE – PLAN
SCALE: 1:50



TYPICAL PEDESTRIAN GATE – ELEVATION
SCALE: 1:50



SECTION 1–1
SLAB EDGE THICKENING DETAIL
SCALE: 1:10

ISSUE	AMENDMENT	DRAWN DATE	CHK'D DATE	APPR'D DATE
A	ORIGINAL ISSUE	DEC '14	DEC '14	DEC '14

DRAWING AUTHORISED FOR PUBLICATION
FOR ASSET ENGINEERING MANAGER STRATEGIC ASSET MANAGEMENT
DESIGN APPROVED
SENIOR CO-ORDINATOR NATURAL ENVIRONMENT ASSET SERVICES/BRISBANE INFRASTRUCTURE

DESIGN	CPO - P&D	DATE	DEC '14
DRAWN	CPO - P&D	DATE	DEC '14
CHECKED	BI - FSG - AS	DATE	DEC '14
DRAWING FILENAME	BSD-7009-Sheet 2 of 2.dwg		
ASSOCIATED PLANS	BSD-7009-Sheet 1		

BRISBANE CITY

BRISBANE CITY COUNCIL STANDARD DRAWING

FENCE – NATURAL AREA – CHAINWIRE FAUNA EXCLUSION FENCE – SHEET 2 OF 2

SCALE: AS SHOWN
DWG No.: BSD–7009
ORIGINAL SIZE: A3
REVISION: A