

APPENDIX O

Green Network Plan and Offset Strategy

Executive Summary

Plans for Caboolture West seek to improve the current urban expansion approach in which biodiversity protection often results in dysfunctional fragmentation of both natural and urban habitats. Both natural and urban systems have their own spatial logics:

- Natural systems have regional ecosystem requirements to ensure their long term viability - such as ensuring a minimum viable area size, regularising remnant vegetation areas to mitigate edge-effects, and linking and consolidating remnant vegetation.
- Sustainable urban areas need sufficient contiguous areas to achieve walkable town and neighbourhood centres, reduce car-dependence and promote active and public transport. Most land within centre catchments needs to be occupied by urban development of sufficient densities and continuity to enable exchange, walkability and viability for those centres and the public transport that serves them.

The approach at Caboolture West has been to balance the requirements of biodiversity conservation with the needs of urban sustainability. Also, careful consideration has been given to the enhancement of the regional ecosystem through proposals for offsetting and rehabilitation of environmental corridors. The natural elements have been included as a Green Network Plan in the Caboolture West Structure Plan.

Key influences in the development of the Green Network Plan were:

1. The *Caboolture West Environmental Study* (2013) commissioned by Council which found that the Caboolture West planning area supports an important population of residential and transitory koalas. The potential for Koala population recovery is good through appropriate urban planning to consolidate habitat patches, increasing the availability of habitat and enhancing habitat connectivity both within the Study Area and with areas of known habitat elsewhere in the region by establishing a corridor network.
2. A Green Infrastructure Network (GIN) that has been developed as a component of the draft Strategic Framework for Moreton Bay Regional Council, to be included in Council's new Planning Scheme.

The GIN was tailored specifically for Caboolture West as a Green Network Plan, having regard to the objectives of the Koala population recovery and biodiversity conservation objectives of the *Caboolture West Environmental Study*.

The Caboolture West Green Network Plan proposes to significantly improve the existing green network by way of consolidating, expanding and rehabilitating currently fragmented patches and corridors into a linked network of patches and corridors that is preserved for environmental purposes including enhancement of koala habitat, biodiversity values and stormwater management. Habitat for koalas and other priority species will be provided through the Green Network Plan, whilst ensuring that future Caboolture West residents benefit from the many ecosystem services provided by green infrastructure.

The backbone of the proposed Green Network Plan is a series of corridors that will provide habitat in their own right and link key environmental areas within Caboolture West and between Caboolture West and the wider region as follows:

1. **Caboolture River:** Corridors of State significance 300m width
2. **Wararba Creek:** Corridors of State significance 200m width
3. **Secondary Corridors:** Caboolture River tributaries, South Wararba Creek 100m width
4. **Tertiary Corridors:** Minor drainage lines and watercourses 20m width.
5. **Linkages:** Strategic connections provided between habitat patches

Habitat offsets are proposed to be used to mitigate the potential loss of habitat where urban development impacts on land identified and mapped for Essential Habitat, Vegetation Management Act and Koala Habitat.

An offset framework has been developed to ensure that there is no net loss of Essential Habitat and to ensure an appropriate contribution is made towards the achievement of a net gain in Koala Habitat in the Caboolture West Structure Plan area.

It is proposed that the offset scheme will operate through Moreton Bay Regional Council as the offset provider, with an offset charge being included as an additional component to infrastructure charges.

Contents

| | |
|---|----|
| Executive Summary | 1 |
| 1. Introduction | 5 |
| 2. Context..... | 5 |
| 2.1. SEQ Regional Plan 2009-2031..... | 5 |
| 2.2. Background History..... | 5 |
| 2.3. Caboolture West MPA Declaration | 6 |
| 3. Statutory Environmental Provisions | 6 |
| 3.1. Environmental Protection and Biodiversity Conservation Act 1999..... | 6 |
| 3.2. South East Queensland Koala Conservation State Planning Regulatory provisions | 6 |
| 3.3. State Planning Policy SPP 2/10 Koala Conservation in South East Queensland | 7 |
| 3.4. Draft State Planning Policy – April 2013..... | 7 |
| 3.5. Offsets for Net Gain of Koala Habitat in South East Queensland Policy | 8 |
| 3.6. Draft Queensland Environmental Offsets Policy 2013..... | 8 |
| 3.7. Vegetation Management Act 1999 (As amended by the Vegetation Management and other legislation Amendment Act 2009 (VMOLA) | 9 |
| 3.8. Nature Conservation Act 1992 | 9 |
| 3.9. South East Queensland Regional Plan 2009-2031 | 9 |
| 4. Caboolture West Environmental Study | 10 |
| 4.1. Koala Habitat | 10 |
| 4.2. Habitat Assessment Other Priority Species | 13 |
| 4.3. Areas of Regional Ecological Significance..... | 15 |
| 4.4. Areas of Ecological Significance | 18 |
| 4.5. Corridors..... | 19 |
| 5. Caboolture West Green Network Plan | 19 |
| 5.1. Introduction..... | 19 |
| 5.2. SMEC Caboolture West Environmental Study..... | 20 |
| 5.3. MBRC Green Infrastructure Network..... | 20 |
| 5.4. Development of the Caboolture West Green Network Plan..... | 21 |
| 5.5. Green Infrastructure Offset Strategy | 26 |

Figures

| | |
|---|----|
| Figure 1 - Gazetted Master Planned Areas | 5 |
| Figure 2 - Koala Activity in the Caboolture West Study Area | 11 |
| Figure 3 - Koala Habitat SPP 2/10 Verification Comparison | 12 |
| Table 1 - Summary of potential occurrence of priority species in the Study Area | 13 |

| | |
|--|----|
| Figure 4 - Vegetation Management Act Essential Habitat..... | 14 |
| Figure 5 - Regional Ecosystem Mapping..... | 16 |
| Figure 6 High Value Regrowth..... | 17 |
| Figure 7 Areas of Ecological Significance..... | 18 |
| Table 2- Green Infrastructure Network Native Vegetation Framework..... | 21 |
| Figure 8 Caboolture West Green Infrastructure Vision..... | 24 |

Tables

| | |
|---|----|
| Table 1 - Summary of potential occurrence of priority species in the Study Area | 13 |
| Table 2- Green Infrastructure Network Native Vegetation Framework..... | 21 |

1. Introduction

The Green Network Plan (GNP) and offset strategy has been created to support the Structure Plan for the Caboolture West Master Planned Area.

2. Context

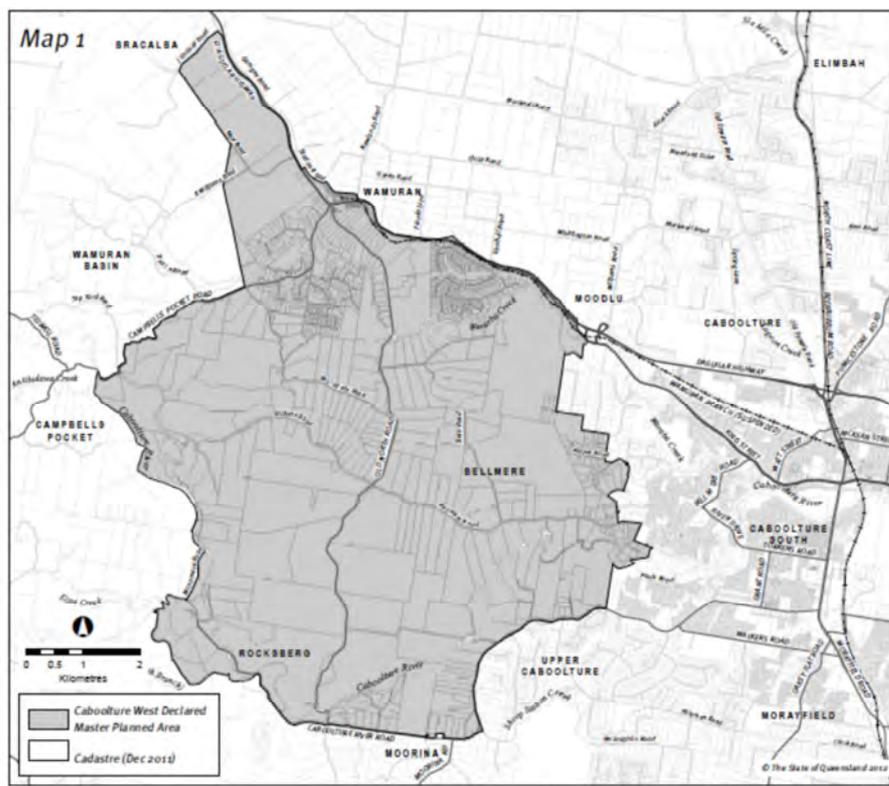
2.1. SEQ Regional Plan 2009-2031

Caboolture West is one of fifteen, *Identified Growth Areas* (IGA) in the SEQ Regional Plan 2009-2031. Many of the IGAs are remote to existing urban areas and potentially costly to provide infrastructure and services for both the local and State governments. Caboolture West IGA (CIGA) is uniquely placed to be one of the least costly areas to open up for urban growth prior to 2031 due to its proximity to existing services and infrastructure.

2.2. Background History

Following SEQ Regional Plan submissions to the State from the landowners and a developer's group in 2008 and further representations from Council during 2010 and 2011, the Caboolture West area was declared as a Master Plan Area under the provisions of the Sustainable Planning Act 2009 (SPA) on 17 February 2012. The declaration set in place the need to begin a process of preparing a structure plan (land use and infrastructure plan) in accordance with SPA.

Figure 1 - Gazetted Master Planned Areas



However, the Sustainable Planning Act 2009 was amended on 22 November 2012 by the Sustainable Planning and Other Legislation Amendment Act 2012 removing Chapter 4 (Planning Partnerships) and inserting Section 761A which specifically covers the ongoing planning processes for the Caboolture West declared master planned area. Under the new provisions of section 761A, Council is not required to prepare a “structure plan” for the area. Instead, Council is required to make a SPA planning scheme by 22 November 2015 and that planning scheme is to include specific measures addressing each of the following for the Caboolture West declared master planned area:-

- a) set out the broad environmental, infrastructure and development intent to guide detailed planning for the area;
- b) appropriately reflect the standard planning scheme provisions;
- c) include a code that:
 - states the development entitlements and development obligations for the area; and
 - includes a map which gives a spatial dimension to the matters addressed in the code; and
- d) include an assessment table, (or its equivalent), which allocates assessment levels and applicable codes for each form of development within the area.

Council has been preparing its new planning scheme since 2011 and is scheduled to have this new scheme commence in 2014. The Caboolture West Structure plan is intended to be incorporated into the first release of the new planning scheme.

2.3.Caboolture West MPA Declaration

The Master Plan declaration specifically includes in section 7. *Other Matters* that the structure plan is to ensure that koala populations are maintained and enhanced within the declared master planned area and in the wider landscape.

3. Statutory Environmental Provisions

There are relevant Commonwealth and State environmental legislation, regulations and policies that apply to Caboolture West as follows.

3.1. Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act provides for environmental regulation of development at a Commonwealth level. Any proposed action that has, will have or is likely to have a significant impact on a Matter of National Environmental Significance, or another matter specified under the Act, may be considered a “controlled action” and must be the subject of a referral to the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) for their approval.

On 2nd May 2012, Koala populations in Queensland were listed as Vulnerable under the Environment Protection Biodiversity Conservation Act 1999 (EPBC Act). Referral to the Commonwealth Government is required if an action is likely to have a significant impact on an important koala population.

3.2.South East Queensland Koala Conservation State Planning Regulatory provisions

The *South East Queensland State Regulatory Provisions* came into effect in May 2010. The SPRP targets areas of the Koala Coast, and Pine Rivers and areas outside the urban footprint, where

koalas are known to be under the most significant risks. This replaced areas previously regulated by the *Interim South East Queensland Koala State Regulatory Provision (February 2010)* and the *nature Conservation Koala Plan 2006 and management program 2006-2026*. The SPRP prohibits clearing bushland in the priority areas of Koala Coast and Pine Rivers, and in areas outside the urban footprint.

The Caboolture West Area is not covered under the SPRP.

3.3.State Planning Policy SPP 2/10 Koala Conservation in South East Queensland

The Koala SPP 2/10 augments the Koala SPRP by informing future Government planning, such as planning scheme amendments, and land-use planning decisions through structure plans, local area plans, master plans, community infrastructure designations, and biodiversity development offset areas.

The SPP 2/10 has a wider applicability than the SPRP and applies to the seven eastern local government areas of South-east Queensland: Sunshine Coast Regional Council, Moreton Bay Regional Council, Brisbane City Council, Redland City Council, Ipswich City Council, Logan City Council and Gold Coast City Council, which collectively form the South-east Queensland Koala Protection Area (SEQKPA).

The intent of the Koala SPP 2/10 is to ensure that koala habitat conservation is taken into account in planning processes, contributing to a net increase in koala habitat and assisting the long term retention of viable koala populations in SEQ. Planning decisions made in the SEQKPA must include strategies and measures to respond to potential conflicts between achieving koala conservation objectives and development. Section 3.3 of the SPP states: "A local planning instrument, structure plan or an amendment to a planning scheme made under the SPA must include planning strategies and measures aimed at minimising the impacts of new development on koalas and koala habitat."

The Koala SPP 2/10 will soon be superseded by the single State Planning Policy, which is currently under review in draft form (August, 2013).

3.4.Draft State Planning Policy – April 2013

The Koala SPP 2/10 is one of thirteen State Planning Policies developed under the *Integrated Planning Act 1997* and current under the *Sustainable Planning Act 2009*. The Draft State Planning Policy (draft SPP, April 2013), a single state planning policy to replace the multiple policies in existence, is currently being developed.

The draft SPP identifies the state's interests in planning and development and how these are to be dealt with in planning instruments, council development assessment processes and in designating land for community infrastructure.

In making or amending a local planning instrument, local governments will be required to have regard to 6 listed principles in their decision making to inform the preparation of the local planning instrument (emphasis added):

1. Support the efficient approval of appropriate development;
2. Facilitate effective delivery of sustainable planning outcomes;
3. *Protect and enhance Queensland's natural and built environments and places;*
4. Maximise transparency and accountability of planning instruments and decisions;
5. Enable positive responses to change, challenges and opportunities; and

6. Consider infrastructure needs required to support development.

With regards to Environment and Heritage, a local planning instrument is to reflect the SPP for this state interest by:

1. reflecting an appropriate consideration of:
 - a. matters of national environmental significance;
 - b. matters of state environmental significance;
 - c. strategic offset areas;
2. facilitating the protection of matters of national and state environmental significance by:
 - a. protecting species and species habitat, ecosystems and ecosystem services and other natural values, to the greatest extent practicable;
 - b. maintaining or enhancing ecological connectivity;
 - c. avoiding establishing urban areas or other development (unless there is no feasible alternative location) that may:
 - i. significantly and adversely affect matters of national or state environmental significance, or
 - ii. prevent strategic offset areas from being secured, and
 - d. including planning measures that require development to avoid significant and adverse environmental impacts, or where this cannot be reasonably achieved, impacts are minimised and residual impacts offset.

3.5.Offsets for Net Gain of Koala Habitat in South East Queensland Policy

The Offsets for Net Gain of Koala Habitat in South East Queensland Policy are to be applied when determining Koala habitat offsets for a local planning instrument within the South East Queensland Koala Protection Area (KPA) to achieve a net increase in bushland Koala habitat within the planning area. The Caboolture West Study Area is within the KPA.

The policy requires an offset to contribute the equivalent of five new koala habitat trees for every non-juvenile koala habitat tree removed (i.e. 5:1 offset ratio). The koala offset site must be in an area identified as high value or medium value suitable for rehabilitation habitat as identified in the South East Queensland Koala Protection Area Koala Habitat Values Maps for the State Planning Policy 2/10. Where an area of high value or medium value suitable for rehabilitation habitat is not available, koala offset sites should be located within low value suitable for rehabilitation habitat, or where appropriate, within bushland habitat to enhance the quality of bushland within the local government area.

3.6.Draft Queensland Environmental Offsets Policy 2013

The draft policy outlines the Queensland Government's proposed single approach to the use of environmental offsets across Queensland's terrestrial and aquatic ecosystems. It proposes to replace several offset policies including the *Offsets for Net Gain of Koala Habitat in South East Queensland Policy*.

Koalas in SEQ are included as a matter of State Environmental Significance as reflected in bushland koala habitat, and high and medium value koala rehabilitation habitat in the South East Queensland

Protection area. Endangered and Of-concern regional ecosystems are also listed as a matter of State Environmental Significance.

An offset is required where the assessment of an activity cannot be avoided or substantially reduced (mitigated) and residual impacts are significant. Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the affected matter. The offset should be built around direct land based offsets of sufficient quality and equal to or greater than the matter of environmental significance impacted by the activity as per an Offset Assessment Guide calculator to be available on the Department of Environment and Heritage Website. For Koalas, the only acceptable conservation outcome is to plant new koala trees.

3.7. Vegetation Management Act 1999 (As amended by the Vegetation Management and other legislation Amendment Act 2009 (VMOLA))

The *Vegetation Management Act 1999* (VMA) is the state-wide law regulating the clearing of native vegetation in Queensland. It is administered by the Department of Environment and Heritage Protection (DEHP), and applies on all land tenures – private (freehold) land as well as leasehold and unallocated State land.

The VMA regulates the clearing of vegetation in a way that conserves remnant vegetation mapped as containing an Endangered, Of Concern or Least Concern regional ecosystem (RE) and High Value Regrowth vegetation. Clearing permits are required under this legislation to remove any remnant vegetation mapped in the study area.

RE mapping is also used to determine where essential habitat is likely to occur based on vegetation that is consistent with habitat for endangered, vulnerable and rare fauna. Essential habitat mapping for the koala identifies additional values, and may represent more ‘critical’ koala habitat areas.

Amendments to the VMA (Vegetation Management Framework Amendment Bill, 2013) have been approved and will result in the removal of high value regrowth vegetation regulations from freehold and indigenous land.

3.8. Nature Conservation Act 1992

The objective of the *Nature Conservation Act 1992* (“NC Act”) and associated *Nature Conservation (Wildlife) Regulation 1994* is to conserve nature. Nature under the Act refers to ecosystems including their constituent parts and processes.

The *Nature Conservation (Wildlife) Regulation 2006* identifies native wildlife as extinct in the wild, endangered, vulnerable, near threatened and least concern and states the declared management intent for each of the classes of wildlife. All of these categories are considered “protected” under the legislation and clearing of “protected” species is regulated by the Act.

All Australian native plants in Queensland are protected under the *NC Act* and associated subordinate legislation, the *Nature Conservation (Protected Plants) Conservation Plan 2000*. This Plan forms a key part of the framework through which DEHP regulates the taking and use of protected plants, including the clearing of protected plants for development purposes.

3.9. South East Queensland Regional Plan 2009-2031

The study area is located outside the Urban Footprint under the South East Qld Regional Plan 2009-2031. The SE Qld Regional Plan contains broad policy guidelines in regard to biodiversity protection

and Koala conservation. It also draws on the mapping of the “Areas of Ecological Significance” mapping discussed provided by DEHP. The maps are based on areas of state biodiversity significance and spatial data associated with relevant legislation. This mapping is used to support land-use planning and development assessment purposes and feeds into local planning instruments and other documents.

4. Caboolture West Environmental Study

The *Caboolture West Environmental Study* (2013) by SMEC for the Moreton Bay Regional Council assessed on-ground Koala population, flora and fauna habitat, and ground-truthed and verified State and Council’s current environmental values mapping.

It should be noted that the Caboolture West Study Area is sizeable, with the western and northern areas to be maintained in rural, rural residential and environmental management and conservation zones which will largely preserve existing environmental values. Land to the south-east of the study area is proposed for urbanisation and it is here that impacts and interfaces between natural and urban values require mitigation.

4.1. Koala Habitat

The State Planning Policy (SPP) 2/10 Koala Habitat Values mapping shows that Koala Bushland Habitat is widespread in the Study Area, particularly in the northern two-thirds which are mostly to be excluded from urban development:

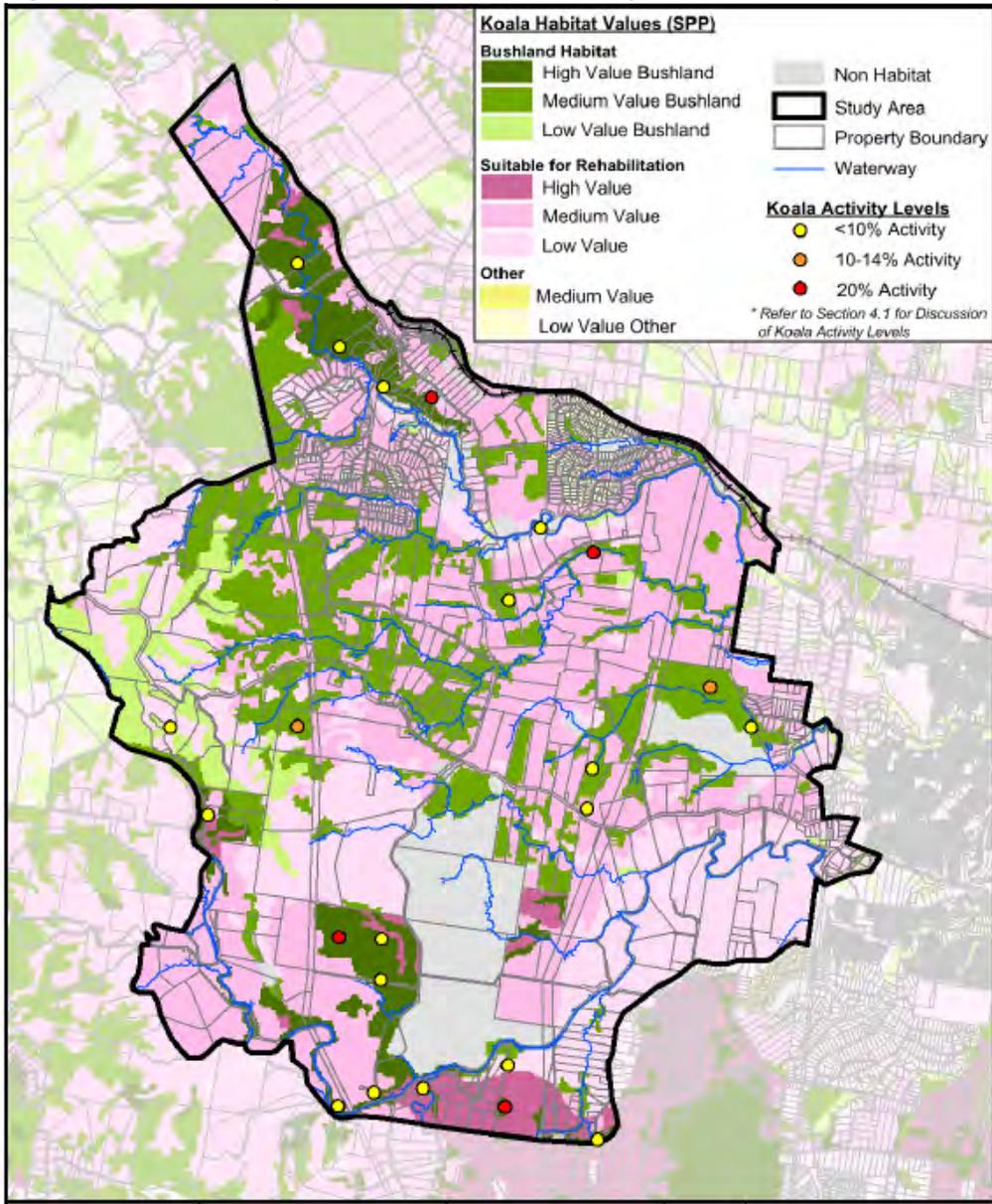
- Areas are mapped as high value bushland habitat were mostly outside areas proposed for urban development, except for two small areas central in the development and riparian edges along Caboolture River;
- The majority of habitat in the Study Area is mapped as medium value;
- Areas of low value bushland are confined to the more elevated far west of the Study Area; and
- Portions of the Study Area proposed for urban development were Non-Habitat

In terms of spatial distribution within the Study Area (**Figure 2 refers**):

- Overall, the mapping shows Koala habitat to be highly fragmented with larger, more continuous patches are evident in the north and west outside the area proposed for urban development;
- The southern part of the Study Area contains little mapped Koala bushland habitat, except that the Caboolture River supports some habitat along its high bank (where Forest Red Gum is present). Caboolture River is likely to be an important movement corridor for the Koala, connecting the Study Area to habitat to the south where a higher density Koala population is known to be present (GHD, 2008).

According to the criteria of Phillips and Callaghan (2011), all sites are considered to show low Koala activity levels with reference to an east coast high density population (the threshold for medium use is 22%). The Koala activity levels did not reflect the mapped Koala habitat value, with a range of activity levels lower in both medium and high value bushland habitat. A few sites were located in low value habitat, but SMEC found that these areas seemed to be associated with lower activity levels. (**Figure 2**).

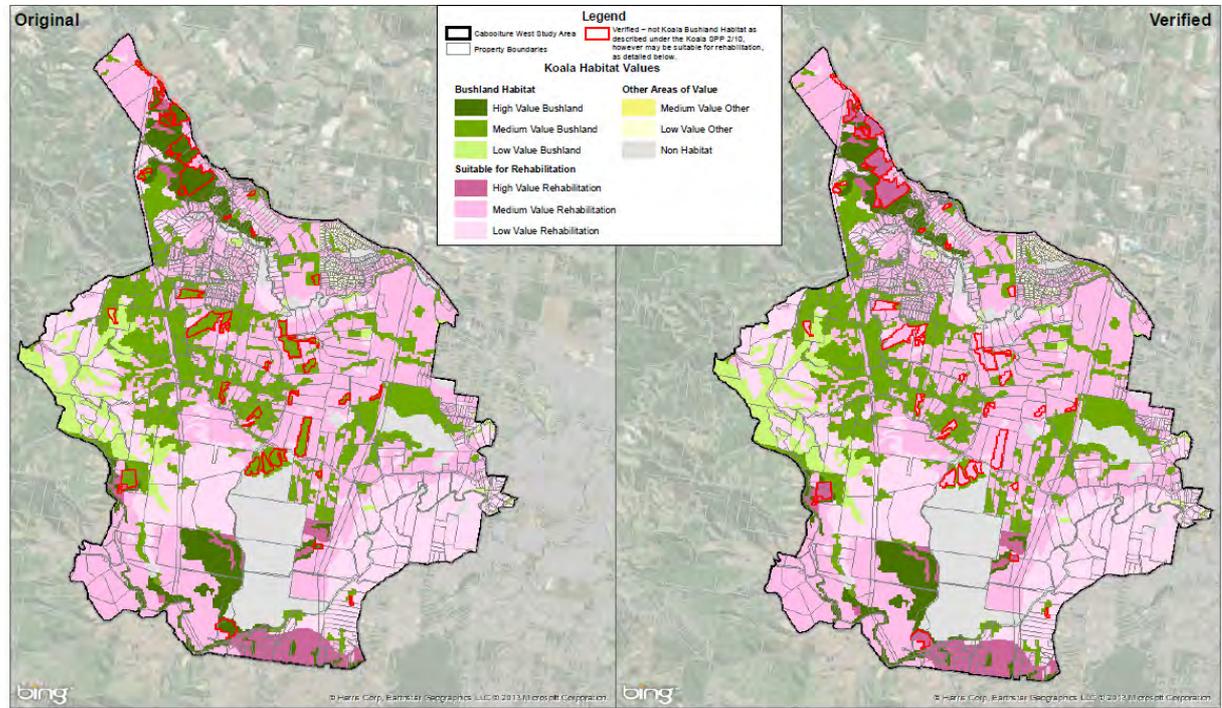
Figure 2 - Koala Activity in the Caboolture West Study Area



Koala Activity, Figure 5 SMEC Caboolture West Environmental Study

Mapping errors were found in the Koala Habitat SPP 2/10, with areas shown in **Figure 3** as not Koala Bushland Habitat (but may be suitable for rehabilitation).

Figure 3 - Koala Habitat SPP 2/10 Verification Comparison



Koala Activity, Figure 4 SMEC Caboolture West Environmental Study

Overall, the Koala population in the Study Area appears to be dispersed and characterised by a low density of individuals. The combination of limited habitat and low density suggests that the overall population size is likely to be small. However, with the available data it is not possible to estimate an accurate population number.

Activity levels at each Koala Spot Assessment Technique (SAT) survey site suggested to SMEC that there are a few low density clusters of the Koalas in the Study Area, indicated by the higher activity levels approaching 20%. Transitory individuals are moving across the landscape in areas of lower activity with the presence and activity of dispersing Koala in the Study Area likely to be underestimated.

Despite finding that Koalas were patchily distributed in the Study Area, the SMEC fieldwork revealed that preferred Koala food trees are widespread in the Study Area (e.g. Forest Red Gum, Tallowwood, Scribbly Gum, Small-fruited Grey Gum), both in areas of remnant vegetation and in areas of regrowth.

Moreover, Koalas are known to occur both within the Study Area and in higher density areas to the south. These factors suggest that the potential for population recovery is good, but will require amelioration of current threats. If that can be achieved, a slow outward expansion from a number of small core areas to eventually form a more continuous population in the long-term is possible. Key mitigation actions will need to include wild dog control, reducing the occurrence of vehicle strike through appropriate urban planning, consolidating habitat patches, increasing the availability of

habitat and the enhancement of habitat connectivity both within the Study Area and with areas of known habitat elsewhere in the region by establishing a corridor network.

Enhancing habitat connectivity via a corridor network is perhaps the most important action to enhance and secure the viability of the Koala in the Study Area into the future. The *Caboolture West Environmental Study* (2013) advised that the effect of the corridor network would be threefold:

1. Due to habitat fragmentation the parts of the Study Area where aggregations of Koalas were identified are spatially discrete, suggesting that the Koala population is fragmented. Thus, the Koala population would exist as a meta-population, which is a series of local population connected by dispersal. Dispersal is an important mechanism that maintains population viability in a meta-population. A principle function of corridors is to facilitate dispersal and can be used to achieve connectivity within the Study Area and to link the Study Area with other areas of Koala habitat in the region.
2. Koalas are capable of using linear corridors as living habitat. Koalas require access to a certain number of feed trees to persist and the area required to achieve this varies with habitat quality, the characteristics of individual trees, disturbance regimes and land use. While area is, therefore, an important consideration, the shape of the home-range is of secondary importance. Therefore, corridors have the potential to increase the total size of the Koala metapopulation, possibly transforming it into one large, continuous population. Population size is the single most important determinant of population viability.
3. Corridors potentially reduce mortality rates. In the case of the Koala, corridors with continuous tree cover enable escape for predators and reduce levels of energetic stress. The viability of populations of long-lived, slowly reproducing species such as the Koala, are very sensitive to the mortality rate of juvenile, sub-adult and particularly adult individuals.

According to the *Caboolture West Environmental Study* (2013) to be effective, corridors should have characteristics attractive to the target species. In the case of the Koala, the presence of quality food trees is going to be an important factor. As discussed above, Forest Red Gum would be captured in corridors along major drainage lines. Other likely food species were sufficiently widespread that they would be captured in corridors in other landscape positions. While Koalas will use narrow corridors and corridors consisting of scattered trees, neither situation is ideal because they expose them to a higher level of predator and may restrict social interactions. Dogs, which are known Koala predators, can generally penetrate up to 200 m into undisturbed habitat. However, they will gradually decline with increasing distance from a habitat edge. This suggests that corridor widths suitable for the Koala of 200 – 400 m. Corridors of this width would also be capable of supporting overlapping home-ranges, enabling fairly natural patterns of spatial organisation and social behaviour to become established.

4.2. Habitat Assessment Other Priority Species

121 priority species have been recorded within, or in close proximity to the Study Area, including 46 flora and 75 fauna species. Table 1 summarizes the likelihood of occurrence of these priority species within the Study Area based on the availability of known habitat characteristics.

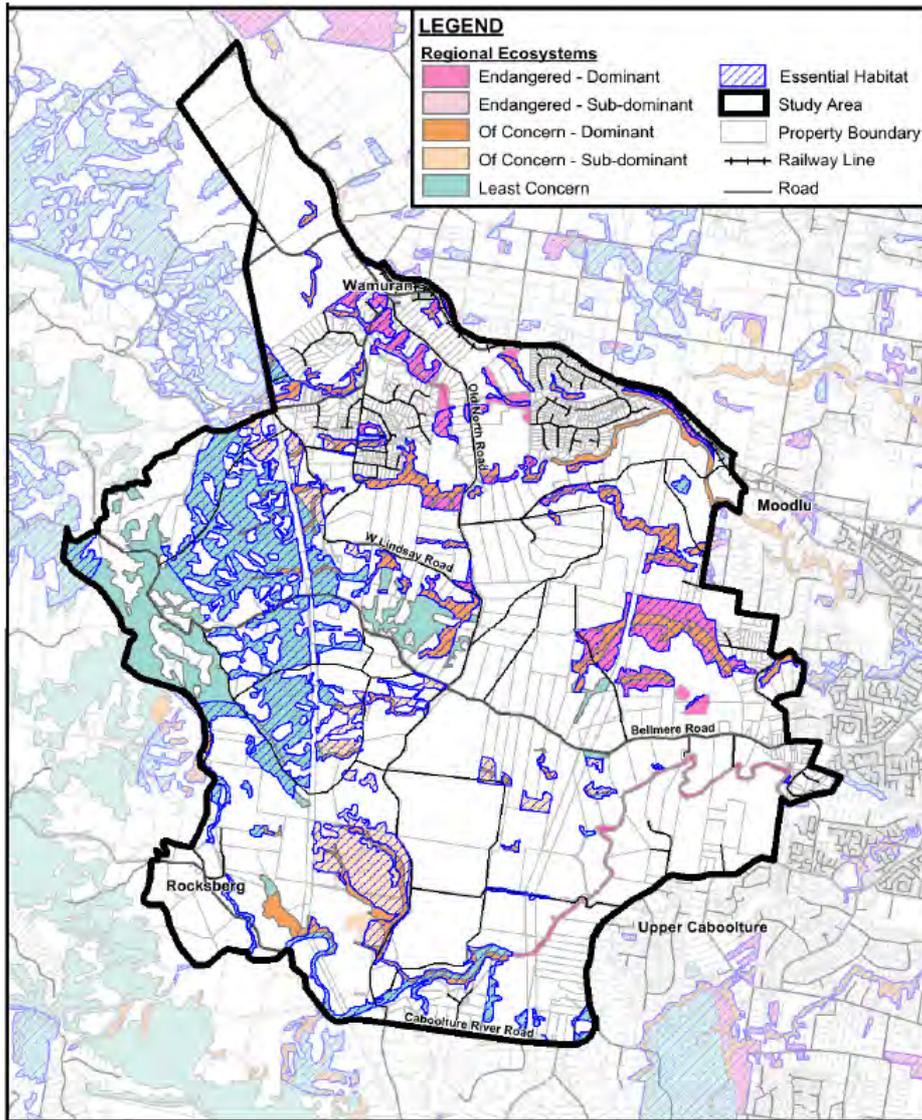
Table 1 - Summary of potential occurrence of priority species in the Study Area

| Taxa | High | Moderate | Low | Occasional | Nil | Total |
|-------|------|----------|-----|------------|-----|-------|
| Flora | 2 | 8 | 19 | n/a | 17 | 46 |

| | | | | | | |
|--------------|----|----|----|---|----|-----|
| Fauna | 10 | 11 | 26 | 6 | 22 | 75 |
| Total | 12 | 19 | 45 | 6 | 39 | 121 |

Essential habitat for threatened species is shown collectively in Figure 4 below:

Figure 4 - Vegetation Management Act Essential Habitat



Vegetation Management Act Essential Habitat, Figure 6 SMEC Caboolture West Environmental Study

31 priority species (10 flora, 21 fauna) are considered to have a moderate to high probability of occurring in the Study Area, mostly to the West of Old Northern Road. An additional 6 fauna are also highly likely to utilise the Study Area, however due to their seasonally nomadic behaviour (e.g. Little Red Flying-fox, Regent Honeyeater) only occasional use is expected.

Most of the priority flora species that are likely to occur in the Study Area are associated with streams and/or rainforest, particularly drier rainforest. Most streamside vegetation in the eastern half of the Study Area showed evidence of previous disturbance, which suggests a lower probability of many priority species occurring there. Therefore, most priority flora would be found in the western part of the Study Area where the vegetation is less disturbed.

Priority fauna species highly likely to occur in the Study Area include species associated with:

- Rivers and creeks, e.g. Giant Barred Frog (Plate 1), Tusked Frog and Platypus;
- Farm dams, e.g. Australian Painted Snipe and potentially Tusked Frog; and
- Flooded pasture, e.g. Green-thighed Frog and Tusked Frog (particularly when near forest), Black-necked Stork and Brolga.

Stream-dwelling fauna (e.g. Giant Barred Frog, Tusked Frog, Platypus Sapphire Rockmaster, Australian River Mussel) have the potential to be widespread in the Study Area. The streams are generally in good condition, water quality appears good and riparian vegetation is fairly continuous. Habitat appeared to be particularly good for the Giant Barred Frog, with pool/riffle sequences evident along most of the major drainage lines (e.g. Caboolture River, Wararba Creek). This species is listed as Endangered under both State and Commonwealth legislation, making it perhaps the most significant species of conservation concern in the Study Area. The Plumed Frogmouth is also strongly associated with streams, but it most likely to be confined to the steep gullies in the western part of the Study Area.

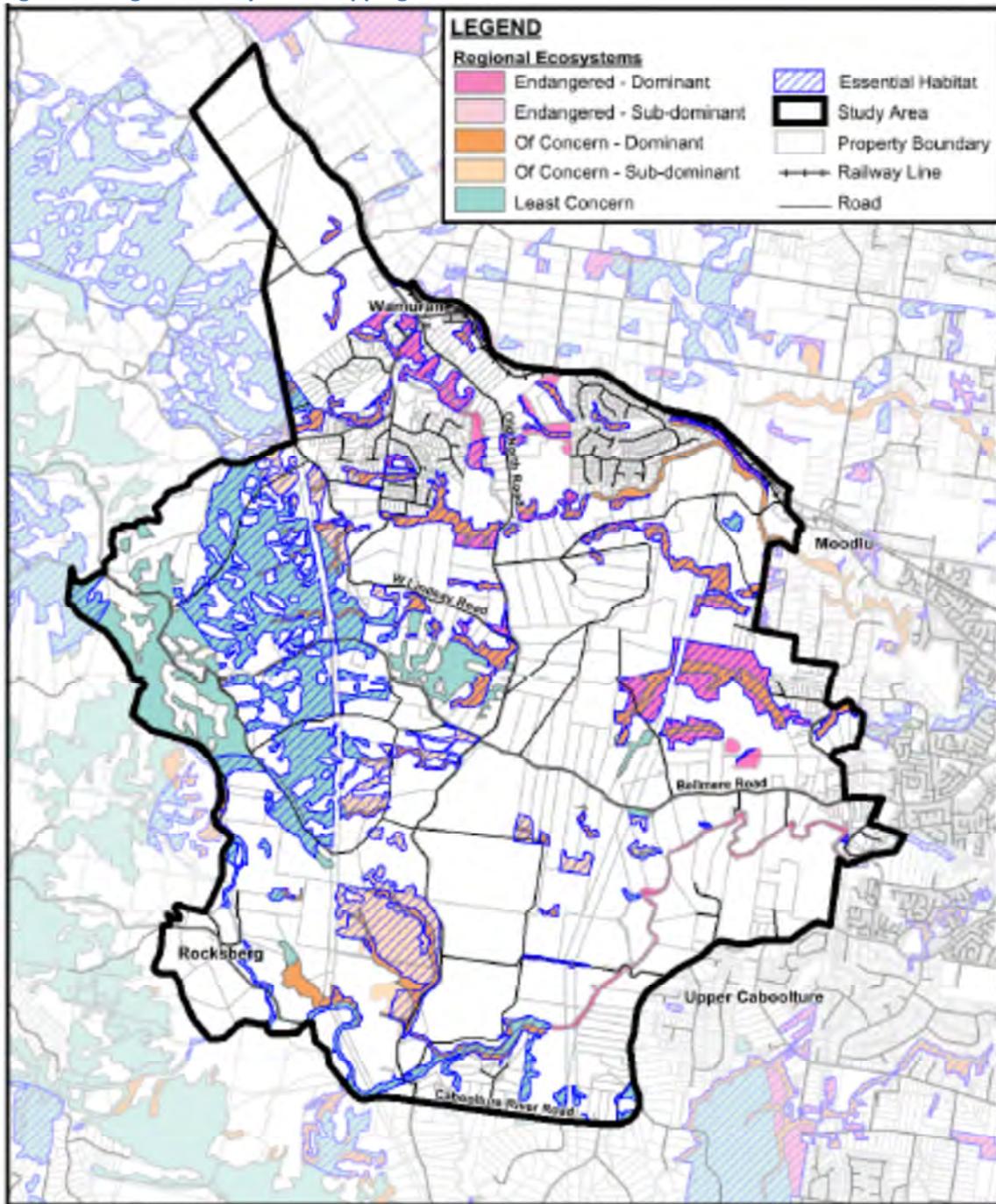
Mobile nectarivores, including honeyeaters, Swift Parrot, flying-foxes and gliding possums (where tree hollows are available), and species with large territories (e.g. Grey Goshawk, Square-Tailed Kite and Powerful Owl) are likely to be moderately to highly tolerant of the current extent of habitat fragmentation in the Study Area and so could be expected to occur on an occasional basis. A net increase in habitat patches or enhancing corridor linkages would benefit these species.

The remaining 90 priority species would either not occur in the Study Area because the area clearly does not provide any suitable habitat, or would have a low probability of occurring (very unlikely but difficult to definitively exclude).

4.3. Areas of Regional Ecological Significance

The RE mapping revealed that 14 different areas of Regional Ecological Significance occur in the Study Area (**Figure 5**). Three of these are described as Endangered (12.3.1, 12.5.3, 12.5.6) and four as Of Concern (12.3.2, 12.3.11, 12.11.14, 12.11.15). REs are mostly found as linear strips along waterways (e.g. Endangered 12.3.1) or in the steep, elevated western part of the Study Area (e.g. Least Concern 12.11.18). Essential habitat for threatened species is shown collectively in Figure 5.

Figure 5 - Regional Ecosystem Mapping



Vegetation Management Act Essential Habitat, Figure 6 SMEC Caboolture West Environmental Study

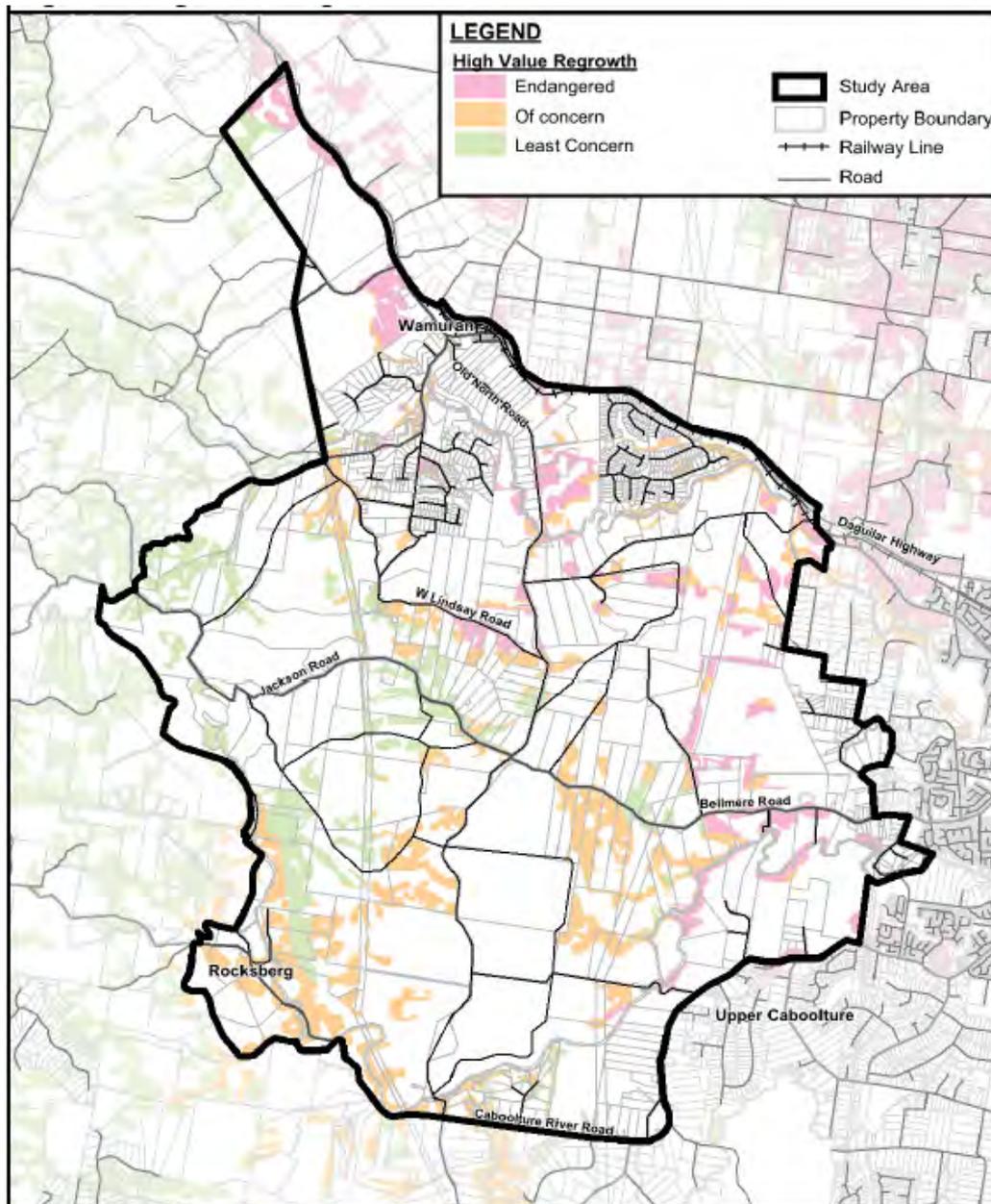
Figure 5 reveals that the least constrained area from a regional ecosystem perspective is east of Old North Road and south of Wararba Creek, noting importance of Wararba Creek and Caboolture River and linked areas of regional ecosystem in the central-east of the study area.

Areas of Endangered and of Concern regrowth vegetation are mapped in the lower elevation eastern two-thirds of the Study Area (**Figure 6**). Regrowth vegetation has benefits over cleared land

for this purpose as stands of regrowth are likely to require gap planting rather than broad-scale planting and there will be a reduction in the time required for structural habitat features, such as hollow-bearing trees, to develop.

Notwithstanding that Amendments to the VMA will result in the removal of high value regrowth vegetation regulations from freehold and land, they should be targeted for any required offsetting wherever possible.

Figure 6 High Value Regrowth

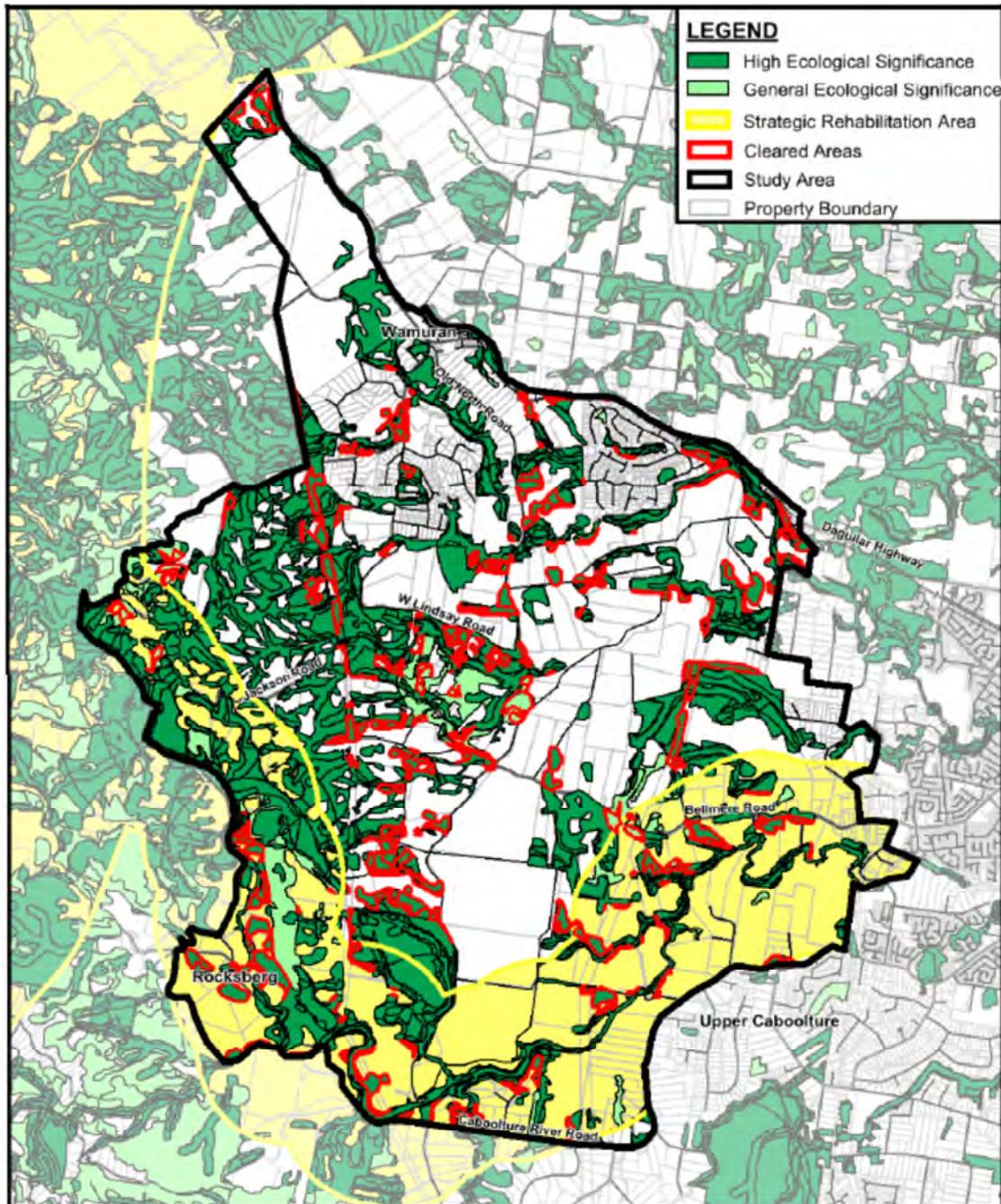


High Value Regrowth, Figure 10 SMEC Caboolture West Environmental Study

4.4. Areas of Ecological Significance

The *Caboolture West Environmental Study* (2013) distilled a range of ecological values into a single map layer of Areas of Ecological Significance (AES). AES mapping was verified based on the verification of all other local and state values mapping. Anomalies in AES mapping are highlighted in Figure 7.

Figure 7 Areas of Ecological Significance



Verification of Areas of Ecological Significance Figure 11 SMEC Caboolture West Environmental Study

4.5. Corridors

Corridors are proposed by the *Caboolture West Environmental Study* (2013) to be established at Caboolture West to improve the viability of the local Koala population and populations of other threatened and priority species at Caboolture West by consolidating and linking habitat patches to allow the exchange of individuals.

Corridors are proposed to recognise waterway health and physical constraints along with linking larger and more proximate habitat areas. Smaller and more distant habitat areas were given lower importance.

Creek lines are likely to be important movement corridors for Koalas and are capable of providing living habitat if sufficiently wide. While the major creek lines often support rainforest vegetation (e.g. RE 12.3.1), eucalypt communities (particularly RE 12.3.11) generally commence from the high bank. Forest Red Gum is an indicator species of RE 12.3.11 and has been identified as an important Koala food tree in many studies (e.g. White 1990; Tucker *et al.* 2007; Callaghan *et al.* 2011). Vegetated buffers along creek lines that capture RE 12.3.11 will be required to provide functional movement habitat for the Koala throughout the study area.

Because corridors are relatively long and narrow, their function can be substantially affected by edge effects. Edge effects can arise for a variety of reasons, including abiotic and biotic effects such as altered micro-climate, altered light levels, weed invasion, inter-specific competition and increased rates of predation (Hilty *et al.* 2006). Abiotic effects (e.g. altered micro-climate and light levels) generally extend up to 50 m into an area of habitat (Murcia 1995). Biotic effects (e.g. weed invasion, inter-specific competition, predation) can penetrate 200 m or more into habitat (e.g. Goldingay and Whelan 1997; Piper and Catterall 2003; Clarke and Oldland 2007), but the influence is not always that extreme (e.g. Goosem 2000). The influence of edge effects decreases with increasing distance from the edge. For example, Recher *et al.* (1987) found that a 250 m wide corridor was sufficient to contain a full complement of forest birds. The intensity of edge effects also tends to decrease over time, suggesting that edge sealing can somewhat ameliorate edge effects (Murcia 1995).

5. Caboolture West Green Network Plan

5.1. Introduction

Plans for Caboolture West seek to improve the current urban expansion approach of dividing up natural and urban lands in which biodiversity protection often results in dysfunctional fragmentation of both natural and urban habitats. This is where urban development is 'squeezed like toothpaste' into the crevices between conservation areas, degrading the natural environment and diminishing the ability of the urban area to function efficiently.

Both natural and urban systems have their own spatial logics. Natural systems have regional ecosystem requirements to ensure their long term viability - such as minimum viable area size, regularisation of remnant vegetation areas to mitigate edge-effects, ability to link and consolidate remnant vegetation, and so on. Sustainable urban areas also have their own spatial logic - to achieve walkable town and neighbourhood centres and reduce car-dependence and promote active and public transport, most land within centre catchments needs to be occupied by urban

development of sufficient densities and continuity to enable exchange, walkability and viability for those centres and the public transport that serves them.

The approach at Caboolture West has been to balance the requirements of biodiversity conservation with the needs of urban sustainability. Also, careful consideration has been given to the enhancement of the regional ecosystem through proposals for offsetting and rehabilitation of environmental corridors. The natural elements have been included as a Green Network Plan (GNP) in the Caboolture West Structure Plan.

5.2. SMEC Caboolture West Environmental Study

The SMEC *Caboolture West Environmental Study* described in Section 4 above formed the foundation for the Caboolture West Green Network Plan together with the proposed MBRC Green Infrastructure Network.

The study proposed corridors to recognise waterway health and physical constraints along with linking larger and more proximate habitat areas for koalas and other priority species.

The *Caboolture West Environmental Study* (2013) identified 121 priority species recorded within the Caboolture West Structure Plan area, including 46 flora and 75 fauna species¹. Of these, 31 are considered to have a moderate to high probability of occurring in the study area.

The study found that the Caboolture West planning area supports an important population of residential and transitory koalas. This population is considered to be widespread across the study area. Known food and habitat trees are prevalent across the area and especially in fragments of remnant and regrowth vegetation and along drainage lines and waterways.

The *Caboolture West Environmental Study* (2013) study found that the potential for Koala population recovery is good through appropriate urban planning to consolidate habitat patches, increase the availability of habitat and the enhancement of habitat connectivity both within the Study Area and with areas of known habitat elsewhere in the region by establishing a corridor network.

5.3. MBRC Green Infrastructure Network

A Green Infrastructure Network (GIN) that has been developed as a component of the draft Strategic Framework for Moreton Bay Regional Council, to be included in Council's new Planning Scheme.

The proposed GIN will comprise natural elements of forests, wetlands, rivers and streams that work together as a whole to sustain ecological values and functions of MBRC. In addition to naturally occurring elements, semi-natural environments and built components (for example wildlife movement infrastructure, stormwater management systems and revegetation projects and designed parklands) contribute to the network by linking natural elements and augmenting or assuming natural ecological processes. Accordingly, the GIN comprises core environmental areas,

¹ MBRC has identified a number of priority fauna and flora which are either present or likely to occur in the MBRC local government area. Species identified include those listed under the NC and EPBC Acts and other, non-threatened species recognised by MBRC as having local and/or regional significance. These latter species are often recognised as a key indicator in the management of particular ecosystems.

managed forests, environmental corridors, grassy fields, urban forests, green engineering, wildlife movement infrastructure, stepping stones, street trees and residential gardens.

The GIN categorises native vegetation as follows:

Table 2- Green Infrastructure Network Native Vegetation Framework

| Native Vegetation | Clearing Intent | Description |
|-------------------|-------------------|--|
| Class 1 | No go | No native vegetation clearance (exemptions apply). <i>Protected areas; Federal, State and locally valued endangered ecosystems & koala bushland. Supported by Coast and Riverlands and Mountain Ranges, Forest and Waterways Place types.</i> |
| Class 2 | Limited go | Avoid native vegetation clearing. Offset unavoidable clearing (net gain). Secured offset required. |
| Class 3 | Go | Clearing does not result in net loss of native vegetation. Achieve through landscaping. Secured offset not required. |
| Class 4 | Go | Vegetation retention = high quality design solutions |

Protection of large habitat trees where possible.

GIN Green Infrastructure Principles are set out in Appendix 1.

5.4. Development of the Caboolture West Green Network Plan

The GIN has been tailored specifically for Caboolture West as the Green Network Plan, having regard to the objectives of the Koala population recovery and biodiversity conservation objectives of the *Caboolture West Environmental Study*.

To balance biodiversity and urban objectives, the GIN and land use plan for Caboolture West have been adjusted through an iterative design process to ensure that both natural and urban systems have their required structure and integrity. The Green Network Plan meets environmental requirements of biodiversity protection, linkage and provision of living habitat requirements of the GIN. For urban systems, Caboolture West is designed as a series of walkable neighbourhoods clustered between the Green Network Plan.

The Vision for the Green Infrastructure Network is:

“A healthy and productive network of natural, semi-natural and engineered green spaces and assets that are valued for what they are, the ecosystem services they provide, and their contribution to regional biodiversity and environmental resilience”.

The Green Network Plan proposes to significantly improve the existing green network by way of consolidating, expanding and rehabilitating currently fragmented patches and corridors into a linked network of patches and corridors that is preserved for environmental purposes including enhancement of koala habitat, biodiversity values and stormwater management.

The Green Network Plan proposes to provide habitat for koalas and other priority species, whilst ensuring that future Caboolture West residents benefit from the many ecosystem services provided by green infrastructure.

The Green Network Plan comprises the “no go” area (Class 1) for urban development from the GIN. These areas may contain limited areas suitable for activities that won’t compromise environmental values. There has been allowance made for sewer systems along the waterways on the basis that the final sewer designs will be adjusted to avoid, to the extent that it is practicable, all significant trees within the sewer corridor.

The Green Network Plan map also includes most areas that future development should avoid or minimise impact (Class 2). Where vegetation clearing is necessary to provide for proper urban structuring to facilitate an optimal urban network, clearing will be allowed to occur subject to the vegetation being offset back into the Green Network. It is anticipated that some vegetated areas will be retained with the detailed planning of the urban area. Otherwise, the Green Network Plan fully offsets the loss of vegetation within the proposed urban area.

The Caboolture West planning area contains a range of natural features including rivers and tributaries, bushland and rainforest fragments, gullies, wetlands and dams. These features were used to identify and develop an environmental areas and corridors network with the objective of conserving and improving the viability of the local koala populations and populations of other threatened and priority species into the future.

Linkages are also proposed through the urban area to provide for fauna movement away from major roads as well as offering other ecosystem services to the future Caboolture West community such as aesthetics and a cooler urban environment. These linkages can connect the various parks and open spaces areas incorporated into the detailed urban design layout.

The green network plan aims to maximise overall population sizes by consolidating habitat into large patches and strategically linking habitat to allow the exchange of individuals. The backbone of the proposed Green Network Plan is a series of corridors that will provide habitat in their own right and link key environmental areas within Caboolture West and between Caboolture West and the wider as follows (refer Figure 8):

1. **Caboolture River:**

- Corridors of State significance at 300m width (which may vary – but must total the equivalent of a consistent 300 metre width)

2. **Wararba Creek:**

- Corridors of State significance at 200m width (which may vary – but must total the equivalent of a consistent 200 metre width)

3. **Secondary Corridors:**

- Caboolture River tributaries, South Wararba Creek at 100m width (which may vary – but must total the equivalent of a consistent 100 metre width)

The major corridors are proposed to be rehabilitated to ensure that these areas are capable of providing suitable habitat for priority species and will provide key linkages in the proposed corridor network as the habitat values in these areas develop. The corridors will link to major patches of regional ecosystems and a terrestrial north-south linkage is proposed to be established along an existing power easement to form an overall Green Network in the eastern portion of the Caboolture West Study Area which is proposed for development. This network will link to the western portion of the study area from Old North Road, ensuring regional linkage to Sheep Station Creek Conservation Park.

Detailed design of Concept Plans for Caboolture West will also include consideration of smaller and more minor linkages for use during dispersal and in the course of movement between patches through developed areas:

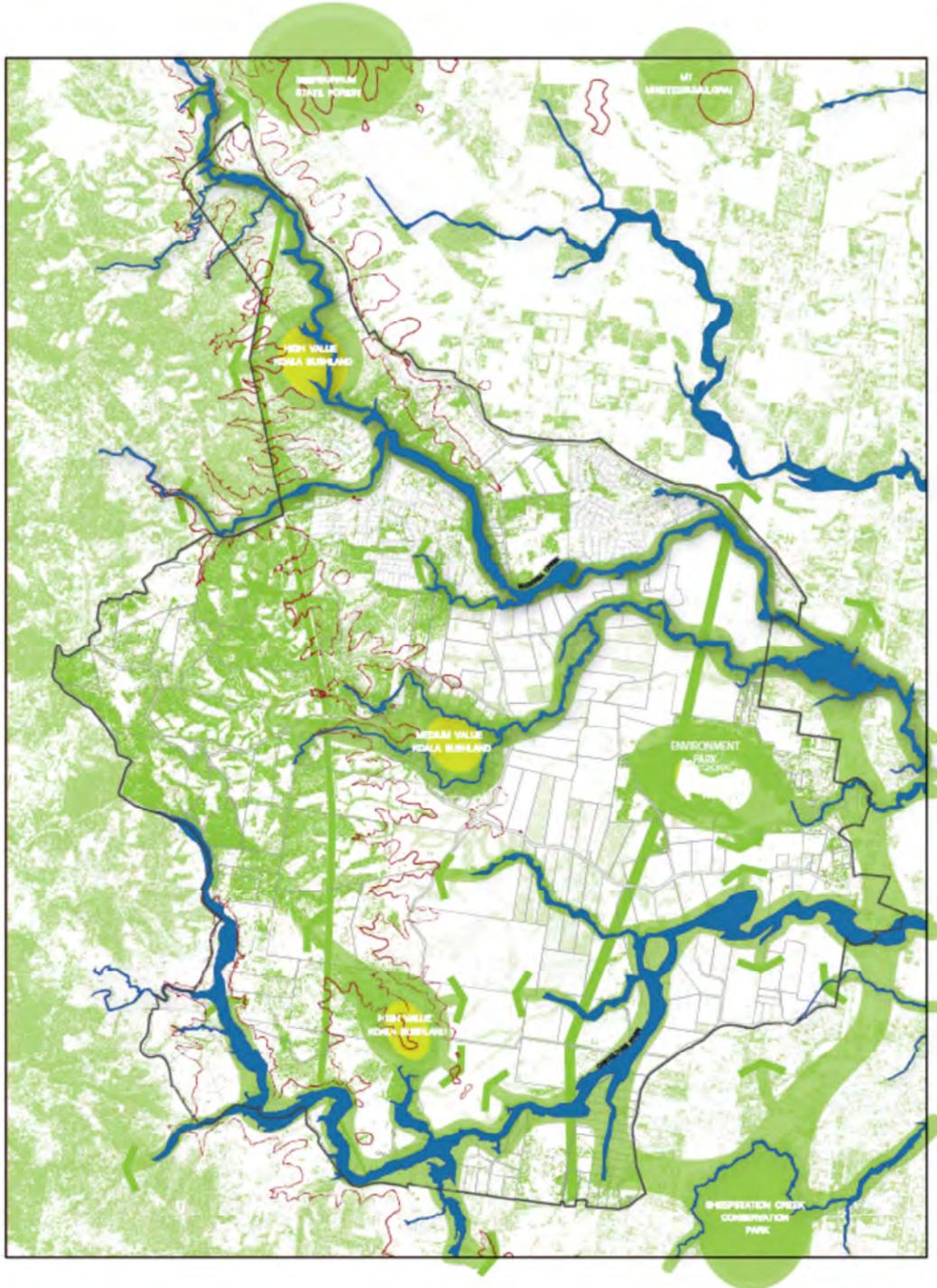
4. **Tertiary corridors**

- Minor drainage lines and watercourses and other constraints, such as priority species habitat not connected to primary or secondary corridors with a minimum 20m width as shown indicatively on Figure 7. They will be included in Local Context Plans as part of the urban design for local areas.

5. **Linkages:**

- Strategic connections between habitat patches to provide north-south linkage between Primary and Secondary corridors, and possible linkages across main thoroughfares, such as Old North Road and Bellmere Road. They will be included in Local Context Plans as part of the urban design for local areas.

Figure 8 Caboolture West Green Infrastructure Vision



Caboolture West Green Infrastructure Vision

Caboolture West Structure Plan's green infrastructure network will be a multi-functional system of natural ecosystems, semi-natural environments augmented with engineered green spaces. The aim of this network is to maintain a healthy natural environment and to support meaningful connections between people and nature – particularly in urban areas. The use of a green infrastructure network approach will provide solutions to avoid or lessen environmental impacts associated with land use change by enhancing urban design to creating a sense of place.

The Green Network Plan supports the Seven Principles of Green Infrastructure Planning in Moreton Bay Region as follows:

| Seven Principles of Green Infrastructure Planning in Moreton Bay Region |
|---|
| <p>1. Linkage</p> <p>Strong connections between green infrastructure components will contribute to a healthy and productive green infrastructure network. Linkage of the green infrastructure network across diverse landscapes including both public and private lands will allow for plant and animal movement between both private and public spaces, assisting with species adaptability and resilience into the future.</p> |
| <p>2. Multi functioning</p> <p>The green infrastructure network will be planned and designed to promote healthy environments that are appropriate to location and setting. There will be a focus on creating highly productive green spaces that retain and promote natural, semi-natural and built environmental assets encouraging a shared use of space. In town centres for example, street trees and vegetated storm water management systems will provide shade and aesthetics to pedestrians, while creating a habitable climate by cooling otherwise hot urban environs. In parkland settings, bushland areas, grassy fields and scattered trees will encourage a connection to nature and provide recreation opportunities for people, while allowing wildlife to move through the area. Environmental corridors and street tree boulevards facilitate movement of animals and seeds.</p> |
| <p>3. Integration</p> <p>Green infrastructure considers and complements other infrastructure types through integration. Environmental impacts can be reduced or reversed by incorporating green infrastructure at design stage. For example, where a planned road upgrade will cause habitat to become fragmented, a wildlife underpass, overpass or substantial street tree linkage may help to maintain habitat connectivity within the green infrastructure network. Planning for a productive and highly functioning green infrastructure network involves consideration of future growth predictions and alignment of the network with long term regional planning responses. Integration ensures a strongly flexible and resilient network. Green infrastructure can be designed to suit the needs of a community - whether highly urbanised or strongly rural.</p> |
| <p>4. Flexible</p> <p>Green infrastructure offers opportunities to strengthen environmental values while supporting development and other associated infrastructure networks. There are many green infrastructure solutions that can be designed into new developments, providing flexible choices appropriate to location and setting. A long-term approach is used for the green infrastructure network to ensure that as development occurs across the landscape, the balance and integrity of the green</p> |

infrastructure network is maintained. Green infrastructure will be included as part of development design to ensure linkage across the landscape, and where environmental impacts such as vegetation clearing occurs we will seek to counterbalance the impact by replacing the vegetation in other areas in the region.

5. Diversity

The diverse natural landscapes of the region support an amazing variety of plants and animals and habitats. Maintaining and improving biodiversity increases the health of the environment.

The green infrastructure network contains unique environmental assets of national, state, regional and important local significance. These environmental resources have value beyond their direct use, including aesthetic values which increase community wellbeing and connectedness to nature.

6. Sustainability

Sustainability is arguably the central planning and management concept of our time. Our environment is changing with a swiftness not seen in previous generations. Rapid environmental change presents tremendous uncertainty for ecological communities and natural systems and the plants and animals that inhabit them. Green infrastructure will provide short and long term solutions that are locally focused and innovative.

Sustainability is most effective when it is not an end in itself, rather when it becomes a pathway to maintaining and enhancing healthy and productive environments.

7. Evidence-based

For the Moreton Bay region, green infrastructure components are identified and valued using scientific data that is authenticated through remote sensing, field monitoring and ground-truthing against predetermined criteria such as ecological value and consideration of future land use intent. This process provides a higher degree of certainty for development to occur and for green infrastructure to be integrated as part of the design of development.

5.5.Green Infrastructure Offset Strategy

The Green Network Plan links existing vegetation through proposed corridors to protect viable remnant vegetation containing essential habitat comprising endangered regional ecosystems within the Caboolture West urban development area. The objective of Koala protection for Caboolture West is to provide for a net increase in the amount of Koala habitat, resulting in an improvement in the viability of Koala populations.

The following corridors are to be delivered across the Caboolture West Structure Plan:

1. **Caboolture River:** Corridors of State significance 300m width
2. **Wararba Creek:** Corridors of State significance 200m width
3. **Secondary Corridors:** Caboolture River tributaries, South Wararba Creek 100m width

The establishment of new habitat within corridors will be established through waterway revegetation for stormwater quality management and through offsetting the impact of loss of vegetation in other parts of the Caboolture West Structure Plan area.

This will enable consolidated development layouts and maximise the values of retained and established habitat areas by increasing habitat area and the strategic linking of habitat.

Smaller and/or more distant habitat areas and other minor linkages will be achieved the normal design and development process:

Habitat offsets are proposed to be used to mitigate the potential loss of habitat associated with proposed development within the Caboolture West urban development area, rather than assign them to the wider regional area. The green network within Caboolture West will be delivered in this way.

Offsets will apply where urban development impacts on land identified and mapped for the following purposes:

1. Areas of Ecological Significance (Figure 7)
 - High
 - General
2. Koala Habitat (Figure 3)
 - High value bushland
 - Medium value bushland

An offset framework has been developed to ensure that there is no net loss of Essential Habitat and to ensure an appropriate contribution is made towards the achievement of a net gain in Koala Habitat in the Caboolture West Structure Plan area.

An obligation to offset arises where development will result in the clearing of remnant vegetation containing Areas of Ecological Significance and Koala Habitat. The offset-framework recognises the worth of rehabilitating existing regional ecosystems and koala habitat in the proposed Green Network Corridors and follows the ULDA Guideline 17 Remnant Vegetation and Koala Habitat Obligations in Greater Flagstone and Yarrabilba UDA's for other offsets in the corridors.

The proposed Green Network Corridor approach gives priority to the restoration of existing Areas of Ecological Significance within the Green Network Corridors, including partial revegetation and the establishment of new vegetation where required. The protection, upgrading and establishment of new habitat within corridors will offset the impact of loss of vegetation in other parts of the Study Area. The use of offsets within the corridors will increase patch size, provide more regular patch boundaries (decreasing edge to core ratios) and provide strategic linkages between habitat patches. This will deliver an overall conservation outcome through increased habitat area, strategically linked habitat areas as well as facilitating a consolidated urban development area.

An additional contribution to the rehabilitation of the corridors will be made through revegetation for stormwater quality management. Also, land within the corridors will be available for nutrient offsets, should they be required by Unity Water.

Offset requirements are proposed as:

1. Areas of Ecological Significance @ 4:1 (hectares)
2. Koala Habitat @ 5:1 (NJKHT)

Statutory protection will be provided through the inclusion of the Green Network Corridors as a Green Network Precinct in the Caboolture West Local Plan of the new Moreton Bay Planning Scheme. A Green Network Precinct Code will provide for the protection and management of land by facilitating consolidation and rehabilitation of fragmented land, and create a strong and connected network of quality environmental landscape areas through development offsetting.

It is proposed that the offset scheme will operate through Moreton Bay Regional Council as the offset provider for the on-going protection and rehabilitation of the green network corridors. A green infrastructure charge would form a component of the anticipated infrastructure charges for Caboolture West. MBRC's role will provide the offset scheme with necessary administrative and technical support for long term ecological conservation and rehabilitation.

Following inclusion of Caboolture West in the Moreton Bay Planning Scheme, a management plan will be prepared that includes:

- management objectives and outcomes
- a program of activities
- a monitoring and reporting program
- an appraisal of estimated costs and expenses for the expected life of the offset.

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