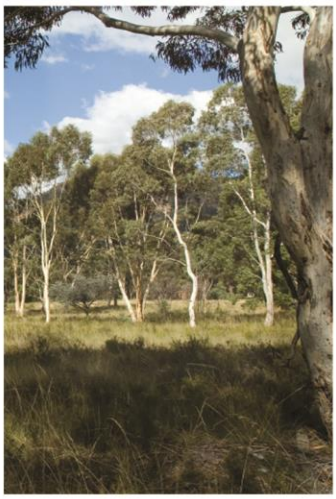
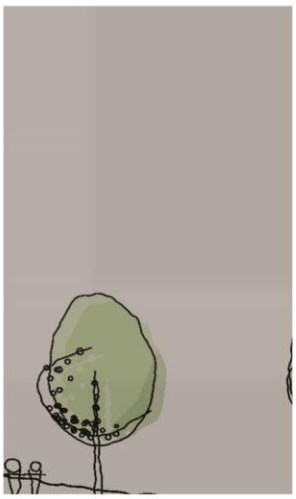
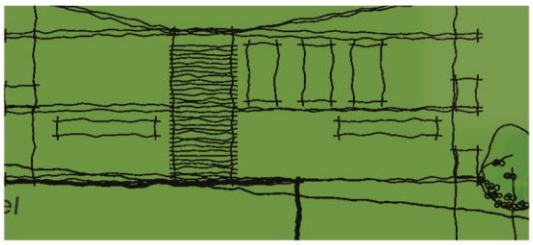
COOMERA WOODS KOALA EVALUATION AND ASSESSMENT CHAPTER 2

RESPONSE TO DEPT. OF ENVIRONMENT AND ENERGY REFERRAL DECISION BRIEF

PREPARED FOR POLARIS COOMERA PTY LTD




Planit Consulting Pty Ltd

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This report has been prepared by:

Planit Consulting Pty Ltd

ABN 20 099 261 711

Level 1, 2247 Gold Coast Highway

Nobby Beach QLD 4218

PO Box 206

Nobby Beach QLD 4218

Telephone: (07) 5526 1500

Facsimile: (07) 5526 1502

Email: admin@planitconsulting.com.au

Web: www.planitconsulting.com.au

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EXECUTIVE SUMMARY

Planit Consulting has been commissioned by Polaris Coomera Pty Ltd to prepare a response to the statements made by the Department of Environment and Energy (DEE) within the Referral Decision Brief as a part of the koala assessment for a Development Application over part of Lot 44 SP207822 and part of Lot 1 on SP165374), 49 George Alexander Way Coomera, Figure 1. This site will be referred to as the Coomera Woods Site (CW Site).

The DEE agreed that in line with the Koala Referral Guidelines, this area does not constitute habitat critical to the survival of the koala. The DEE however concluded that the proposed action is likely to have a significant impact on the koala due to a range of factors. Relevantly, the DEEs Referral Decision Brief relies on the following propositions in recommending that the proposed action is likely to result in a significant impact on the koala:

- The Impact Area may allow for the long-term persistence of the koala population present on the CW Site (despite the lack of connectivity).
- The koala population in the Impact Area is important for the viability of the species in the Coomera area.
- The proposed action is likely to facilitate additional impacts from other actions in the area. This is likely to increase all threats to the koala.
- The proposed clearing will force koalas into adjoining residential areas. These koalas will likely be killed by domestic dogs, struck by motor vehicles and/or succumb to disease. Sequential clearing is likely to increase stress on the koalas which will increase vulnerability to disease.

This report addresses these concerns through:

- Determining an estimate of the koala population on the CW Site and importance to the Coomera area;
- evaluating long-term persistence of this population through the determined minimum viable population (MVP) and the CW Site's carrying capacity;
- review of threats to koalas within the surrounding area; and
- assessment of the established ecological corridor against a review of best practice corridor principles.

The conclusions are:

1. The koala population within the CW site is not important for the viability of the species in the Coomera area.
2. The Impact Area will not allow for the long-term persistence of the koala population present on the CW Site.
3. The proposed action is unlikely to facilitate additional impacts from other actions in the area and unlikely to increase all threats to the koala.
4. The proposed sequential clearing will guide koalas into the ecological corridor and facilitate movement into the Coomera Koala Habitat Area, an area which will allow for the long-term persistence of the koala population. The ecological corridor will provide safe passage and reduce threats by domestic dogs, motor vehicles and aggressive wildlife.

CONTRIBUTORS

Contributors to this report and their roles are tabulated below:

TABLE 1: REPORT CONTRIBUTORS

NAME	ORGANISATION	ROLE
Boyd Sargeant	Planit Consulting	Report preparation, koala survey and assessment, technical and quality assurance review
Laura Thorley	Planit Consulting	Report preparation, technical and quality assurance review

1.0 INTRODUCTION

Planit Consulting (Planit) have been engaged by Polaris Coomera Pty Ltd to undertake this report along with that in Chapter 1 to establish the ecological significance of the proposed Coomera Woods development at 49 George Alexander Way, Coomera, hereafter referred to as the CW Site. This is in response to the Department of the Environment and Energy (DEE) criteria outlining development upon the CW Site as 'a controlled action'.

This development was outlined in the City of Gold Coast City Plan (City Plan) as a part of the Coomera Town Centre development within the Coomera-Pimpama Koala Habitat Area (C-PKHA) (Figure 1). The CW Site is situated within the designated Urban Koala Area (UKA). The area to the east has been reserved as a Koala Conservation Area (KCA). The total area of the original C-PKHA was 3640ha with a total of 2148ha designated to UKA and 1492ha to KCA under the Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016.

The total area covered by the CW Site is 147ha, approximately 137ha is a proposed master-planned development to increase essential residential dwellings to house the expected population growth within South East Queensland (SEQ) over the next 20 years. Within the design there is the provision for ecological corridors to aid wildlife movement from within the CW Site to the designated KCA.

Original surveys were performed over the entirety of C-PKHA and estimated that the koala population at the time was approximately 510 koalas in 2006 at the time of survey before the development within the UKA. The surrounding landscape is a mix of completed and under-construction residential developments and well-established transport links.

There are important legislative requirements associated with this development as the koala is listed as a vulnerable species under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC) and *Nature Conservation Act 1992* (NCA) and is therefore a matter of National and State environmental significance. Within the CW site there is mapped medium value bushland and rehabilitation under the State Planning Policies and no assessable development koala areas under the State Planning Regulatory Provisions (SPRP).

1.1 EPBC ACT REFERRAL GUIDELINES FOR THE VULNERABLE KOALA

The guidelines were consulted during the referral stage and the CW Site was not valued as critical habitat. It is important to understand the terms used within the guidelines to assess the development and likely impacts on potential koala habitat and populations.

1.1.1 STUDY AREA

The study area as defined by the guideline:

> *"Area that includes the impact area and any other areas that are, or may be, relevant to the assessment of the action. When determining the study area, consideration should be given to the extent of the koala habitat, koala records, likely koala home range, connectivity of habitat, control sites, comparison sites etc. in some circumstances the study area may be confined to the impact area, it may be necessary to revise the study area during the assessment if the need for additional information becomes apparent."*

The study area for this report is the UKA described and mapped within previous Biolink reports and referred to as the Urban Footprint in the Koala Conservation Plan for East Coomera 2148ha and includes the impact area (Figure 2).

1.1.2 IMPACT AREA

The impact area as defined by the guideline:

> *"Area in which direct, indirect and facilitated impacts on the koala will, are likely to or may occur."*

The impact area is the CW Site at 49 George Alexander Way, Coomera and is located within the UKA (Figure 2).

1.1.3 HABITAT CRITICAL TO THE SURVIVAL OF THE KOALA

Critical Habitat as defined by the guideline:

> *"Habitat that is Important for the species long-term survival and recovery and scores a '5' or more using Koala habitat assessment tool."*

The habitat within the impact area was assessed with the Koala Habitat Assessment Tool and was scored a total of '4' and therefore not considered as critical habitat and would usually not need a referral as it has a low risk of resulting in a significant impact.

1.1.4 IMPORTANT POPULATION

The Matters of National Environmental Significance – Significant Impact Guidelines 1.1 define an important population as:

> *"a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:*
>
> *i. key source populations either for breeding or dispersal*
> *ii. populations that are necessary for maintaining genetic diversity, and/or*
> *iii. populations that are near the limit of the species range."*

The population within the impact area has been assessed within a number of reports and the most recently performed survey by Planit 2017. Estimates of population size range from 1-15 within the impact area. The population within the impact area is not perceived as an important population as it does not meet the requirements stated within the Significant Impact Guidelines.

1.1.5 SIGNIFICANT IMPACT

The Significant Impact Guidelines defines a Significant Impact as:

> *"an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance."*

As the impact area is not declared a critical habitat and the population is not important to the long-term survival and recovery of koalas there would not be a significant impact.

1.2 DEPARTMENT OF ENVIRONMENT AND ENERGY REFERRAL DECISION BREIF

The DEE agreed that in line with the Koala Referral Guidelines, this area does not constitute habitat critical to the survival of the koala. The DEE however concluded that the proposed action is likely to have a significant impact on the koala due to a range of factors. Relevantly, the DEEs Referral Decision Brief includes the following:

> *"Although the habitat is not identified as being critical to the species' survival under the koala guidelines, the Department has considered a range of factors specific to this proposal when assessing the likelihood of significant impacts.*
>
> *The proposed action area is a large contiguous area of habitat (147 ha) which may allow for the long-term persistence of the koala population present on site, despite the lack of connectivity. Therefore, the Department considers that the proposed action will result in the loss of a population which could be important for the viability of the species in the Coomera area.*
>
> *The proposed action to develop the town centre is likely to facilitate additional impacts from other actions in the area such as clearing of land or widening of roads. In combination, these facilitated additional impacts are likely to lead to an increase in all of the key threats to the koala.*
>
> *The proponent is proposing sequential vegetation clearing to allow the koalas to move offsite. The compliance report states, and the Department agrees, that clearing will result in a forced dispersal of koalas into adjoining residential areas where they will likely be killed by domestic dogs, encounter motor vehicle strike and/or succumb to disease. The sequential clearing of vegetation is also likely to increase stress on the animals, which will increase vulnerability to disease."*

The essence of the above is contained within the following four statements:

1. The koala population in the Impact Area is important for the viability of the species in the Coomera area.
2. The impact area may allow for the long-term persistence of the koala population present on the CW Site (despite the lack of connectivity).
3. The proposed action is likely to facilitate additional impacts from other actions in the area. This is likely to increase all threats to the koala
4. The proposed clearing will force koalas into adjoining residential areas. These koalas will likely be killed by domestic dogs, struck by motor vehicles and/or succumb to disease. Sequential clearing is likely to increase stress on the koalas which will increase vulnerability to disease.

This report will consider the statements above.

In order to address statements 1 and 2 above, it is necessary to evaluate the following:

- How many koalas are present in the Impact Area.
- Assessment of the koala population against EPBC Referral Guideline's Important population criteria.
- How many koalas constitute a Minimum Viable Population (MVP) and does the population in the Impact Area constitute a MVP.
- What is the koala carrying capacity of the Impact Area.

Sections 2, 3 and 4 hereunder considers the above and address statements 1 and 2.

In order to address statements 3 and 4 above, it is relevant to consider the following:

- The current threats to koalas within the Study Area
- The remedial actions and controls that are required by State and Local Government to be put in place as part of the staged vegetation clearing process.
- The dispersal of koalas along the ecological corridor.

Sections 5 and 6 hereunder considers the above and address statements 3 and 4.

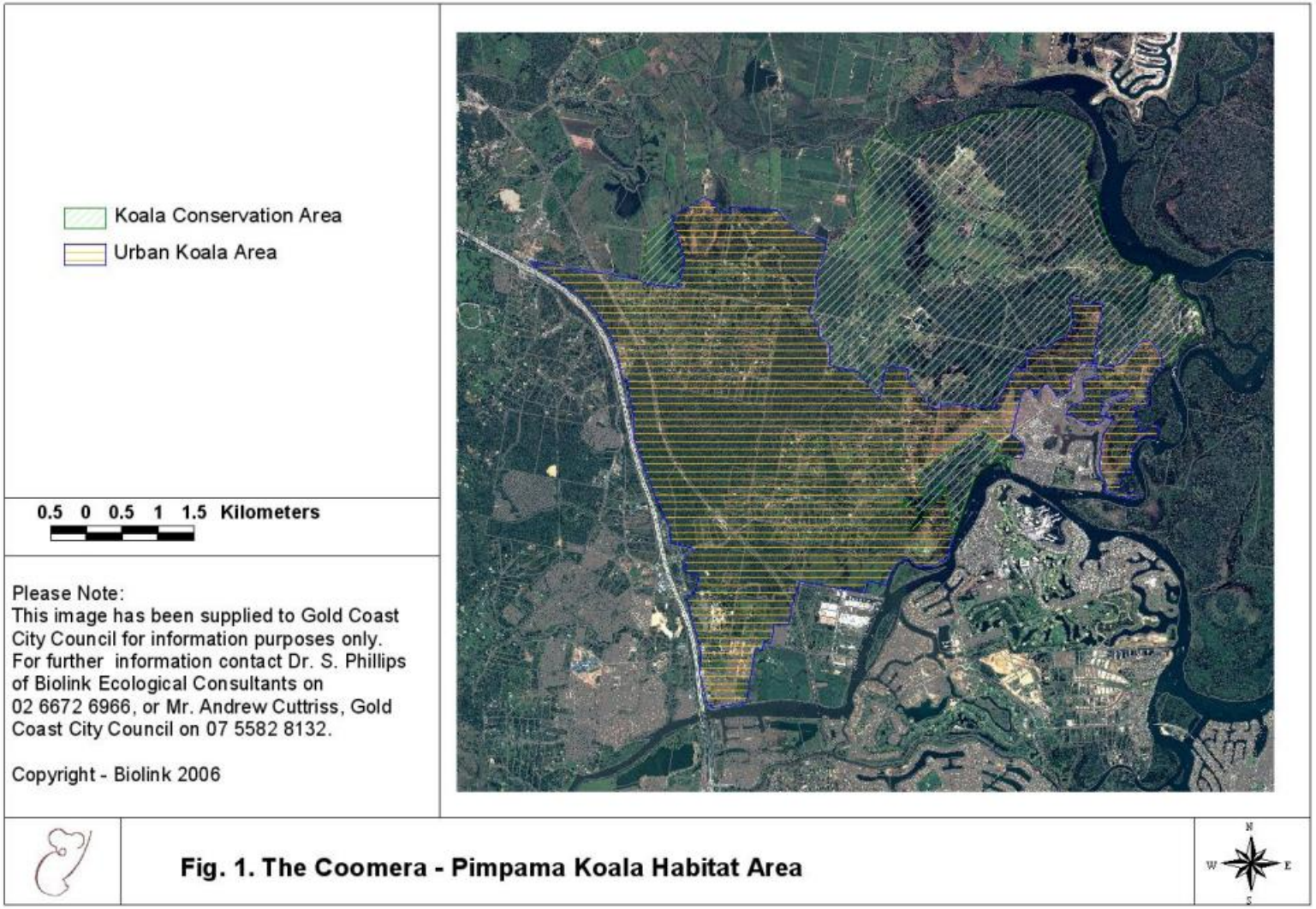

FIGURE 1: THE COOMERA-PIMPAMA HABITAT AREA (BIOLINK 2007)

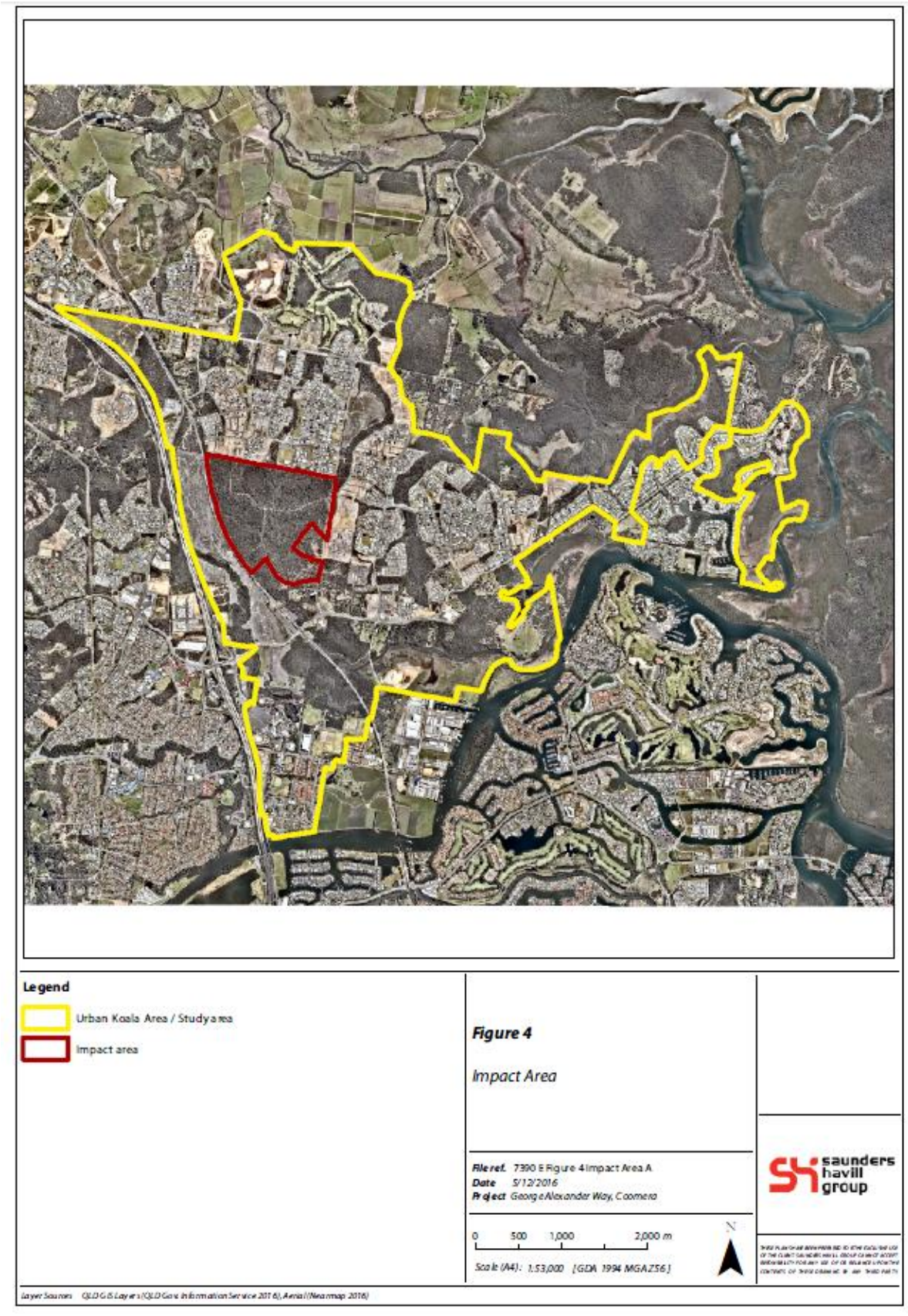

FIGURE 2: STUDY AREA AND IMPACT AREA (SGH 2016)

2.0 CW SITE KOALA POPULATION

The first factor to address was to determine the koala population size on the CW Site. This was necessary to address whether the population was vital to the survival of the local Coomera Koala population. To be vital to the survival of the local population the CW Koala population would need to constitute a viable and important population, as described in section 1.1.4;

i. "key source populations either for breeding or dispersal
ii. populations that are necessary for maintaining genetic diversity, and/or
iii. populations that are near the limit of the species range."

2.1 ESTABLISHING KOALA POPULATION ON CW SITE

Over the last decade there have been a number of studies and reports publishing conflicting koala population data within the study area. The initial survey performed by Biolink in 2006 was inclusive of the entire study area, C-PKHA using the spot assessment technique (SAT) method. Between then and the more current surveys there has been ongoing development of areas surrounding the impact area and the translocation of 180 koalas under the Koala Conservation Plan for East Coomera.

In 2015 the impact area was assessed again by Phillips through a habitat quality assessment and the SAT method and determined from these methods that the density results produced within the 2007 reports would still be applicable to the impact area. In 2016, Saunders Havill Group (SHG) undertook a survey of the impact area using the SAT and strip transect method. Planit 2017 replicated the SAT sites by Biolink and performed a line transect survey over the entire impact area.

Figure 3 shows the timeline of surveys and other significant activities that have impacted the current koala population within the study area. Each survey method was assessed for result accuracy and possible bias within Chapter 1 of this report and concluded that the methods used by Planit 2017 were the most reliable.

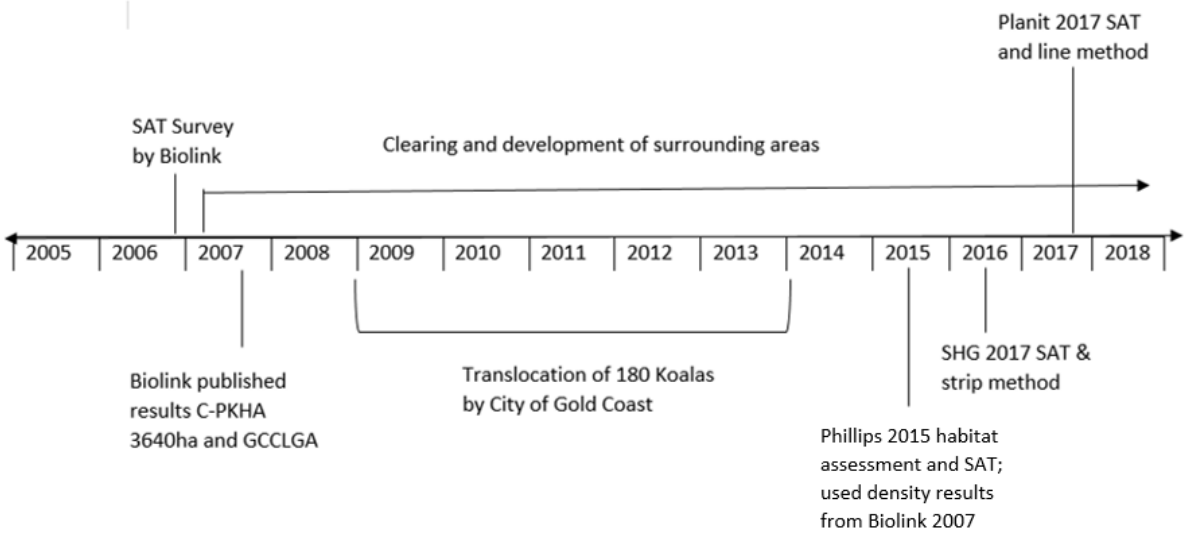

FIGURE 3: TIMELINE OF SURVEYS AND SIGNIFICANT ACTIVITIES SURROUNDING THE CW SITE

The koala population and density estimates for the CW Site derived from the various surveys are discussed in detail in Chapter 1 of this report. These can be summarised as follows:

1. Biolink 2007 Report
2. City of Gold Coast Translocation Program
3. Phillips 2015 Report
4. Saunders Havill Group 2017
5. City of Gold Coast Plans and Reports
6. Planit 2017

2.1 BIOLINK 2007 RESULTS

Initial surveys of the study area, were performed by Biolink and published their results in 2007 within the *Koala Habitat and Population Assessment for Gold Coast City LGA.* The study area was the C-PKHA which covered 3640ha.

The results from the SAT method and opportunistic visual observations over 39.2 hectares estimated that koala density over the C-PKHA was at 0.23 ± 0.03 (SE) koalas ha^{-1} and resulted in a population estimate of 510 ± 129. The accuracy of these results were assessed in Chapter 1 of this report.

2.2 PHILLIPS 2015 RESULTS

In 2015 Phillps was engaged by the Department of the Environment for expert advice regarding the presence and quality of koala habitat associated with proposed clearing action at the Impact Area.

The first phase of this survey was a habitat quality assessment of the Impact Area. Phillips determined that the CW Site was heavily disturbed with simplified mid- and lower- strata which coincides with a history of under-scrubbing and low-intensity fires. The CW Site did support preferred koala trees; Red Gum (*E. tereticornis)*, Tallowwood (*E. microcorys)* and Grey Gum (*E. propinqua)*.

The 15 SAT sites that were originally used by Biolink (2007) on the impact area were replicated within this survey and determined that 33% (61ha) of the CW Site was occupied by koalas as only 5 of the 15 SAT sites recorded faecal pellet deposition. Phillips, determined that the original density estimate of 0.23 ± 0.03 (SE) koalas ha^{-1} would still apply to the 61ha within the Impact Area estimated to be occupied by koalas. This resulted in a population estimate of 15 individuals.

Chapter 1 of this report analysed the calculations Phillips used and established that the 15 individuals calculated is incorrect and using Phillips' own figures should be;

(147 x 0.33) x 0.23 = 11.2.

11 koalas.

Chapter 1 of this report evaluated the reliability of results from using SAT site activity levels and determined that it was not an accurate method to determine koala abundance and density.

2.3 SHG 2017 RESULTS

The SHG surveyed the impact area in 2016 and finalised results in 2017. SAT site activity levels were performed over the impact area. 16 sites were sampled, only 3 sites recorded high activity levels. These activity levels suggest limited use of the CW Site by koalas and a potential transitioning population.

SHG also undertook strip transect surveys to produce more reliable population estimates. The strip transects were performed in two rounds each with 95 strip transects. No koalas were observed within the strip transects during either round of the surveys. In the first round a koala was observed moving in and out of the CW Site. The second round observed a koala in between two transects.

SHG determined that the impact area was being used by transitioning koalas and does not provide critical habitat for resident koala. The extensive coverage of this survey and use of direct observations are considered to provide reliable results and robust support for a limited koala population.

Chapter 1 of this report established that the strip transect method did produce more reliable results than SAT as it was based on visual observations instead of indices. The results from this report would hold more robustness against those produced in 2007 and 2015.

The number of koalas captured from within the impact area and surrounding lots were assessed from recorded data and used to estimate population density for the CW site. The result was 0.151 k/ha including joeys (refer Chapter 1). Which would result in a Koala population of 7 on the CW site.

This density estimate is much lower than that found by Biolink (2007) and more reliable as the abundance is produced through capture records. The data recorded from the CW site and areas directly surrounding the impact area. Unlike the Biolink (2007) density estimate which was produced from the entire C-PKHA before development within the UKA.

2.4 CITY OF GOLD COAST'S KOALA CONSERVATION PLAN (DRAFT)

The City of Gold Coast's Koala Conservation Plan (Draft) supports the density figures found by SHG through translocation records. The council translocated 180 koalas from within the UKA and estimated that 40 koalas were still residing within the UKA after the translocation, suggesting a total population within the UKA at 220. The density would then result in 0.102 koalas per hectare. If this density was applied to the CW Site with the occupancy rate of 33.3% recorded by Phillips 2015, the estimated koala population would be 4.99 koalas.

2.5 PLANIT 2017 RESULTS

Planit 2017 employed two sampling methods to survey the impact area; SAT sites and line transect method. The 15 original SAT sites by Biolink were replicated by Planit to compare results with previous reports. The SAT site activity levels recorded, only 1 site of high activity levels. This sampling method was applied to the impact area approximately 8 weeks after a heavy rain event. The resulting activity levels are likely to be a current representation of activity levels as any older faecal pellets would have been removed.

The line transect method was extensive and covered the entire impact area, something none of the previous visual observations have done. The result was 5 koalas recorded over the entire impact area. This result is a third of that estimated by Phillips in 2015. Chapter 1 of this report established that the line transect method applied to the entire impact area performed during the day and a night with spotlighting is the most reliable method to produce accurate koala abundance and density results.

TABLE 2: PLANIT 2017 SURVEY RESULTS

Day/night	Day 1	Night 1	Day 2
Koala recordings	3 + 1 skull	4 (1 Additional found at night)	4*
Total			5*

*On Day 2, 4 koalas were observed, however the individual identified within the south-west could be the same as the one identified on Day 1 to the north-west but considered another individual due to the perceived size difference between the two koalas.

If the potential occupancy rate of 33% determined by Phillips in 2015 was applied to the koala population recorded by Planit (2017) the density estimate would be approximately 0.103 a figure significantly lower than the 0.23 estimated by Biolink (2007).

147 x 0.33 = 48.51ha

5*/48.51 = **0.103 koalas/hectare**

2.6 SUMMARY OF REPORT RESULTS

TABLE 3: SURVEY METHODS PERFORMED BY EACH ORGANISATION

Organisation	Year	Survey Method			
		Habitat Quality Assessment	SAT	Strip Transect	Line Transect
Biolink 2007	2007		X	X	
Phillips 2015	2015	X	X		
SHG 2017	2017		X	X	
Planit 2017	2017		X		X

TABLE 4: ESTIMATED KOALA POPULATION WITHIN THE CW SITE

Survey Method	Surveyor		
	Phillips 2015	SHG 2017	Planit 2017
Habitat Assessment	15 Koalas[1]		
SAT			
Strip Transect		N/A[2]	
Capture Records		7 Koalas[3]	
Line Transect			5 Koalas[4]

[1] This figure was produced from Biolink 2007 density estimate of 0.23k/ha over the entire C-PKHA and using an estimated occupancy rate of 33% of the CW site. However, this calculation is in correct (refer section 2.4.2). If the calculations by Phillips (2015) were corrected and it was appropriate to use the density figures estimate within 2006 the estimated population within the CW Site should have been **11 koalas**.

[2] No koalas were recorded within the strip transects. Two individuals were recorded outside of the strip transects.

[3] This was calculated from the density estimate from capture records and the estimated occupancy rate of 33% estimated by Phillips (2015). Workings - 0.151 x (147 x 0.33) = 7.33 koalas.

[4] The entire CW site was covered three times (2 days, 1 night) by experienced observers and each individual recorded. On Day 2, 5 koalas were observed, however one individual could have been one already identified on Day 1 of surveying, due to perceived size difference it has been considered a separate koala.

The methods employed by Planit 2017 have been assessed as the most reliable in producing abundance and density results that are representative of the impact area. The original surveys performed by Biolink were implemented over the C-PKHA which was a large (3640ha) intact habitat using an indirect survey method.

The SAT method has been reviewed and found to be accurate at establishing the presence/absence of target species and not reliable at estimating abundances and densities. Within the Biolink 2007

reports there were conflicting results and when SAT were compared with strip transect results, SAT were found to estimate much higher densities.

Phillips visited the impact area in 2015 where a habitat quality assessment was performed and the 15 original SAT sites from Biolink were replicated. The habitat quality assessment found that the impact area was heavily disturbed and SAT site activity levels suggested that only 33% of the CW Site was being occupied by a koala population. The original density estimates were again applied to the CW Site to suggest a population of 15 individuals.

SHG (2017) performed SAT sites and strip transects and only observed 2 koalas over the survey period within the impact area, neither of which were in the strip transects and could not be recorded. It was suggested that the CW Site was not currently being used by a resident koala population but a transient population. SGH estimated a density of 0.151 koalas per hectare (when joeys were included) from the translocation records.

This figure is supported within the Koala Conservation Plan (Draft) as 180 koalas have been translocated from the UKA with a further 40 estimated to still be within future development areas. A population of 220 within the UKA before development is a direct contradiction to the results found by Biolink (2007). Biolink estimated that approximately 510 koalas lived within the C-PKHA and with 70% residing in the UKA which would result in 357 koalas within the UKA;

510 x 0.7 = 357

Even at the lower bound the UKA population estimate was 266 koalas;

(510 – 129) x 0.7 = 266

The review of the reports has revealed that there is a significant discrepancy in koala abundance and density within the impact area. The most recent and reliable report by Planit 2017 has revealed a small population of ~5 individuals within the impact area. The population is not significant as was reported by Phillips in 2015. The bias in the 2015 report has influenced decision making by skewing the ecological value of the impact area.

2.7 ASSESSMENT AGAINST EPBC ACT REFERRAL GUIDELINES

EPBC Act Referral Guidelines for the vulnerable koala to determine an Important population;

i. key source populations either for breeding or dispersal

The CW Site koala population is not a source for breeding and dispersal. The population is a sink where the immigration rates are lower than the extinction rates (Pulliam 1988; Dias 1996) and do not allow for an excess in population to disperse.

ii. populations that are necessary for maintaining genetic diversity

As the population is not large enough to allow for dispersal the CW site population is not necessary for maintaining genetic diversity within the Coomera area koala population.

iii. populations that are near the limit of the species range

This population is not near the limit of the species range.

The current koala population size within the impact area does not warrant “important population” status as it does not meet the requirements within the Significant Impact Guidelines. As this population is not important this means that there is also no significant impact to the population if the development were to proceed. The population is not viable due to habitat constraints and koala abundance within the impact area, this will be discussed further in the sections to come.

3.0 THE CW SITE CARRYING CAPACITY

The DEE agreed that it was not a critical habitat defined as;

> "*Habitat that is Important for the species long-term survival and recovery and scores a '5' or more using Koala habitat assessment tool."*

The CW Site habitat scored a '4' against the koala habitat assessment tool. The DEE still determined that this habitat may allow for the long-term persistence of the resident koala population;

> *'a large contiguous area of habitat that may allow for the long-term persistence of the koala population on site'.*

This is a contradiction as the score against the assessment tool suggests that the CW site is unable to allow for the long-term survival of the koala population.

An assessment of the current habitat condition within the CW Site is required to establish carrying capacity and whether it can sustain a viable population. It is important to consider some basic conservation principles such as patch size, shape and connectivity to other patches, to evaluate the current impact area condition. These factors are discussed below.

3.1 HABITAT CONSERVATION PRINCIPLES

This section provides a brief overview of conservation principles to get a better understanding of the current quality of site condition. The most well-known conservation principles are embedded within the island biogeography theory (McArthur and Wilson 1967).

McArthur and Wilson 1967 formalised the theory to account for the observations that islands species richness reduces with increasing isolation and decreasing inland size. Depicted in figure 5, this theory states that large patches are better than small patches, one patch better than many, close patches better than patches further away and connected rather than separate (Diamond 1975; Wilson and Willis 1975).

As the landscapes continues to be fragmented through urban development the remnant patches become islands and conservation principles can be applied to assist in their survival (Diamond 1975; Lunney and Recher 1994; Whittaker 1998).

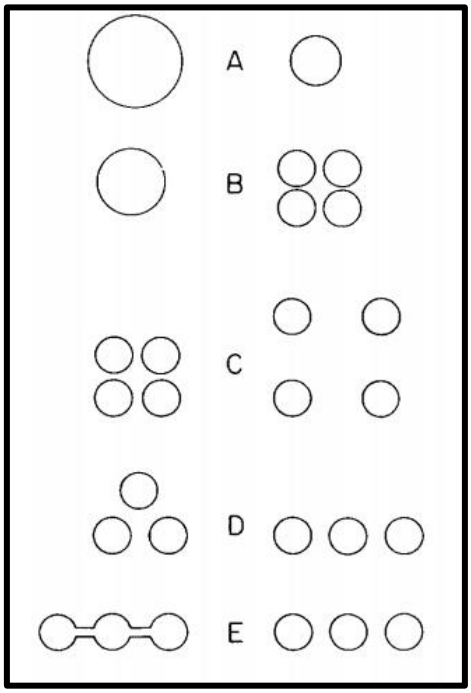

FIGURE 4: DIAMOND, J, 1975 PRINICIPLES FOR THE DESIGN OF NATURAL RESERVES (APPLY TO HABITAT PATCHES)

Figure 5 should only be considered in the regard to habitat patches. The size and shape of the habitat patch is important to consider when evaluating patches as critical habitat. The size and shape of the habitat influences the availability of resources essential for the survival of species (Chapin *et al*. 2002; McArthur and Wilson 1967).

If the ratio of area to perimeter is high the edge effects are likely to be more damaging and disturbance can be felt within the 'core' of the habitat (Boulter *et al*. 1999). If disturbances are felt within the core more sensitive species are likely to disperse from the area or species may become locally extinct from such a patch.

Examples of edge effects;

- invasion of exotic species,
- predation by aggressive native or exotic species,
- change in vegetation structure from human disturbances and fire.

The distance one patch is from another and available resources upon arrival can limit immigration of animals from source populations. Limited immigration can lead to a decline in genetic diversity and often decreases population viability (Hilty *et al*. 2006).

All the factors mentioned above can influence the carrying capacity of habitat by limiting availability of essential resources, increased disturbances and decreased connectivity to other patches (Chapin *et al*. 2002; McArthur and Wilson 1967; Diamond 1975).

3.2 CW SITE ASSESSMENT

3.2.1 HISTORICAL CW SITE CONDITION

The C-PKHA was a large contiguous site of relatively undisturbed habitat when the initial surveys by Biolink were performed (Figure 6). The entire area covered 3640ha, 2148ha was designated to UKA in

south-west side of the C-PKHA and 1492ha was reserved for the KCA further north-east. Biolink estimated that there was approximately 1716ha of bushland within the C-PKHA and 1035ha within the UKA. Potential habitat features were present within the study area in the form of vegetation structure and preferred koala food trees; Red Gum *E. tereticornis*, Tallowwood *E. microcorys* and Grey Gum *E. propinqua.*

The initial surveys were required as the Coomera was designated as an area of significant growth within the SEQ regional plan and City Plan to house the expected population growth over the next 20 years and the potential impacts on koala population were required to be assessed.

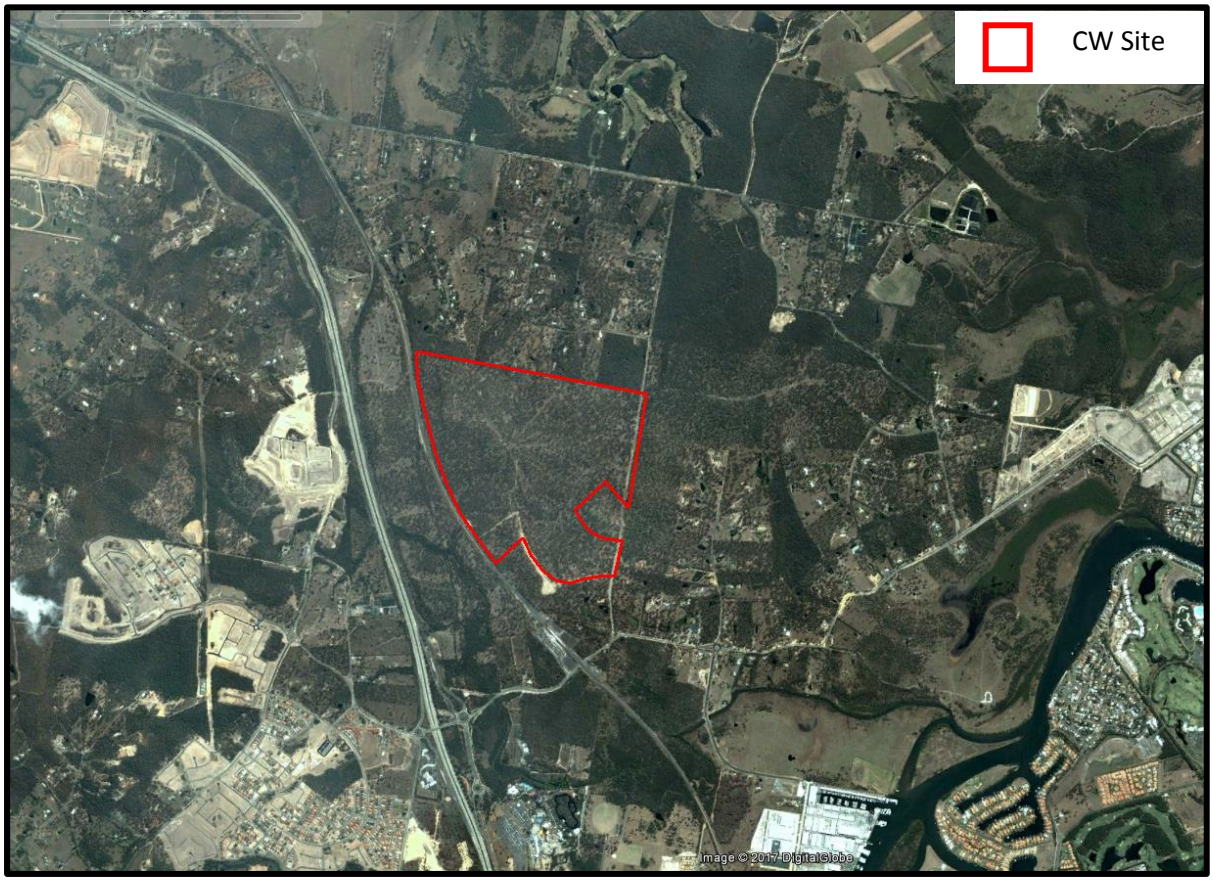

FIGURE 5: CONDITION OF AREAS SURROUNDING THE CW SITE IN 2006 (25/07/2006)

3.2.2 SURROUNDING LAND USES

The initial surveys were performed in 2006, since that time the surrounding landscape has undergone a significant transformation. The landscape is now fragmented from the completed and under-construction residential development within the study area and surrounding the impact area (Figure 7). The residential development consists of attached and detached dwellings, schools, shopping centres and transport infrastructure. There is provision for green spaces and ecological corridors within developments for recreation and nature to facilitate dispersal from high risk areas.

The incompatible land uses of the surrounding areas increase the prevalence of edge effects and reduces the connectivity to other patches of remnant vegetation and decrease the habitat value to koalas. The adjacent land uses are primarily residential which lead to a number of edge effects associated with human disturbance.

The reduced connectivity as a result of surrounding land uses can have significant impacts on the long-term persistence of populations within a patch of habitat. Koalas from source populations are unable to immigrate due to limited availability of resources and core habitat within the patch. As there is limited immigration the CW Site lacks genetic diversity which decreases the viability of the population within the CW Site (Hilty *et al*. 2006).

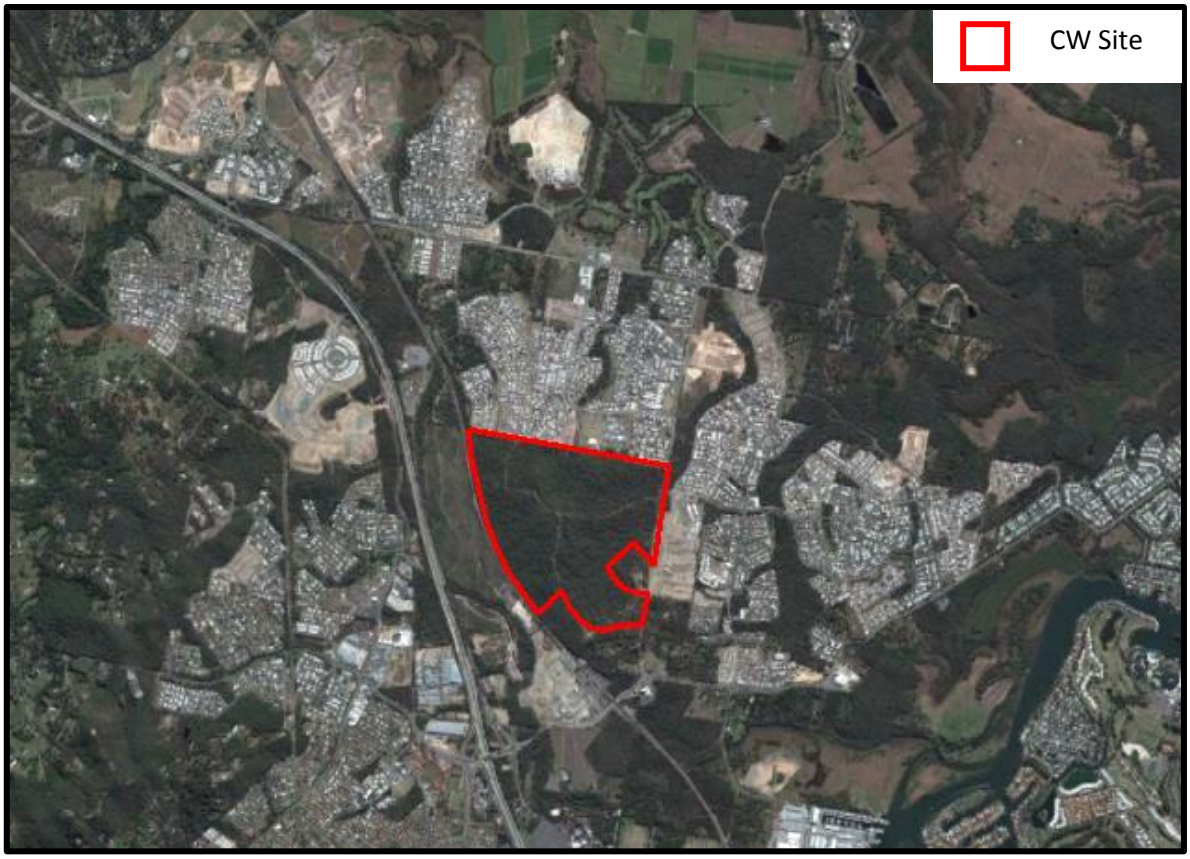

FIGURE 6: CONDITION OF AREAS SURROUNDING THE CW SITE (29/08/2017)

3.2.3 CURRENT CW STE CONDITION

In 2007, Biolink determined that there were preferred koala food trees in the impact area and Phillips reaffirmed in 2015 that these were still present on the CW Site. Recent visits to the CW Site have revealed several site characteristics that are important to mention as it needs to be considered when assessing value of potential habitat for wildlife.

The CW Site is close to the Pacific Motorway and the railway runs along the western side of the lot. North of the CW Site has been developed into residential dwellings and a local school. The eastern side of the CW Site is currently being developed into a residential area. Within the CW Site there are several trails that are frequently used as four-wheel drive and motorbike tracks, despite efforts by the land owner to deter these actions.

The habitat quality assessment by Phillips in 2015 did confirm these disturbances and estimated as a result that only 33% was potentially occupied by koalas. This CW Site is within a fragmented landscape, surrounded by incompatible land uses. As a result of these disturbances the core habitat within the CW Site is limited.

The current CW Site condition and land use of surrounding areas has had a significant impact on the sites' carrying capacity. The ecological corridor linking the CW site to the KCA allows for the dispersal of koalas from the CW site, but the current CW Site condition does not encourage immigration or recruitment.

EPBC Act Referral Guidelines;

> *"Urban areas are not likely to contain habitat critical to the survival of the koala..."*

It is unlikely that this area would be able to ensure long-term persistence of a population as a result of limiting resources and reduced connectivity to source populations. The impact area is no longer a large contiguous area of habitat that could sustain a viable koala population.

4.0 LONG-TERM PERSISTENCE OF KOALAS ON THE CW SITE

In order for the koala population to persist long-term the following factors need to be considered;

- Minimum Area
    - Habitat carrying capacity
        - Available resources → Occupancy rate and Immigration
        - Edge effects → Occupancy rate and Immigration
- MVP

For a population to be viable an equilibrium of the rate of immigration is required to match the rate of extinction. This equilibrium is influenced by remoteness and size of the remnant patch (McArthur and Wilson 1967). Biolink ran a variety of scenarios to establish a minimum viable population (MVP) and the minimum area of habitat that would be required to support such a population.

> "Population size has been shown to be the major determinant of persistence of a variety of animal species." (Reed *et al*. 2003)

A MVP is a threshold number of individuals that once a population has dropped below it cannot recover (Shaffer 1981). A population below MVP can lead to inbreeding and can result in poor genetic diversity making populations less resilient and susceptible to disturbances and disease (Hilty et al. 2006; Franklin 1980; Gilpin and Soule' 1986). A habitat would need to be able to sustain a MVP to be considered to be important for the species survival.

> *"Conservation biologists use the concepts of founder effects, demographic bottleneck, genetic drift, inbreeding, and island biogeography to estimate minimum viable population of rare and endangered species: the number of individuals such populations need for long-term survival."* (Miller and Spoolman 2009)

MVPs should be highly specific, depending on the environmental and life history characteristics of the species (Reed *et al.* 2003).

4.1 LIMITING FACTORS

The impact area is degraded habitat as a result of edge effects. The limited core habitat and reduced availability resources has decreased the potential immigration by koalas from source populations (Woolnough 2005).

The current population of koalas within the impact area is approximately 5 as reported by Planit 2017 on an area that is only 147ha. Studies from the Noosa Shire suggest that the chance of koalas being present within a habitat declines once the patch becomes smaller than 150 hectares (City of Gold Coast 2014).

Biolink 2007 reported that the MVP of koalas is 170 individuals which would require a minimum habitat area of 1500ha. The carrying capacity of the impact area could never sustain a viable population of 170 individuals. The CW Site koala population will not recover within this habitat.

The current population is likely to either disperse to a more viable habitat or will go extinct from the impact area within the near future. The current habitat is a sink where the immigration rates are lower than the extinction rates (Pulliam 1988; Dias 1996).

The disturbances, availability of resources and conflicting land uses of surrounding areas have reduced the carrying capacity of the habitat. The current corridors within the developments allow for the

dispersal of animals from the impact area but due to the lack of suitable habitat and resources, the impact area records little to no recruitment from surrounding population sources.

This reduces the genetic diversity and causes a sink population where mortality rates are higher than recruitment. The impact area is not critical habitat and will not allow for the long-term persistence of the koala population on site.

The current koala population is already well below the required MVP for such a species, even if the over estimated population of 15 individuals were within the impact area they would still not be able to persist within this habitat (Gilpin and Soule' 1986). The population is not important as defined by the EPBC Act Referral Guidelines and does not contribute to the overall survival of this species.

The Koala Conservation Plan (Draft) estimated that between 16-26 koalas were admitted to the Currumbin Wildlife Hospital between 2010-2016 from the Coomera area were diagnosed with disease. Chlamydia is the major cause of mortality in Gold Coast koalas. There were 371 koalas diagnosed with chlamydia admitted to the Currumbin Wildlife Hospital between 2010-2016 and of that total 77% of them died from the disease.

Biolink reported that the population within the C-PKHA was in healthy condition. The hospital admittance records demonstrate that the population is not healthy and this will have a significant impact on the long-term persistence.

Biolink (2007) came to the following conclusion;

> *"we determined that a KHA should ideally include a minimum area of approximately 1,500 ha of reasonably well-connected, high quality koala habitat in order to sustain a Minimum Viable Population of ~170 koalas while also allowing for a minimum occupancy rate of approximately 50% of available habitat in order to accommodate meta-population expansion and contraction."*

According to the factors above the CW Site and koala population does not meet;

1. the minimum area; or
2. MVP; and
3. The CW Site has a low occupancy rate (33%, estimated by Phillips 2015).

These factors reduce the potential for long-term persistence of the koala population within the CW Site. The CW Site does not meet the carrying capacity requirements to sustain a MVP and the koala population is already well below the MVP. It is likely that the koala population on the CW site will go extinct in the near future.

4.1.1 CRITICAL HABITAT

Critical Habitat as defined by the guideline:

> *"Habitat that is Important for the species long-term survival and recovery and scores a '5' or more using Koala habitat assessment tool."*

The habitat within the impact area was assessed with the Koala Habitat Assessment Tool and below '5' and therefore not considered as critical habitat. This would usually not need a referral as it has a low risk of resulting in a significant impact.

The habitat does not allow for the long-term persistence of the koala population currently within the CW Site as assessed above. The CW Site is therefore not important for the species long-term survival and recovery.

4.2 SIGNIFICANT IMPACT EVALUATION

The Significant Impact Guidelines defines a Significant Impact as:

> *"an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance."*

Sections 2, 3 and 4 above have assessed the CW Site koala population and habitat and found that;

1. the population is not an important population;
2. the CW Site will not allow for the long-term persistence of the koala population on the site; and
3. the habitat is not critical to the survival of the Coomera Koala population.

The actions proposed by the Development Application will not have a significant impact on the species.

5.0 REVIEW OF THREATS TO KOALAS

This section addresses the following statement;

> *"The proposed action is likely to facilitate additional impacts from other actions in the area. This is likely to increase all threats to the koala"*

Threats to Koalas (City of Gold Coasts Draft Koala Conservation Plan 2016);

- Loss of habitat
- Health and Disease
- Vehicle strikes
- Pest and domestic animal attacks

The loss of habitat will be insignificant (137ha). The CW Site is not critical habitat for the species survival and will not ensure the long-term persistence of the koala population on the CW site.

The adjacent developments to the north of the CW Site encompasses a green space network to facilitate wildlife movements. The planned development on the CW Site has allocated approximately 10 hectares to continue this corridor through the lot and encompass Wildlife Movement Solutions (WMS) to avoid contact with vehicles and domestic animals.

The Koala Conservation Plan (Draft) estimated that between 2010-2016 there were only 3-5 koalas admitted to the Currumbin Wildlife Hospital from a dog attack and 5-7 admitted for vehicle strikes from the Coomera area. These figures are insignificant compared with admittance for diseases.

The development of the surrounding sites has been ongoing for many years with no koala recorded mortalities by vehicle or domestic animals within the development vicinity.

This is confirmed within the koala Conservation Plan for East Coomera as demonstrated in figures B3.1 koala vehicle strikes (July 2008- October 2013) and C1.2 Home range analysis for in-situ koala monitoring. All vehicle strikes were recorded along the Pacific Motorway and roads south of the impact area.

The proposed development will not facilitate additional impacts from other actions in the area and unlikely to increase all threats to the koala.

EPBC Act Referral Guidelines;

> *"These existing threats are best addressed by local remedial action, rather than through regulation under the EPBC Act."*

The mitigation measures implemented through the proposed development will address these threats and meet the State and Local Government objectives.

6.0 ECOLOGICAL CORRIDOR FUNCTIONALITY

This section addresses the following statement;

> *"The proposed clearing will force koalas into adjoining residential areas. These koalas will likely be killed by domestic dogs, struck by motor vehicles and/or succumb to disease. Sequential clearing is likely to increase stress on the koalas which will increase vulnerability to disease."*

6.1 SIGNIFICANCE OF LANDSCAPE CONNECTIVITY

Connectivity in nature refers to the movement of processes or organisms through an environment (Crooks and Sanjayan 2006). Some wildlife species have difficulty living in or moving through a developed landscape (Bennett 1991; Riley *et al.* 2006). They require a continuous link of suitable habitat between two vegetation patches to safely move across the landscape (Bennett 1999). Connectivity of landscapes is important for the foraging and dispersal of koalas.

Koalas can travel hundreds of metres to favoured food trees, the connectivity of the environment in between these locations is important to provide safe passage and a landscape that is easy to traverse (Phillip and Callaghan 2011). Dispersal of species is vital for genetic, behavioural, evolutionary and physical processes (Bennett 1991; Riley *et al.* 2006).

As koalas are a solitary marsupial they must search for mates, as a result landscape connectivity supports genetic diversity and contributes to long-term persistence of koala populations (Hilty *et al.* 2006). Dedicated corridors can help facilitate these movements through a variety of structures and undisturbed landscapes reducing isolated populations.

6.2 ECOLOGICAL CORRIDORS AND KOALA SENSITIVE DESIGN

An ecological corridor is a linkage of wildlife habitat, generally of native vegetation which connects two or more larger areas of similar habitat that were once connected in historical time (Bennet 1999). Connections between habitats are vital for maintenance of ecological processes, allowing for movement of animals and continuation of viable populations.

Connections between habitat enable migration, colonisation and interbreeding of plants and animals. When areas are isolated and reduced in size, species within become increasingly isolated and the on-going viability is affected. The collapse of ecological processes ensues as species migration, dispersal, recycling of nutrients, pollination of plants and other natural functions decline and usually resulting in the severe decline of biodiversity within a patch.

Ecological corridors can be implemented on varying scales depending on the target habitat and species; national, state and local scale. Local corridors provide connection of remnant patches of veg and landscape features such as creek lines, gullies, wetlands and ridges. In some cases, local corridors are less than 50m wide.

To combat these affects in an increasingly urbanised and fragmented landscape a number of artificial ecological corridors and WMS have been implemented to maintain essential ecological processes between habitat patches (Hayes and Goldingay 2009). Roads often pose a barrier to wildlife movement and threat through vehicle strikes (Jones *et al*. 2011). WMS have been implemented to facilitate the safe movement of wildlife and reduce mortality rates.

6.2.1 TYPES OF ECOLOGICAL CORRIDORS

There are three primary corridor designs that are utilised within fragmented landscapes:

1. Linear habitat corridor;
    - The corridor is a long relatively linear patch of remnant or rehabilitated landscape the directly connects one patch to another (NSW Government 2011).
2. Habitat mosaic corridor;
    - A landscape pattern comprising a number of patchy interspersed habitats of different quality for the target species (Bennett 1999).
3. Stepping stone corridor;
    - small remnant/rehabilitated vegetation patches or isolated trees, that provides resources and refuge to assist in movement through the landscape (Bennet 1999).

When considering corridor design the scale, target species and potential threats need to be evaluated.

6.2.2 WILDLIFE MOVEMENT SOLUTIONS

WMS can be categorised into two different types (Queensland Government 2010):

1. Overpass; this enables the fauna to cross over the barrier
    - Land bridges
    - Dual purpose small roads
    - Cut and cover tunnel
    - Canopy bridge
    - poles
2. Underpass; this enables the fauna to cross below the barrier
    - Culvert
    - Tunnel
    - Bridge

6.3 ECOLOGICAL CORRIDOR ASSESSMENT

The proposed ecological corridor is shown within Figure 8, this corridor will connect to the established corridor shown within Figure 9. The proposed corridor is on a local scale and will provide dispersal for koalas to remnant patches and protected koalas habitats.

The result will be a corridor to provide immediate refuge and dispersal to wildlife from residential and development areas. The corridor has a dense canopy cover within a preferred landscape of established vegetation. This allows for safe refuge for koalas from threats posed by vehicles and aggressive animals which limits potential edge effects.

The designated corridor is sufficient to provide refuge and dispersal for threatened wildlife. The design is important so that the corridor provides a method of dispersal only and not large enough to encourage recruitment.

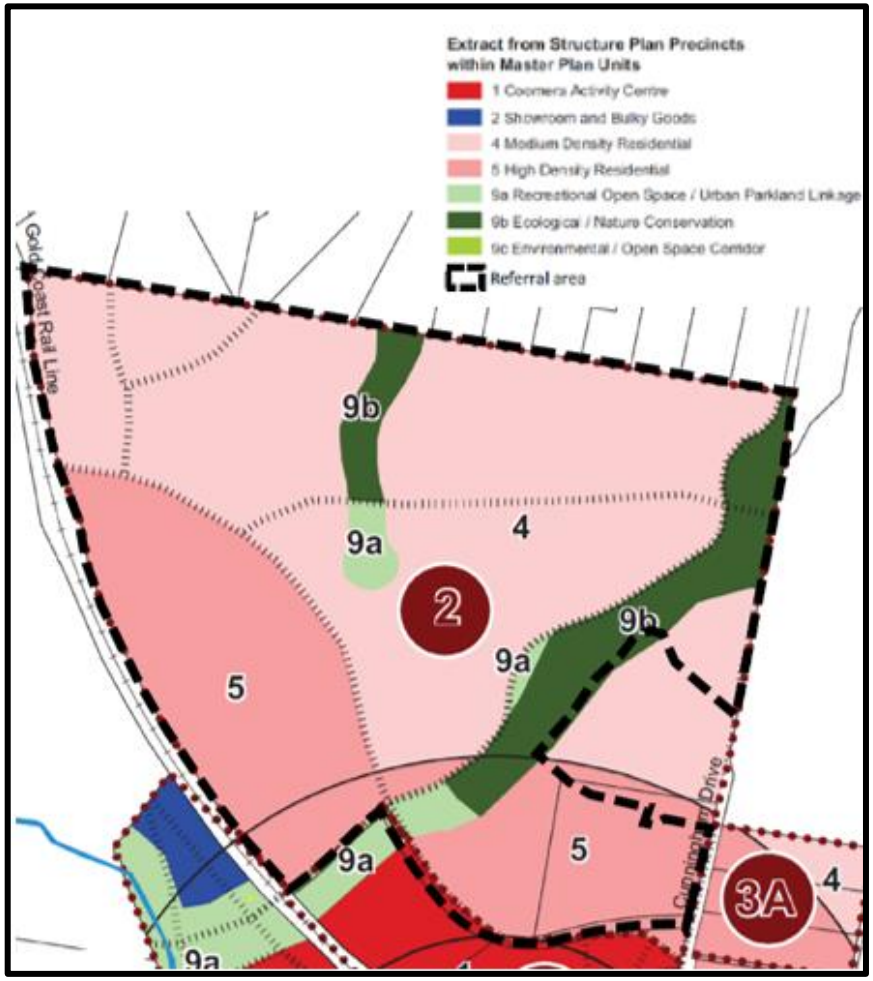

FIGURE 8: DIAGRAM ILLUSTRATES THE CONTINUED ECOLOGICAL CORRIDOR THROUGH THE CW SITE (SOURCE: SHG 2015)

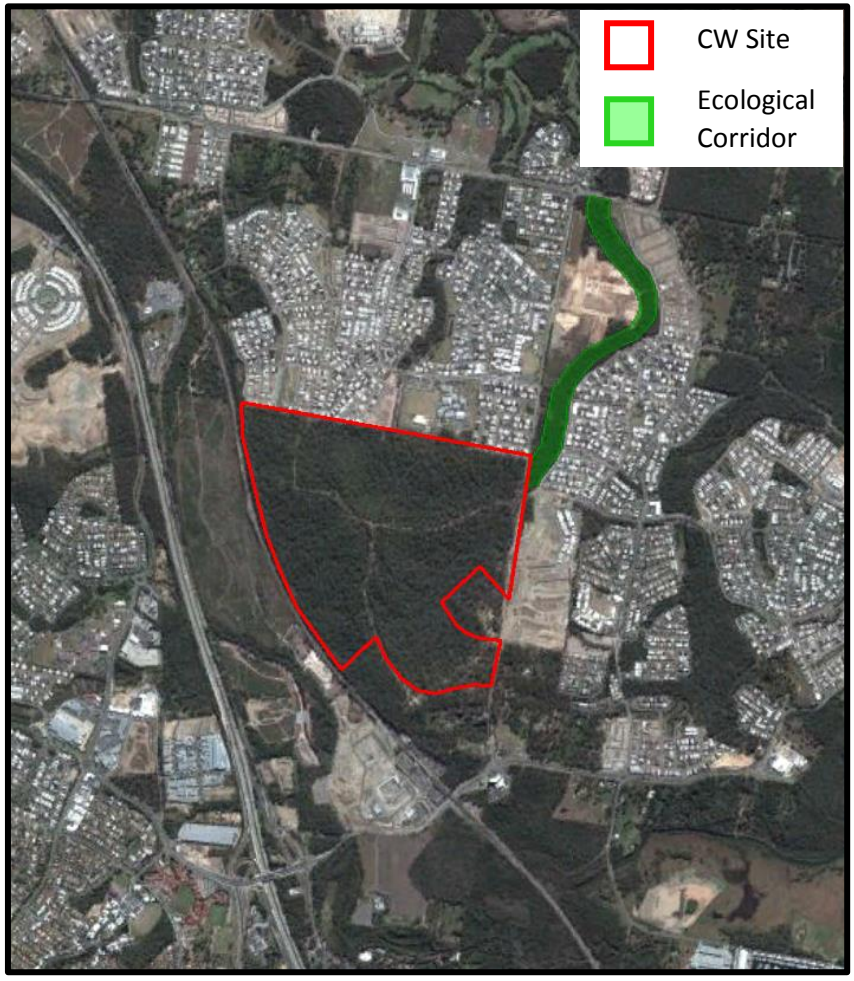

FIGURE 7: AERIAL SHOWING THE EXISTING CORRIDOR TO THE NORTH-EAST OF THE CW SITE (SOURCE: GOOGLE EARTH 2017)

Images: Coomera Woods Ecological Corridor

Under the SPRP the impact area is not located within an identified koala broad-hectare area. The proposed development meets the requirements within Column 2, Division 3.2 Development Assessment Criteria:

1. Site design provides safe koala movement opportunities as appropriate to the development type and habitat connectivity values of the site determined by reference to the factors for consideration in Schedule 2.
2. Native vegetation clearing is undertaken as sequential clearing and under the guidance of a koala spotter where the native vegetation in a non-juvenile koala habitat tree.
3. During construction phases:
    a. Measures are incorporated into construction practices to not increase the risk of death or injury to koalas; and
    b. Native vegetation that is cleared and in an area intended to be retained for safe koala movement opportunities is progressively restored and rehabilitated.
4. Landscaping activities provide food, shelter and movement opportunities for koalas consistent with site design.

The development would meet objectives 2, 3, 4, 7 and 8 of koala sensitive design within the Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 through the design of the planned corridor and WMS:

- Provision of continuous connection of habitat where fragmentation by roads and other structures is minimised;
- linkage of on-site habitat to habitat external to the site;
- reconnecting and rehabilitating disturbed habitat linkages and areas retained within open space;
- mitigating threats from domestic dogs; and
- minimising and mitigating impacts from road traffic.

In the East Coomera Koala Conservation Plan (2014-2018; p. 30) the study of home ranges recorded approximately 4 individuals using the corridor area. This suggests that the established corridor within the residential developments is currently facilitating safe wildlife movement through the residential and development areas.

Further evidence of this was confirmed while SHG were performing strip transects through the CW Site and even though the koala was not counted within the survey it was witnesses moving on and off the CW Site over a period of five days using the existing corridor to the north east of the impact area (Figure 10).

The existing corridor allows for the safe movement of koalas from the impact area demonstrating that there is sufficient connectivity for the current population to disperse into viable habitats, such as the KCA to the east.

The above illustrates that Polaris Coomera Pty Ltd meets requirements of SPRP and the Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 by facilitating the safe movement of koalas in and out of the impact area.

In addition to this the implementation of sequential clearing and use of an experienced spotter/catcher will be used to mitigate any potential threat to individuals within the impact area. If there are any outlying koalas within the impact area at the time of clearing they will be guided to safety within the corridor and disperse to the KCA.

TABLE 5: ECOLOGICAL CORRIDOR ASSESSMENT

Criteria	Comments	Compliance
Local Scale	Width of corridor meets the requirements for a local scale corridor, > 50m.	Y
Continuous Linear Corridor	The ecological corridor is a linear habitat corridor of remnant vegetation.	Y
WMS	The corridor also integrates WMS solutions to reduce wildlife encountering vehicles.	Y
Target Species Requirements	Dense canopy cover, suitable for the koala to provide refuge and reduce edge effects.	Y
	Preferred food trees available	Y
Clearing Process within Site	Sequential clearing will be undertaken to allow for dispersal and guide wildlife towards the ecological corridor.	Y
Spotter/Catcher	Expert spotter/catcher will be on site during clearing to reduce potential threats to wildlife.	Y

EPBC Act Referral Guidelines;

> *"These existing threats are best addressed by local remedial action, rather than through regulation under the EPBC Act."*

The proposed development meets the requirements of State and Local planning instrument objectives.

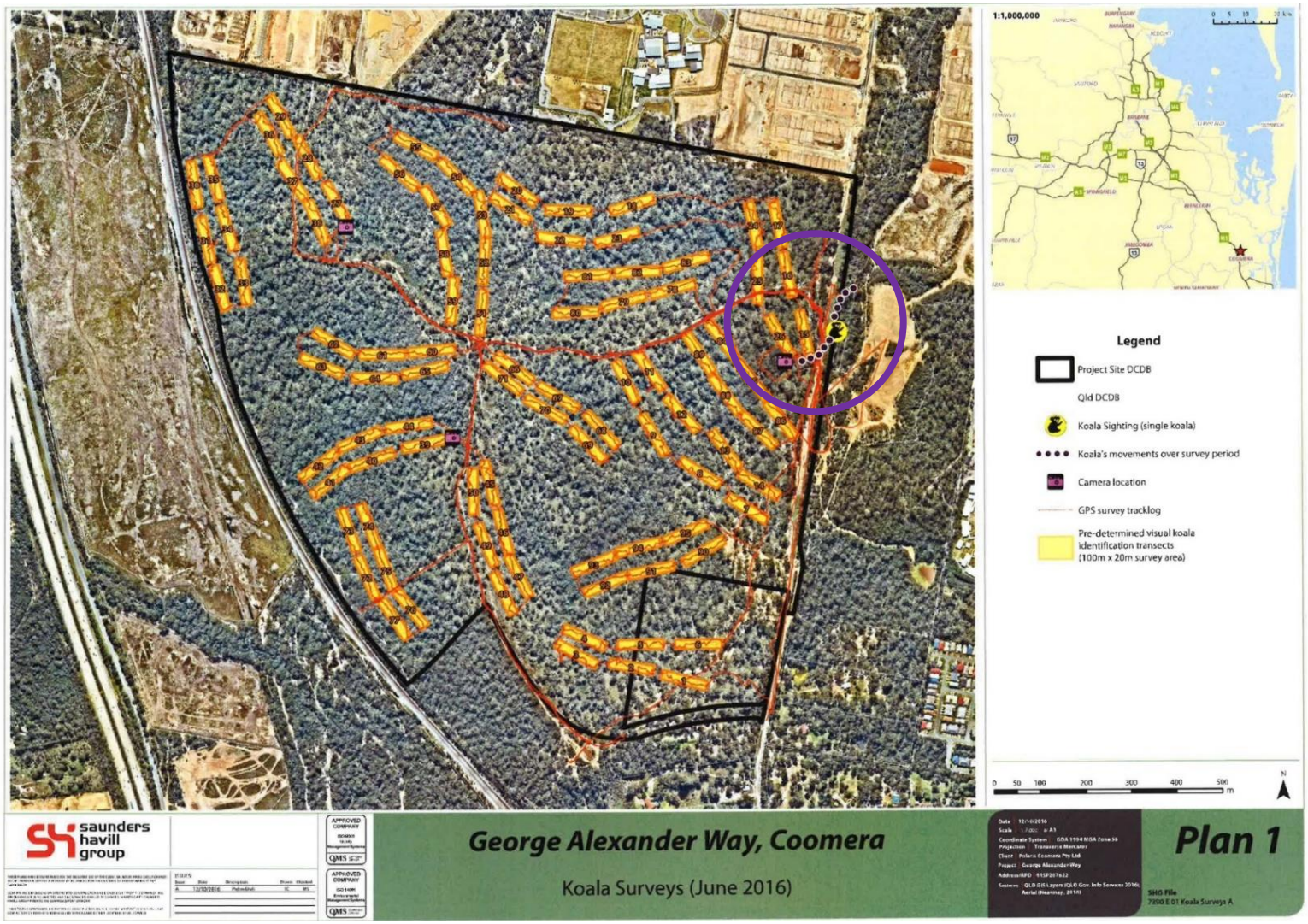

FIGURE 9: KOALA WITNESSED USING CORRIDOR TO MOVE IN AND OUT OF IMPACT AREA (SHG 2017)

7.0 DISCUSSION

The purpose of this report was to address the four statements by DEE decisions that development within the CW Site is likely to have a significant impact on the koala due to a range of factors. The four statements are contained within the following;

- The Impact Area may allow for the long-term persistence of the koala population present on the CW Site (despite the lack of connectivity)
- The koala population in the Impact Area is important for the viability of the species in the Coomera area.
- The proposed action is likely to facilitate additional impacts from other actions in the area. This is likely to increase all threats to the koala.
- The proposed clearing will force koalas into adjoining residential areas. These koalas will likely be killed by domestic dogs, struck by motor vehicles and/or succumb to disease. Sequential clearing is likely to increase stress on the koalas which will increase vulnerability to disease

The surveys performed by Planit in 2017 and the review of literature have confirmed that the current population size, site quality and conflicting land uses of surrounding areas that the population will not persist long-term. The designated ecological corridor will allow for the refuge and safe dispersal of koalas from the impact area.

The present koala population occupying the impact area is estimated to be approximately 5 individuals, a third of the original estimate by Phillips in 2015. The sampling method chosen by Planit to produce this result was evaluated within part 1 of this report as being the most reliable to estimate koala abundance and density.

It was essential to establish a reliable population estimate to analyse the significance of the population and habitat. The population within the impact area is not classified as an 'Important Population' under the Significant Impact Guidelines. The population is not vital to the long-term survival or recovery of the species.

When the C-PKHA was first surveyed by Biolink, the area was a large contiguous site of relatively undisturbed habitat. Within the last decade the UKA has undergone a significant transformation to provide essential dwellings, amenities and transport infrastructure for the growing SEQ population. The habitat was declared as not 'critical habitat' when assessed against the koala Habitat Assessment Tool. The habitat connectivity, key existing threats and recovery value were all scored low due to the current habitat quality and surrounding land uses.

The habitat's carrying capacity has significantly reduced due to the size of the patch, edge effects and reduced connectivity from conflicting land uses surrounding the impact area. In 2015 Phillips acknowledged that disturbances have has a significant impact on the quality of habitat during the habitat quality assessment and estimated as a result that only approximately 33% of the site was habitable by koalas. As a result of the present habitat quality and reduced carrying capacity the impact area would not be able to ensure long-term persistence of a viable population.

The estimated koala population size has been established at 5 individuals as reported by Planit 2017 and resides within the impact area, which is 147 hectares. Biolink reported that models they ran

produced an output of 170 individuals as the MVP and 1500 hectares would be required to sustain a population of that size. The population within the impact area would not be able to recover to create an equilibrium where the immigration/recruitment rate match the extinction rate, as the carrying capacity for the site has declined significantly.

It is likely that the current koala population will not persist within the impact area even if it is reserved for conservation. The population is not important within the scope of species survival or recovery and the habitat will not allow for the long-term persistence of this population in relation to the lack of resources to sustain a viable population and inadequate recruitment from source populations (Pulliam 1988; Dias 1996).

The established ecological corridor within the residential development to the north of the impact area facilitates the movement of fauna through the landscape and away from the impact area. this was confirmed through the Koala Conservation Plan for East Coomera as there were no recorded koala mortality from roads surrounding the impact area and corridor.

During the surveys performed by SHG a koala was witnessed using the corridor to move in and out of the impact area over five days multiple times. The provision of an ecological corridor within the proposed development by Polaris Coomera Pty Ltd meets the SPRP requirements of development within an identified broad-hectare koala area and the Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016 by addressing a number of koala sensitive design objectives that allow koalas to move safely within a landscape.

7.1 SUMMARY AND CONCLUSIONS

The report concludes that the proposed development within the impact area by Polaris Coomera Pty Ltd will not result in a significant impact on the koala as listed and protected as a Matter of National Environmental Significance under the *EPBC Act 1999*. The impact area and koala population have been rigorously surveyed and assessed against the Significant Impact Guidelines and concluded that:

1. The Impact Area will not allow for the long-term persistence of the koala population present on the CW Site;
2. The koala population within the Impact Area is not important for the viability of the species in the Coomera area;
3. The proposed action is unlikely to facilitate additional impacts from other actions in the area and unlikely to increase all threats to the koala
4. The proposed sequential clearing will guide koalas into the ecological corridor and facilitate movement into the Coomera Koala Habitat Area, an area which will allow for the long-term persistence of the koala population. The ecological corridor will provide safe passage and reduce threats by domestic dogs, motor vehicles and aggressive wildlife.

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Phillips, S. 2015. Impacts of proposed clearing activity on the koala habitat located at 49 George Alexander Way, Coomera in the City of Gold Coast LGA, South- Eastern Qld. Australian Government, Dept. of Environment.

8.1.3 SAUNDERS HAVILL GROUP 2017

Saunders Havill Group, 2017. Coomera Woods: Koala Assessment Report, 49 & 51 George Alexander Way, Coomera

Attachment- Koala Habitat Assessment Tool (Saunders Havill Group).

Attribute	Score	Comment
Koala occurrence	2	The EPBC Act Protected Matters Search Tool identified the Koala as having potential to occur on site. A search of Queensland's Wildlife Online Search Tool using a 10 kilometre radius found 372 records of the Koala, while 11 sightings had been recorded within a 1 kilometre radius of the site. While there is evidence of Koala occurrence on the site, it is noted that East Coomera Koala Conservation Project has involved the relocation of 180 'at risk' Koalas out of the imminent Coomera development area in June 2014. This has included the removal of 19 Koalas off the referral site as well as surrounding areas the site as part of the East Coomera Koala Conservation Project, significantly reducing the number of Koalas in the area. The East Coomera Koala Conservation Project is now complete having relocated 180 species from the area. Recent survey, since the relocation of Koalas, of the site, noted a single juvenile male was observed on Day 1 of the 4 day field survey completed in 2015 and was not resighted on the following three (3) days. In addition, while scats were observed in several locations across the site, these were concentrated to gully lines and foothills and overall use of the site by the species is considered to be "low". Further, while scats were observed across the site, it is unknown how long they have been on site (i.e. prior to relocation in June 2014), with survey noting in many locations as being 'old'. Additional comprehensive direct koala surveys were completed in August and again in October 2016. Both surveys occurred post the clearing of vegetated areas associated with the Bloom Estate on the land adjoining to the immediate east. In both surveys a single koala was observed either on or adjacent to the project site. **As there is evidence of Koala occurrence is the previous two years, this attribute has been scored 2.**
Vegetation composition	2	A detailed description of the vegetation composition on site is provided in earlier sections of this report, and based on the results from 2004, 2008 and 2015 ecological field survey. Overall, the site was found to be dominated by species that achieve the definition of 'woodland' and 'forest' as referenced in the Koala Referral Guidelines. Ecological survey of the site shows the referral area is predominately dominated by Eucalyptus and Corymbia species. Specifically, these species included *Eucalyptus tereticornis* (Forest Red Gum), E*ucalyptus siderophloia* (Grey Gum), *Corymbia intermedia* (Pink Bloodwood), *Corymbia citriodora* (Spotted Gum) and Broad-leaved Ironbark (*Eucalyptus fibrosa*)/or Grey Ironbark (*E. siderophloia*). Further, there was a high dominance of *Allocasuarina littoralis* (Black She-oak), *A. torulosa* (Forest She-oak) and Wattles (*Acacia disparrima, A. leiocalyx, A. melanoxylon*) throughout the shrub layer and a number of weed species were identified. As vegetation composing of canopy species on site is made up of more than two species considered to be Koala food trees, this attribute has been given a score of 2. **Two or more Koala food trees were identified in the canopy, resulting in an attribute score of 2.**
Habitat Connectivity	0	Contextually, the site is bound by the Gold Coast Railway Line to the west, Foxwell Road the south and existing and approved development to the north and east. While current aerial imagery shows vegetated patches to the south, southwest and east (refer **Plan 5**), connectivity to this vegetation is segregated by existing arterial and rail infrastructure and future development and EPBC approvals. Additionally, the Bloom Estate to the immediate east has now completed vegetation clearing removing the majority of vegetation adjoining the eastern boundary with the exception of the retained gully line. Urban development has expanded significantly in the wider Coomera area over the past decade, with residential estates now dominating the landscape to the east and west of the Pacific Motorway. A primary barrier to dispersal between the site and bushland directly to the west is the Gold Coast Railway Line and Coomera Train Station. Trains travel along this portion of the line between Brisbane and the Gold Coast roughly every half an hour between 5am and 12pm. The high frequency of train movements along the track poses significant threats of injury or death to dispersing Koalas. In addition, vegetation clearing of isolated pockets between the railway line and Pacific Motorway associated with Westfield's Northern Frame Precinct (EPBC2014/7291) and Shopping Centre (EPBC20147292) has now been completed. The State Government committed to $47.4million, in addition to the existing $410 million commitment from the Australian Government and $17.3 million commitment from the developers of the Coomera Town Centre, for the upgrade of the existing interchange connected to the Pacific Motorway and Coomera Exit 54 located at Foxwell Road. This financial

		commitment demonstrates the obligation from all levels of Government for Foxwell Road to be developed as a major arterial. This upgrade is required to cater for continued growth of the Coomera Area and has recently been completed. The Coomera Town Centre Structure Plan, provided in **Plan 5**, shows that the surrounding Coomera area is expected to undergo even further development in the future. The subject site comprises a significant proportion of this development zone and as such, will be surrounded by existing and future development. Consequently, the project area will become a completely isolated patch fragmented from habitat patches elsewhere in the landscape once surrounding development is complete. Operational clearing of the Bloom Estate to the east of the project has now been completed. No functioning viable corridors suitable to support the regular and onging movement of koalas between habitat areas has been planned or retained within the Coomera Town Centre. Further, Council have taken direct action through the East Coomera Koala Conservation Project, to relocate the large Koala population outside of the Coomera Town Centre to areas designated for Koala conservation within the broader jurisdiction of the Gold Coast. A minor network of lineal open space has been achieved in fragments through developments to the north and east. These areas range in width from 20m to 80m. No conservation measures have been incorporated into this system (i.e. fencing, signage, Koala tree planting program). Additionally, the linear system is severed by several minor and major roads and in other locations the full width of open space caters for storm water treatment devices. This lineal system is not assessed as supportive of functional connectivity in relation to habitat to and from the site (refer **Plan 6**). Although not providing functioning connectivity the Koala Conservation Plan for East Coomera maintains these areas for provision of dispersal of any remaining koalas in the Urban Koala Area to the Koala Conservation Area which is to be retained and restored for as permanent koala habitat. Overall, the site is significantly disconnected from large contiguous patches of bushland. While limited movement opportunities are currently exist to the east, future development intent and Council approvals over these areas will inevitable see this vegetation cleared for residential development. Once approvals are in place, contiguous vegetation within the landscape will be confined to the referral site and vegetated properties to the north and south, comprising 185ha. In addition, as no viable movement corridors or areas of Koala habitat have are planned to be retained adjoining the site. The attribute value for habitat connectivity has been determined to be 0. **No habitat connectivity values will be retained in the short or long term surrounding the site, resulting in an attribute score of 0.**
Key Existing threats	0	Detailed knowledge is known about the existing threats to koalas in the East Coomera area as extensive monitoring and research was completed during 2012 and 2013 as a lead in to implementing the Council's translocation strategy. The following data is provided from Council's Reports surrounding this strategy and reports on threats at a time when East Coomera was substantially less developed than to the current day. **Vehicle Strike:** Between 2012 and 2013 **Wildcare Australia** recorded six (6) koala fatalities from vehicle strike within East Coomera. In the same period Gold Coast City Council recorded a further two (2) koala fatalities taking the total deaths from vehicle strike to 8 for the period. The majority of these strikes occurred along Foxwell Road to the south of the project site. Additionally thirteen (13) koala vehicle strike records were made along the Pacific Motorway as it traverses the Coomera area. Substantial development expansion and vehicle usage on existing and new roads has occurred since this period. Additionally, it is noted that the project areaincludes two new large scale "trunk" road corridors partially funded by the Council and State Government. **Dog Attack:** There are 60,000 registered dogs within the Gold Coast area with the majority of these residing in urban settings and occurring and proposed through the entire East Coomera area. In 2012, fifteen (15) koalas were rescued or recovered from the East Coomera Area by Wildcare Australia. Many of these were due to threats or actual suspected attacks by dogs. Substantial evidence of both frequent and regular koala mortality from vehicle strike and dog attack is known within the immediate proximity of the project site. These threats along with the removal of habitat are in essence why the **CGC** commenced the unorthodox strategy of physically capturing and relocating the koalas from the East Coomera area. The Coomera Woods site is almost completely surrounded by these threat factors either through already constructed residential areas and roads or through approved and under construction areas, the majority of which also retain EPBC clearance. **Due to the existence of key threats, the attribute has been scored 0.**

Recovery Value	0	The interim recovery objective for coastal areas is based upon protecting and conserving large, connected areas of Koala habitat, particularly where Koalas are genetically diverse/ distinct, free of disease or have a low incidence of disease or where there is evidence of breeding. None of these elements are considered to be present on the referral site and as such its recovery value is assessed as being 0. This is primarily because, as shown in **Plan 6**, the site is heavily fragmented and will inevitably be isolated from large, continuous patches of Koala habitat, as local development expands in accordance with the Coomera Town Centre Structure Plan. Further, the site makes up significant proportion of the Coomera Town Centre development area and adjoins the Activity Centre Precinct and Rail Station. If the development does not proceed it dramatically effects all existing development and proposed development in the Coomera area. The referral site is already highly fragmented and isolated by surrounding roads and rails, and while some connectivity remains to the east, future approvals will remove connectivity opportunities between the site and areas of potential koala habitat. Further, this development will result in the isolated site surrounded by\ increased key threats to the species including roads and domestic pets. The site is not considered large enough in isolation to function and sustain koala populations. While a small juvenile male was observed on the site during the first day of field survey, it was not resighted on the remaining 3 days by field ecologists suggesting it, or other potential individuals, are not confined to the project site. This assumption is further supported by two census style direct koala surveys completed in 2016 (August and October). Both surveys noted only a single koala and infrequently despite targeted efforts to capture records during 160 person hours of survey and over 100 hours of infred camera surveys. Further, while evidence of scats on site indicated a 'low' level of usage by the species, the age of these scats cannot be ascertained and it is likely that a portion of the scats recorded as part of the SATs were left prior to relocation of koalas off the site as part of the East Coomera Koala Conservation Project in June 2014. Further previous field work as well as research undertaken as part of the East Coomera Koala Conservation Project indicates the site in isolation does not support a viable subpopulation of koalas. As shown in Plan 5, the Coomera Town Centre Structure Plan, planning intent is for the area to be completely developed, with no conservation linkages proposed to be retained within the landscape. While two slithers of Conservation land area mapped over the referral site, and are to be retained by the development, these have been designated due to topographical constraints and reflect drainage lines. The will not in isolation support viable movement corridors for the species and were not designed to form part of conservation linkages for Koala movement in the Coomera Town Centre. The western slither of conservation land adjoins and mapped Recreational Open Space/Urban Parkland linkage which connects the site to parkland associated with Oxley Creek to the west of the railway line. This corridor is intended as a recreational linkage for residents a visitors and will be embellished with amenities. No Environmental Corridors or meaningful areas of conservation are mapped within or adjoining to connect the site with external koala habitat areas. Further, over 180 koalas have been relocated from the area as part of the East Coomera Koala Conservation Project, including nineteen (19) individuals from the site itself due to it being identified as a 'high risk' development area. Planning intent and actions by Council do not support the retention of habitat for koala or existing populations in the area. Overall, the site does not meet the interim recovery objectives for coastal regions and as such, is given an attribute score of 0. As the referral site does not meet the interim recovery objectives, the attribute has been scored 0
Total	4	