APPENDIX 5: MHQAT METHODS – KOALA

1 KOALA MODIFIED HABITAT QUALITY ASSESSMENT TOOL METHODOLOGY

1.1 INTRODUCTION

The following document outlines species-specific Modified Habitat Quality Assessment Tool (MHQAT) methods for assessment of habitat quality for the Koala at impact and offset sites for EPBC referral 2022/09397. This assessment has been conducted following the *Guide to Determining Terrestrial Habitat Quality* (State of Queensland 2017).

Habitat quality is determined based on an assessment of the following attributes:

Site condition + Site context + Species stocking rate = Habitat quality score

The default MHQAT spreadsheet is generalised so it may be applied to a number of species. The Department of Climate Change, Energy, Environment and Water (DCCEEW) require that modifications are made to the MHQAT to suit the unique species characteristics, which are listed in the EPBC Administrative Guidelines on Significance, the National Recovery Plan (NRP) and the Species Profile and Threats Database (Department of the Environment and Heritage 2003; Department of Climate Change Energy the Environment and Water 2022).

This methodology has been adopted and tailored / modified to assess the habitat quality score for the Koala at the impact site and offset site. The method is derived from the *Guide to Determining Terrestrial Habitat Quality* (State of Queensland 2017), which provides the base methodology for the Guide to determining terrestrial habitat quality.

The MHQAT methods have been previously modified as part of the Preliminary Documentation process by Saunders Havill Group to complete impact site habitat quality assessments and to prepare offset strategy documents.

In preparing the Offset Management Plan, targeted modifications to the methods employed by Saunders Havill Group have been applied where necessary to ensure applicability to the species and site context.

Wherever changes have been made to the method, these have been made explicit in the text of the MHQAT method in this document and otherwise methods are consistent with the work of Saunders Havill Group. For each measure removed, changed or for which an indicator has been chosen, justification has been provided. Changes and justifications have been made by previous consultants (Saunder's Havill Group) and modifications have only been made if necessary for continuity and simplicity. This document consolidated the Saunders Havill Group methods for clarity and increases exposition to provide a single reference material. The full methodology has been combined in this document for the sake

of ensuring that all methods are contained succinctly and clearly in one document for future use.

1.2 MHQAT OVERVIEW

The following section outlines the modifications of the base MHQAT method that have been made for the Koala.

MHQAT modifications must be based on species characteristics. Species information has been drawn from the EPBC Administrative Guidelines on Significance, the National Recovery Plan (NRP) and the Species Profile and Threats Database. In summary, modifications have been made on the basis of the following species characteristics:

- The koala is a habitat and dietary specialist, relying on a limited range of eucalypt species that vary regionally in importance.
- The species is strictly arboreal and dependent on mature trees for feeding, shelter, resting and breeding.
- Koalas have low mobility and limited dispersal capacity, making them highly sensitive to habitat loss, fragmentation and movement barriers.
- Individuals occupy overlapping home ranges, with range size and use driven by food tree availability, soil fertility and moisture.
- Koalas depend on canopy structure and tree microclimates for thermoregulation, particularly during heat, drought and cold stress.
- Most water requirements are met from foliage, making koalas vulnerable to drought and declining tree condition.
- Koalas spend most of their time resting and require refuge trees that may be distinct from primary food trees.
- Population viability is strongly affected by terrestrial threats such as vehicles, dogs and disease, which increase with habitat fragmentation.

The site was assessed as per the *Guide to Determining Terrestrial Habitat Quality* (State of Queensland 2017). In accordance with the guideline, Assessment Units (AUs) within the site were determined. Notably, the number of AUs were reduced[1] from three (3) to two (2) AUs following a field investigation completed by two (2) tertiary qualified ecologists in November 2025. The purpose of the change was to align the observed habitat types, being:

1. Regrowth vegetation (foraging value), and
2. Pasture with scattered trees or shrubs (limited value).

The reason for the modification was to separate the vegetation on the basis of present value for the species. The vegetated areas offer some regrowth foraging value, and cleared areas offer limited value beyond dispersal. It was considered unnecessary to

[1] Compared to the previously submitted draft Offset Management Plan prepared by Terrestria.

further segment the regrowth vegetation, which provided the same habitat value. As such, they were consolidated to simplify management and represent the two types of habitats available.

Refer to Figure 1 for a map of AUs and the location of BioCondition assessment plots.

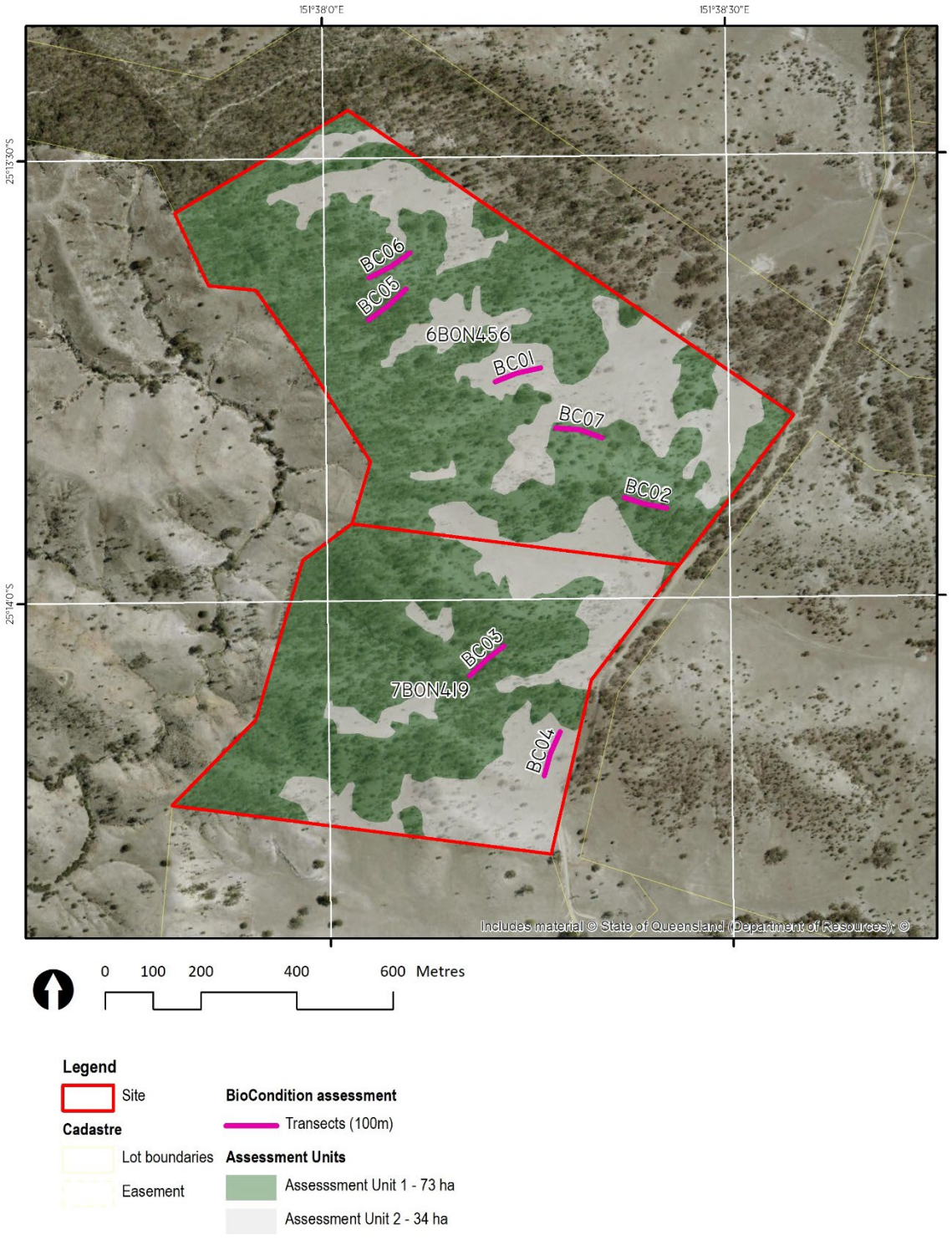

FIGURE 1: ASSESSMENT UNITS AND TRANSECT LOCATIONS WITHIN THE OFFSET SITE.

1.3 OVERALL WEIGHTINGS

This section outlines the weightings of the three components of the MHQAT. The purpose, default weighting, proposed weighting, and justification for each is provided in Table 1.

TABLE 1: MHQAT CATEGORY DESCRITPTIONS, DEFAULT WEIGHTINGS AND PROPOSED WEIGHTINGS, AND JUSTIFICATION FOR PROPOSED WEIGHTINGS.

Category	Description	Default Weighting	Proposed Weighting	Justification
Site Condition	Site condition measures the characteristics of the vegetation community compared to an undisturbed community of the same type (State of Queensland 2017).	3/10	3/10	As an arboreal mammal that utilises the ground and canopy for mobility, that relies on Eucalypt woodland habitats, site condition weighting is considered appropriate in the default state.
Site Context	The surrounding landscape and adjacent land uses can directly influence the quality and security of habitat through edge effects, environmental buffering, or threatening processes.	3/10	3/10	The Koala's movement and home range characteristics make the species sensitive to land clearing, fragmentation and disturbance. The default Site Condition weighting is considered appropriate in the default state.
Species Stocking Rate	A suitable offset must demonstrate that the species occurs in the area, and the site can support the reproduction and continued existence of species. Species stocking rate measures the capacity of a site to support a species.	4/10	4/10	As Species Stocking Rate captures functional habitat occupied by the species, the default Site Condition weighting is considered appropriate. Occupied Koala habitat is more important than unoccupied habitat.

The following sections of the report provide further justification on the measures of habitat quality that comprise the above categories.

1.4 SITE CONDITION

Site condition is assessed using a suite of attributes to describe the structure and function of the vegetation community and is benchmarked against the expected range for a relatively undisturbed community. The MHQAT methodology for Site Condition incorporates:

- From the *Guide to Determining Terrestrial Habitat Quality* (State of Queensland 2017), a BioCondition assessment is applied, and
- Species-specific measures of the MHQAT (Cth), including:
  - The quality and availability of food and foraging habitat, and
  - The quality and availability of shelter.

The relative weightings of BioCondition (80%), food and foraging habitat (10%), and shelter (10%) have not been modified from the original methodology. It is considered appropriate in the default state and is in accordance with original overall weightings applied by Saunders Havill Group. A summary of the relative site condition scores is provided in Table 2.

TABLE 2: SITE CONDITION DEFAULT AND PROPOSED MEASURES.

Default			Proposed		
Measure	**Max. Score**		**Measure**	**Max. Score**	
BioCondition					
Recruitment of woody perennial species in EDL	5		Recruitment of woody perennial species in EDL	5	
Native plant species richness – trees	5		Native plant species richness - trees	5	
Native plant species richness – shrubs	5		Native plant species richness - shrubs	5	
Native plant species richness – grasses	5		Native plant species richness – grasses	5	
Native plant species richness – forbs	5		Native plant species richness - forbs	5	
Tree canopy height (average of emergent, canopy, sub-canopy)	5		Tree canopy height (average of emergent, canopy, sub-canopy)	5	
Tree canopy cover (average of emergent, canopy, sub-canopy)	5	80	Tree canopy cover (average of emergent, canopy, sub-canopy)	5	80
Shrub canopy cover	5		Shrub canopy cover	5	
Native grass cover	5		Native grass cover	5	
Organic litter	5		Organic litter	5	
Large trees (Eucalypt plus Non-eucalypt)	15		Large trees (Eucalypt plus Non-eucalypt)	15	
Coarse woody debris	5		Coarse woody debris	5	
Non-native plant cover	10		Non-native plant cover	10	
Species specific site condition attributes					
Quality and availability of food and foraging habitat	10		A function of the BioCondition score of tree attributes (species richness, height, cover, and large trees).	20	
Quality and availability of shelter	10				
Total					
Total score	**100**		**Total score**	**100**	

The scoring method for each measure is provided in the following sections.

1.4.1 BIOCONDITION

BioCondition has been designed to measure a range of site-scale attributes. Not all attributes may be relevant to the target species. The site condition assessment under the MHQAT is assessed using the following condition characteristics:

- *recruitment of woody perennial species in EDL*,
- *native plant species richness – trees*,
- *native plant species richness – shrubs*,
- *native plant species richness – grasses*,

- *native plant species richness – forbs*,
- *tree canopy height (average of canopy, sub-canopy)*,
- *tree canopy cover (average of canopy, sub-canopy)*,
- *native grass cover*,
- *organic litter*,
- *large trees*,
- *coarse woody debris*, and,
- *non-native plant cover*.

For the Koala, the above measures have not been modified in terms of function or weighting from the original *Guide to Determining Terrestrial Habitat Quality* (Version 1.2 April 2017). Refer to this document for the applied methodology and scoring method for each of these measures.

1.4.2 SPECIES-SPECIFIC HABITAT ATTRIBUTES

Species-specific habitat attributes do not have a 'default' measure as they are not part of the *Guide to Determining Terrestrial Habitat Quality* and are additions of the federal EPBC Act offsets process. They are 'species specific' because suitable shelter and food varies between species.

Species-specific habitat attributes must be selected by the consultant and suited to the target species. In the original context, the *quality and availability of food and foraging habitat* and the *quality and availability of shelter* refer to the extent to which a site provides sufficient, accessible, and ecologically appropriate resources and structural features to support the survival, growth, and reproduction of a species across relevant life stages.

For the Koala, food, foraging and shelter habitat are generally related to the canopy strata, within which Koalas seek almost all of their food and rest.

The impact site assessment method provided by Saunders Havill Group suggests that the following metrics were used to determine the score for food and foraging habitat, and for shelter: *'Given the high scores for recruitment of native perennial species (3/5), native plant species richness of trees (5/5), tree canopy height (5/5) and tree canopy cover (5/5), the Quality and Availability of Food and Foraging Habitat was scored the maximum of 10.*

To maintain consistency, Litoria has utilised the method provided by Saunders Havill Group, with a minor adjustment. Saunders Havill applied the same method twice, both scored out of 10, to comprise the total score of 20. This method consolidates the scoring into the same measure completed once, with a weighting of 20, which simply avoids minor duplication.

The best quality habitat is likely to meet or exceed the BioCondition benchmarks, particularly with regard to canopy trees. For the Koala, canopy tree measures from BioCondition were utilised, where higher scores will indicate a variety of mature tree species options for shelter and food, including:

- Species richness,
- Tree canopy height (average of canopy and sub-canopy),
- Tree canopy cover (average of canopy and sub-canopy), and
- Number of large trees.

For the method of determining the possible score obtained for each measure, refer to the *Guide to Determining Terrestrial Habitat Quality* (Version 1.2 April 2017).

When all four measures are combined, their total achieved score is compared to the total possible score. The score is then translated to a weighted score out of 20. This approach essentially increases the weighting of these canopy tree measures as standard scores measured against a reputable benchmark in BioCondition, whilst ensuring minimal deviation from the method applied by Saunders Havill. The scoring table is provided in Table 3 below.

TABLE 3: EXAMPLE SCORES AND MAXIMUM POSSIBLE SCORES FOR BIOCONDITION MEASURES RELATED TO THE CANOPY.

Species-specific Habitat Attributes		
Measure	**Maximum Score**	**Weighted Score**
Native plant species richness – trees	5	([*Sum of scores*]/30)*20 = [*Final score*] /20
Tree canopy height (average of emergent, canopy, sub-canopy)	5	
Tree canopy cover (average of emergent, canopy, sub-canopy)	5	
Large trees	15	

1.5 SITE CONTEXT

Site context refers to the configuration and location of the habitat and whether the characteristic of the surrounding landscape places the habitat in a favourable or unfavourable context. Site context is assessed using the following default measures:

- From the *Guide to Determining Terrestrial Habitat Quality:*
  - *size of patch*,
  - *connectedness*,
  - *context*,
  - *ecological corridors*, and,
  - *role of site location to species overall population in the state.*
- Species-specific measures introduced by the MHQAT:
  - *threats to the species*, and,
  - *species mobility capacity.*

The default methodology from the *Guide to Determining Terrestrial Habitat Quality* is applied to the related Site Context measures. Refer to the document (Version 1.2 April 2017) for the methods and scoring tables.

In contrast, the species-specific habitat attributes do not have a 'default' measure as they are not part of the *Guide to Determining Terrestrial Habitat Quality* and are additions of the federal EPBC Act offsets process. They are 'species specific' because threats and

mobility capacity vary between species. Species specific habitat attributes must be selected by the consultant and suited to the target species.

The overall weightings of all measures have not been modified from the default (Table 4).

TABLE 4: SITE CONTEXT DEFAULT AND PROPOSED MEASURES.

Default		Proposed	
Measure	**Score**	**Measure**	**Score**
Size of patch	10	Size of patch	10
Connectedness	5	Connectedness	5
Context	5	Context	5
Ecological corridors	6	Ecological corridors	6
Role of site location to species overall population in the state	5	Role of site location to species overall population in the state	5
Threats to the species	15	Threats to the species	15
Species mobility capacity	10	Species mobility capacity	10
Total score	**56**	**Total score**	**56**
Overall weighting	**3/10**	**Overall weighting**	**3/10**

The scoring method for each measure is provided in the following sections.

1.5.1 SIZE OF PATCH

Patch size is the area of vegetation being assessed, including any directly connecting remnant vegetation. Size of patch can influence the quality of habitat through edge effects, habitat security, carrying capacity, and proximity of anthropogenic disturbance (such as vehicles, light and noise).

Patch size is important for the koala because larger, well connected habitat patches are more likely to support sufficient food trees, reduce edge effects and disturbance, and sustain viable populations.

The method for measuring size of patch has not been altered from the method in the *Guide to Determining Terrestrial Habitat Quality* (Version 1.2 April 2017) (State of Queensland 2017).

TABLE 5: SIZE OF PATCH SCORING TABLE.

Size of Patch	
Thresholds	**Score**
<5 ha	0
5-25 ha	2
26-100 ha	5
101-200 ha	7
>200 ha	10

1.5.2 CONNECTEDNESS

Connectedness relates to the capacity for species to disperse through the landscape between suitable patches of habitat as described in the *Guide to Determining Terrestrial Habitat Quality* (State of Queensland 2017).

The method for measuring connectedness has not been altered from the method in the *Guide to Determining Terrestrial Habitat Quality* (Version 1.2 April 2017) (State of Queensland 2017).

TABLE 6: DESCRIPTION AND SCORES FOR CONNECTIVITY IN THE LANDSCAPE

Connectedness	
Thresholds	Score
0-10%	0
>10%–<50%	2
50–75%	4
>75% or >500ha	5

1.5.3 CONTEXT

Context relates to the composition of landscapes surrounding the proposed site. Site context describes the broader landscape setting of a site, including its connectivity to surrounding habitat, degree of fragmentation, and exposure to adjacent land uses and disturbances.

Site context is important for the Koala because connectivity and landscape integrity influence movement between feeding and breeding areas, gene flow, and the species' ability to avoid threats such as roads, urban areas, and habitat isolation.

The method for measuring context has not been altered from the method in the *Guide to Determining Terrestrial Habitat Quality* (Version 1.2 April 2017) (State of Queensland 2017).

TABLE 7: SITE CONTEXT SCORING THRESHOLDS.

Context	
Thresholds	Score
<10% remnant	0
>10–30% remnant	2
>30–75% Remnant	4
>75% remnant	5

1.5.4 ECOLOGICAL CORRDIORS

Ecological corridors relate to habitat linkages that allow fauna to move safely between core habitat areas across a fragmented landscape. Corridors maintain ecological connectivity, enable dispersal and support the long-term viability of species and ecological processes.

The method for measuring context has not been altered from the method in the *Guide to Determining Terrestrial Habitat Quality* (Version 1.2 April 2017) (State of Queensland 2017).

Ecological corridors are important to the Koala to reduce risk to habitat fragmentation and promote connectivity, as it positions the offset in areas that are designed to act as wildlife and riparian corridors and are more likely to support strategic connected habitat and long term protections.

TABLE 8: ECOLOGICAL CORRDIORS SCORING THRESHOLDS.

Ecological Corridors	
Thresholds	Score
Not within	0
Sharing a common boundary	4
Within (whole or part)	6

1.5.5 ROLE OF SITE LOCATION TO SPECIES OVERALL POPULATION IN THE STATE

Role of site location to species overall population in the state refers to how important the assessed site is to the long-term survival of the listed species. The method for measuring context has not been altered from the method in the *Guide to Determining Terrestrial Habitat Quality* (Version 1.2 April 2017) (State of Queensland 2017). The site is considered important if it supports critical habitat for the species. The habitat is assessed with regard to the definition of critical habitat for the target MNES.

In accordance with the Conservation Advice for the Koala, habitat critical to the survival of a species is defined as the areas that the species relies on to avoid or halt decline and promote the recovery of the species. Such areas, if identified, would be expected to include habitat occupied and habitat currently unoccupied, areas necessary for population processes and maintenance of genetic diversity and evolutionary potential, and areas required to accommodate future population increase, recolonisation, reintroduction, or as climate refugia. Under the EPBC Act, the following factors and any other relevant factors may be considered when identifying habitat that is critical to the survival of a species:

- Whether the habitat is used during periods of stress (examples: flood, drought or fire),
- Whether the habitat is used to meet essential life cycle requirements (examples: foraging,
- Breeding, nesting, roosting, social behaviour patterns or seed dispersal processes);
- The extent to which the habitat is used by important populations,

- Whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development,
- Whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements,
- Whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation, and,
- Any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community.

An assessment of the probability that the habitat is consistent with the definition of critical habitat should be made by an expert ecologist. The assessment should consider such factors including but not limited to:

- Direct or indirect species evidence,
- Records of the species on or nearby to the site,
- Other site condition and site context scores (i.e., the quality and connectedness of habitats), and/or,
- Population density, strongholds or genetic importance.

TABLE 9: ROLE OF SITE LOCATION SCORING GUIDE.

Role of Site Location to Koala Overall Population in the State	
Thresholds	Score
Not or unlikely to be critical to species' survival	1
Likely to be critical to species' survival	4
Critical to species survival	5

1.5.6 THREATS TO THE SPECIES

Threats to the species is a species-specific habitat attribute that does not have a 'default' measure as they are not part of the *Guide to Determining Terrestrial Habitat Quality* and are additions of the federal EPBC Act offsets process. They are 'species specific' because threats vary between species.

Threats to the species refers to the current and foreseeable pressures that directly affect the survival, reproduction or habitat of MNES at the site and within its broader population context. It requires identifying the type, severity and immediacy of threats.

For the Koala, threats to the species within impact and offset sites have previously been assessed qualitatively within the Preliminary Documentation (Saunders Havill Group, February 2024). This methodology has been continued to avoid exclusions, misinterpretations or errors. The method has been reapplied within the following framework for a qualitative assessment.

Threats listed in key species resources such as the conservation advice should be understood and each one must be assessed by an experienced senior ecologist with reference to field observations and desktop data. Important threats to the koala include (Department of Agriculture Water and the Environment 2022):

- Habitat loss, degradation and fragmentation,
- Vehicle strike,
- Predation and injury from domestic dogs,
- Disease,
- Altered fire regimes,
- Climate change, and,
- Water stress and drought.

Experts consider each threat then complete the assessment by drawing a conclusion based on the likelihood or probability that survival of the Koala would be influenced by threats as outlined in Table 10.

TABLE 10: SCORING TABLE FOR THREATS TO THE SPECIES (ADAPTED FROM PRELIMINARY DOCUMENTATION; SAUNDERS HAVILL GROUP, FEBRUARY 2024).

Threats to the Species	
Thresholds	Score
High threat level: Many threatening processes are present that are likely to result in stress, death or a local population decline.	1
Moderate threat level: Some threatening processes are present that could possibly contribute to stress, death or a local population decline.	7
Low threat level: Limited threatening processes are present and are unlikely to contribute to stress, death or a local population decline.	15

1.5.7 SPECIES MOBILITY CAPACITY

Species mobility capacity refers to how easily the target species can move across the landscape to access resources, recolonise habitat or avoid threats. It considers the intrinsic movement ability of the species (for example, whether it is highly mobile, moderately mobile or dispersal-limited) and how that interacts with the surrounding landscape condition.

For the Koala, species mobility capacity within impact and offset sites has previously been assessed qualitatively within the Preliminary Documentation (Saunders Havill Group, February 2024). This methodology has been continued to provide consistency between impact and offset sites, as well as to avoid exclusions, misinterpretations or errors. The method has been reapplied within the following framework for a qualitative assessment.

Mobility capacity as discussed in conservation advice should be understood and assessed by an experienced senior ecologist with reference to field observations and desktop data. Factors influencing mobility for the Koala are as follows (Department of Agriculture Water and the Environment 2022):

- Patch size and connectivity, including the presence and width of corridors,
- Gap distances between habitat patches,
- The composition of the matrix between patches,
- Barriers to movement, including roads, rail, fences or urban development,
- Road density and traffic volume,
- Density of domestic dogs,
- Likelihood of koalas needing to move through urban or peri urban matrix,

- Availability of refuge trees and shelter for heat stress, drought or fire,
- Frequency and intensity of bushfire,
- Vegetation species composition,
- Ground layer species composition, particularly with regard to dense or thorned understory species that may prevent or hinder movement, and
- Presence of shade and riparian corridors.

Experts consider each mobility factor then complete the assessment by drawing a conclusion based on the likelihood or probability that the mobility of the species is restricted at the offset site as outlined in Table 11.

TABLE 11: KOALA MOBILITY CAPACITY SCORING TABLE (ADAPTED FROM PRELIMINARY DOCUMENTATION; SAUNDERS HAVILL GROUP, FEBRUARY 2024).

Species Mobility Capacity	
Thresholds	Score
Severely or completely restricted (76–100%)	1
Highly restricted (51–75%)	4
Moderately restricted (26–50%)	7
Minor to nil restriction (0–25%)	10

1.6 SPECIES STOCKING RATE

Species stocking rate refers to the typical density or number of individuals of the target species that a given habitat area can naturally support under current ecological conditions. It reflects how well the site can sustain viable numbers of the species, with higher stocking rates indicating higher habitat suitability and contribution to population persistence.

The MHQAT incorporates species stocking rate as an attribute not discussed under the traditional terrestrial habitat assessment methodology. The MHQAT defines scoring thresholds; however, the consultant must consider how these should be interpreted for the target species.

For the Koala, species stocking rates are estimates of the carrying capacity of the site at the time of undertaking the survey. Given the discreet nature of the Koala, the species stocking rate scoring methodology has been derived through the collation of site-specific surveys and surrounding contextual habitat analysis. Species stocking rate is calculated using the following parameters:

- Species presence on or adjacent to the site,
- Species usage of the site,
- Approximate density of the species on the site, and,
- Role / importance of species population on site.

Scoring weighting and the meaning of each measure has not been modified from the original MHQAT. A summary of the Species Stocking Rate scoring tables, which displays possible scores for each measure, is provided below in Table 12 and Table 13.

TABLE 12: SPECIES STOCKING RATE SCORING TABLE.

Species Stocking Rate				
Measure	Score			
Presence detected on or adjacent to the site	0	5	10	
	No	Adjacent	On site	
Species usage of the site	0	5	10	15
	Not habitat	Dispersal	Foraging	Breeding
Approximate density	0	10	20	30
	0%	Low	Medium	High
Role of species population (on the site)*	0	5	10	15
	0	5-15	20-35	40-45
Species Stocking Rate Score (Maximum)				*70*

TABLE 13: SPECIES STOCKING RATE SUPPLEMENTARY TABLE FOR THE ROLE OF SPECIES POPULATIONS ON THE SITE.

*SSR Supplementary Table		
Measure	Score	
*Key source population for breeding	0	10
	No	Yes/ Possibly
*Key source population for dispersal	0	5
	No	Yes/ Possibly
*Necessary for maintaining genetic diversity	0	15
	No	Yes/ Possibly
*Near the limit of the species range	0	15
	No	Yes
SSR Supplementary Score (Maximum)		*45*

1.6.1 PRESENCE DETECTED ON OR ADJACENT TO THE SITE

Baseline Koala activity levels were determined through utilising the Spot Assessment Technique (SAT) (Phillips *et al.* 2011). Results from the SAT surveys are compared against current available published scientific literature to identify an estimated Koala carrying capacity (stocking rate) to be determined.

SAT surveys were supplemented by spotlighting surveys. The spotlighting transects were conducted in accordance with various relevant state and federal guidance material such as EPBC Act survey guidelines for Australia's threatened mammals and *The Department of Environment, Land, Water and Planning Forest Protection Survey Program Survey Guideline – Spotlighting and Call Playback* (2020) (version 4.1). Multiple transects were conducted for

each day of survey and exceed the total of 1 km requirement of the guideline over three nights.

In summary, survey results found no direct or indirect evidence of Koala on the impact or offset site. Species records show that the Koala has been observed adjacent to the impact and offset sites in the past. Though some potential Koala scratches were observed on the offset site, these were determined by expert analysis (Terrestria) to not be consistent with Koala claw marks.

The impact site species stocking rate scores have not been changed from the Saunders Havill Group results. The offset site score has been allocated 'adjacent' in accordance with the survey results.

1.6.2 SPECIES USAGE OF THE SITE (HABITAT TYPE AND EVIDENCE OF USAGE)

Usage of the site describes what functional aspect of the species' life cycle may take part on the site, from *not habitat* to *breeding habitat.*

For the koala, this measure has been assessed on the basis of the type, arrangement and quality of habitat and considers whether or not the species has been detected by field observation or by species records. Though the MHQAT does not define the habitat categories, the following interpretation was utilised for the Koala. For example:

- Not habitat is an area where the species has not been observed that would not be considered habitat nor functional dispersal habitat for the koala due to lack of vegetation and/or significant barriers to movement.
- Dispersal habitat may be non-forested habitat within the matrix of fragmented patches of koala habitat (where the species has been observed) and is likely to be used for dispersal.
- Foraging habitat includes areas with sufficient density and maturity of koala food trees (where the species has been observed) to provide food resources though it may not be suitable for the total life cycle requirement due to threats, fragmentation, or other stressors.
- Breeding habitat is functional, mature koala habitat comprised of food trees in a patch or series of patches (where the species has been observed) of sufficient size to support a population and the full life cycle of the species.

In accordance with the definitions, AU1 (vegetated) has been assigned 'foraging' and AU2 (cleared) has been assigned 'dispersal'.

1.6.3 APPROXIMATE DENSITY (PER HA)

Approximate density (per ha) refers to the density of the population of the species on the site compared to expected or average species density.

For the koala, this was determined based on the outcome of the SAT results, which can be used as a proxy for species density. The assessment also considers any direct or indirect

species observations, as well as species records (considering the likelihood of observer bias).

The approximate density on the site is considered *low* due to the lack of evidence of the species and disturbed nature of habitat, though this does not exclude their persistence in the landscape.

1.6.4 ROLE OR IMPORTANCE OF SPECIES POPULATION ON THE SITE

This measure considers how a population that may use the site is important with regard to the rest of the known species distribution. It is measured as a sum of the total of four subcategories, for which the scoring is outlined in .

For the koala, this was determined based on the outcome of the SAT results, which can be used as a proxy for species density. The assessment also considers any direct or indirect species observations, as well as species records (accounting for observer bias).

The categories and results are summarised below:

- **Key source population for breeding:** The likelihood that there is a persistent breeding population on the site. Due to the lack of species evidence on the site, it is not considered breeding habitat.
- **Key source population for dispersal:** The likelihood that there is a population on the site that undergoes frequent in or out dispersal. Due to the known presence of the species in broader landscape, this is considered yes/possibly.
- **Necessary for maintaining genetic diversity:** the size, location, connectedness of the population mean that it is likely to be important for genetic diversity (i.e., genetic stronghold, genetic outlier). Due to the known presence of the species in broader landscape, this is considered yes/possibly.
- **Near the limit of the species range** has been defined as a population that does not have another population considered to be existing in another direction (i.e., the known population is on the outside of the known distribution). Both sites are located centrally within the species total range.

2 REFERENCES

Department of Agriculture Water and the Environment (2022). Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory. W. a. t. E. Department of Agriculture. Canberra Australian Government.

Department of Climate Change Energy the Environment and Water. (2022). "Species Profile and Threats Database, Pteropus poliocephalus — Grey-headed Flying-fox." from http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=186.

Department of the Environment and Heritage (2003). EPBC Administrative Guidelines on Significance: Supplement for the Grey-headed Flying-fox. Department of the Environment and Heritage. Canberra, ACT.

State of Queensland (2017). Guide to determining terrestrial habitat quality v1.2. D. o. E. a. H. Protection, State of Queensland.