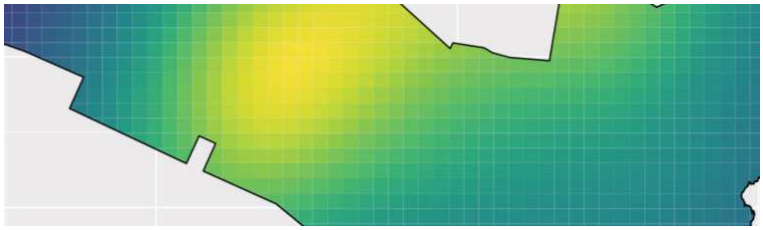
Biota Environmental Sciences

Albany Heritage Park Link Trail: Western Ringtail Possum Impact Assessment



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Albany Heritage Park Link Trail WRP Impact Assessment

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1.0 Executive Summary

Albany Heritage Park (comprising Mount Clarence and Mount Adelaide) is located in the City of Albany, on the south coast of Western Australia approximately 390 km southeast of Perth. The Critically Endangered Western Ringtail Possum (*Pseudocheirus occidentalis*) is known to occur throughout the Albany Heritage Park, with recent assessment indicating an average density of 4.13 possums per hectare, for an estimated population of approximately 1,100 individuals in the park (Biota 2019).

The City of Albany is proposing to upgrade and extend the walking and mountain biking trail network within the Albany Heritage Park, as outlined in *Albany Heritage Park Trail Network Concept Plan* (Common Ground Trails 2015). This development will involve upgrading 13,572 m of existing trail and the development of 25,398 m of new trail within the park. The Albany Heritage Park Link Trail will add approximately 5.8 km of new mountain bike and/or walking trail within the Albany Heritage Park. The City engaged Biota Environmental Sciences (Biota) to undertake an assessment of impacts on Western Ringtail Possums from the development, and provide management recommendations.

Potential impacts on Western Ringtail Possums from the proposed development include:

- loss of habitat through clearing;
- fragmentation of existing habitat through loss of habitat connectivity;
- death or injury during clearing activities;
- increased exposure to predation by foxes and cats;
- indirect loss of habitat through edge effects on the margins of cleared areas;
- death or injury due to bicycle strike when crossing paths; and
- behavioural modification from increased human disturbance.

We consider that these potential impacts are unlikely to have a significant effect on Western Ringtail Possums within the Albany Heritage Park, primarily because the proposed action covers only a small proportion of the park's total area, and also considering that the park sustains a relatively high density of Western Ringtail Possums despite the presence of considerable pre-existing road, infrastructure, firebreak and trail networks throughout the park.

Any potential impacts can be further mitigated by the following actions, a number of which have already been proposed by the City of Albany, including:

- minimise the clearing of native vegetation to the extent practicable;
- retain canopy connectivity over newly cleared areas as much as possible;
- avoid clearing larger trees, particularly those with hollows;
- excluding heavy plant from the works and only undertake clearing manually or using small machinery;
- community education regarding the status of the Western Ringtail Possum on the mounts; and
- investigate alternative measures to improve connectivity for the species should canopy connectivity be reduced.

This assessment concludes that minimal impact will occur to Western Ringtail Possums in the park, and that statistically effective monitoring is impractical because of the small area to be impacted. However, an overall population assessment, initially conducted every two years, would be valuable in assessing any possible cumulative impacts of the development with existing developments and usage within the park.

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2.0 Background

2.1 The Proposal

The Albany Heritage Park (comprising Mount Clarence and Mount Adelaide) is located in the City of Albany, on the south coast of Western Australia. The park covers approximately 260 ha and is bounded by Albany city centre, Middleton Beach, Princess Royal Harbour and King George Sound. The park is underlain by porphyritic granite and felsic gneiss (Fitzsimons and Buchan 2005), which have resisted erosion and formed the characteristic mounts seen today. The vegetation in the western and central areas of the park is dominated by jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) woodland, interspersed with other species such as sheoak (*Allocasuarina fraseriana*), peppermint (*Agonis flexuosa*) and *Eucalyptus staeri* (Figure 2.1). Areas of shrubland and thickets of *Hakea*, *Gastrolobium* and *Spyridium* are patchily distributed on shallow soils surrounding exposed granite through the centre of the park, and also in the eastern coastal section (Figure 2.1). Cleared grass and parklands, and a variety of infrastructure are also present, including the National ANZAC Centre.

The City of Albany is proposing to upgrade and extend the walking and mountain biking trail network within the Albany Heritage Park (AHP), as outlined in *Albany Heritage Park Trail Network Concept Plan* (Common Ground Trails 2015). The park is traversed by a number of roads (totalling 15.5 km) and existing walking, mountain bike and firebreak trails (totalling 33.0 km). The new AHP Trail Network Concept Plan includes the addition of a 6.5 km Link Trail, which is the subject of this assessment (Figure 2.2). When a clearing buffer of 2.8 m is applied, the Link Trail development is 1.631 ha, or approximately 0.61% of the Albany Heritage Park's total area of 266.3 ha.

The proposed development of new trails will involve clearing of native vegetation by hand or with small machines. Clearing activities will involve the removal of all vegetation (including most roots) and the topsoil from trail alignments, and relocation of granite boulders (Common Ground Trails 2015). The width of the proposed clearing varies depending on the type of trail, with the majority of trails having a proposed footprint width of <1.8 m (Common Ground Trails 2015).

2.2 Scope of Work

The City of Albany commissioned Biota Environmental Sciences (Biota) to undertake an impact assessment and provide management recommendations with regard to the Western Ringtail Possum (*Pseudocheirus occidentalis*), which is known to occur in the Albany Heritage Park. This report is intended for use as a supporting document to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral of the Albany Heritage Park Trail Network Concept Plan.

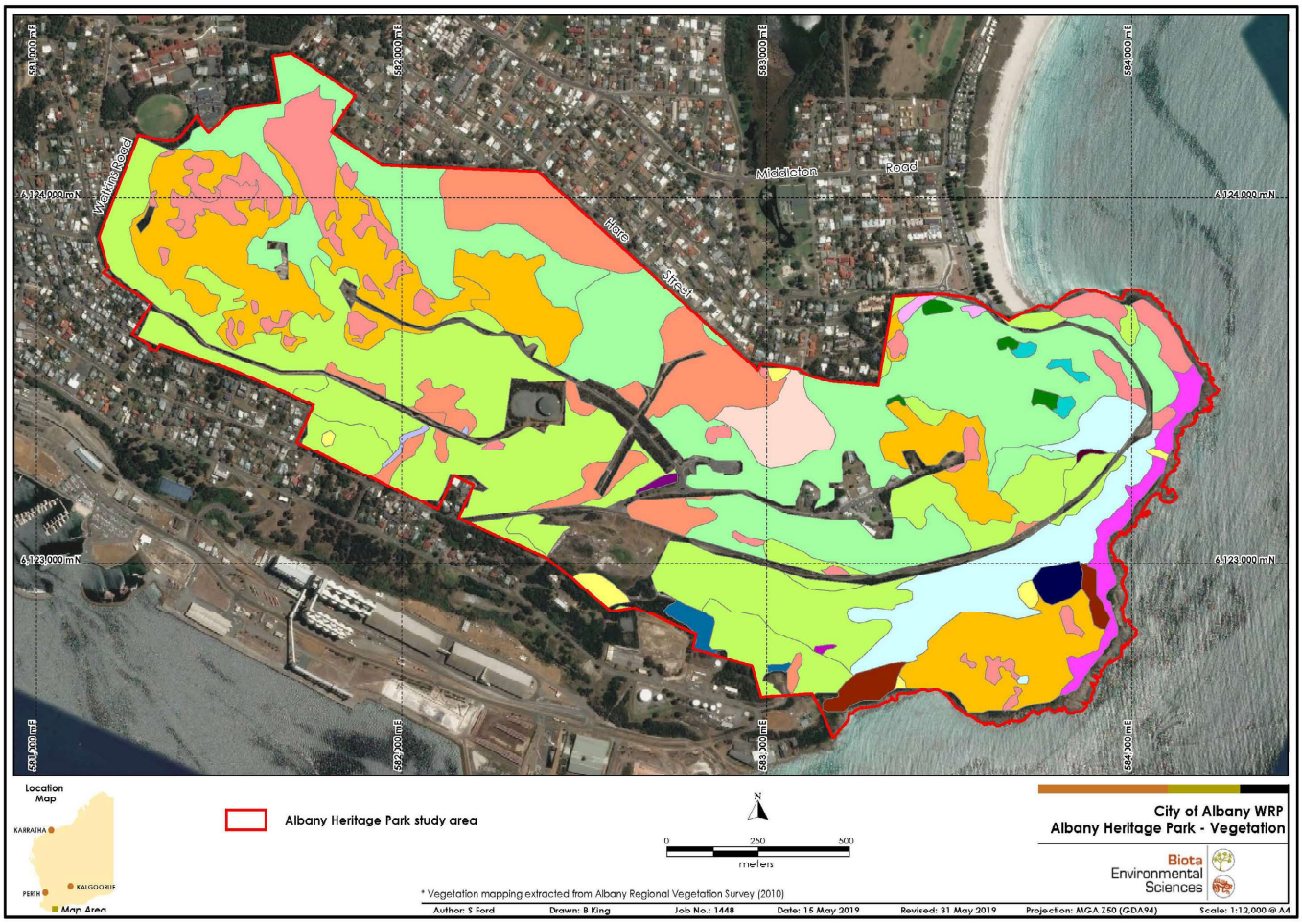
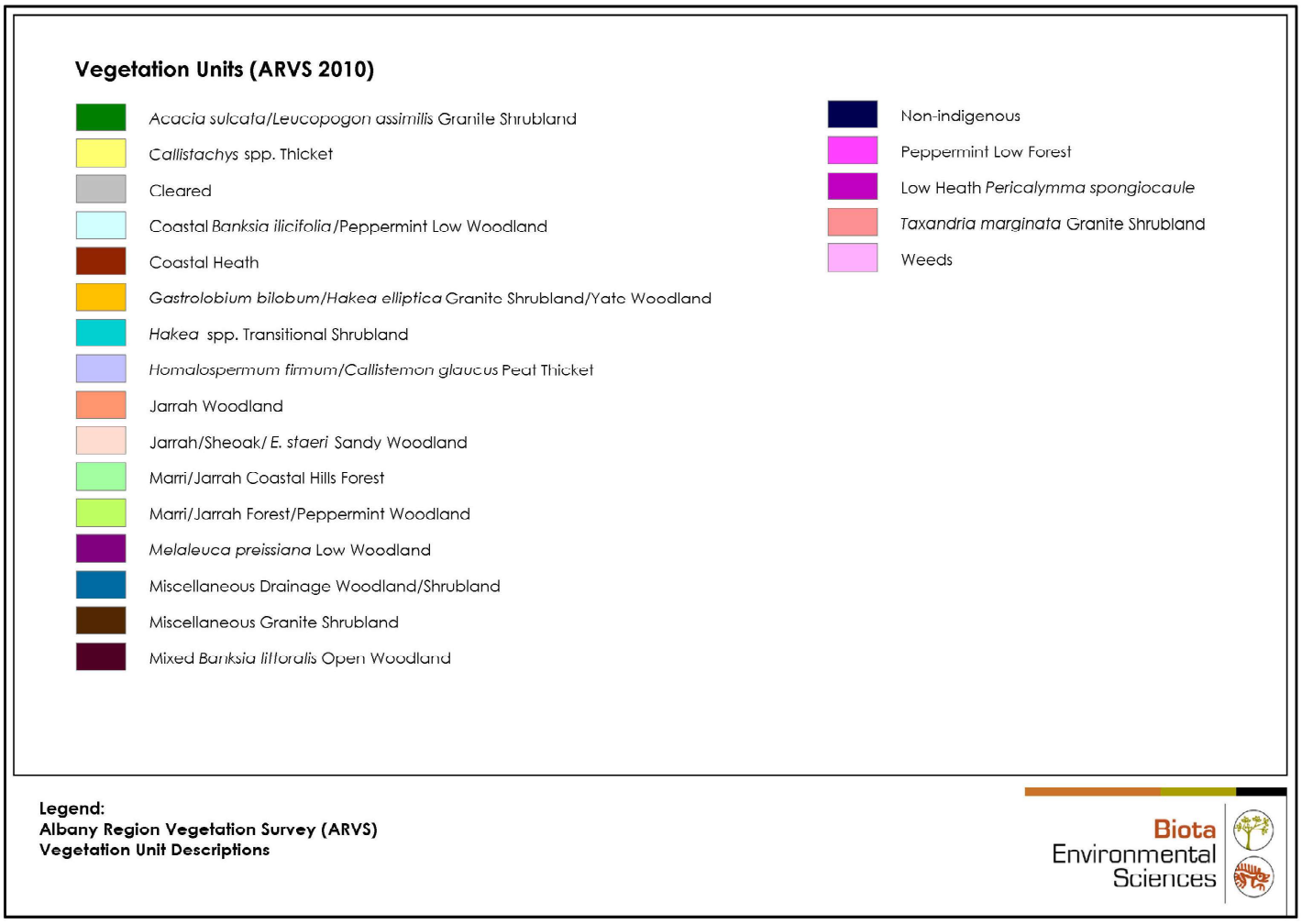


Figure 2.1: Vegetation mapping of the study area, based on Sandiford and Barrett (2010).


Vegetation Units (ARVS 2010)
Acacia sulcata/Leucopogon assimilis Granite Shrubland
Callistachys spp. Thicket
Cleared
Coastal Banksia ilicifolia/Peppermint Low Woodland
Coastal Heath
Gastrolobium bilobum/Hakea elliptica Granite Shrubland/Yate Woodland
Hakea spp. Transitional Shrubland
Homalospermum firmum/Callistemon glaucus Peat Thicket
Jarrah Woodland
Jarrah/Sheoak/ E. staeri Sandy Woodland
Marri/Jarrah Coastal Hills Forest
Marri/Jarrah Forest/Peppermint Woodland
Melaleuca preissiana Low Woodland
Miscellaneous Drainage Woodland/Shrubland
Miscellaneous Granite Shrubland
Mixed Banksia littoralis Open Woodland
Non-indigenous
Peppermint Low Forest
Low Heath Pericalymma spongiocaule
Taxandria marginata Granite Shrubland
Weeds
Legend:
Albany Region Vegetation Survey (ARVS)
Vegetation Unit Descriptions
Biota
Environmental
Sciences

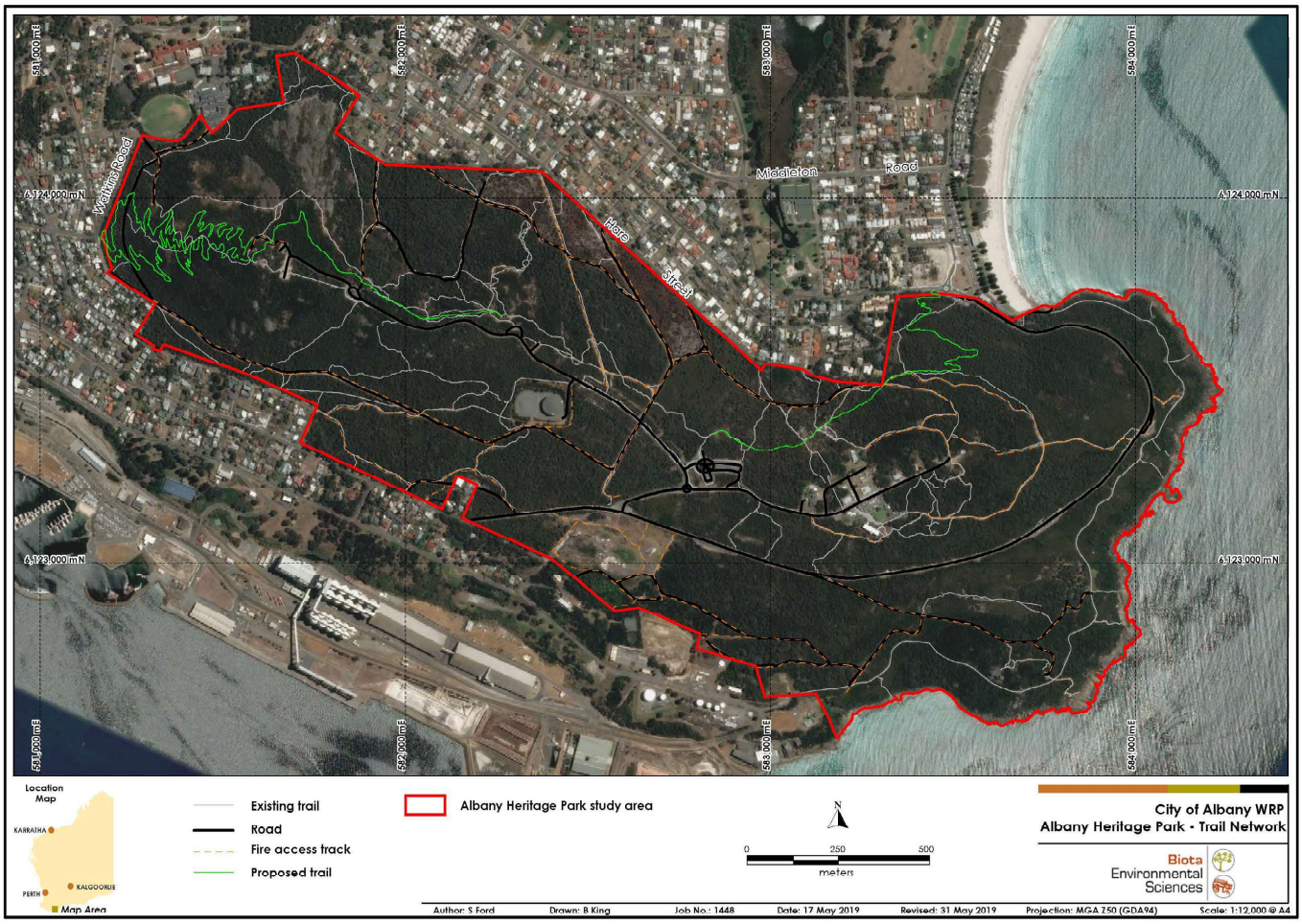


Figure 2.2 **Existing roads and trails within the Albany Heritage Park together with proposed trail.**

2.3 Western Ringtail Possum

The Western Ringtail Possum (*Pseudocheirus occidentalis*) is listed as Critically Endangered under the following legislation:

- EPBC Act (Commonwealth); and,
- *Biodiversity Conservation Act 2016* (State), which has superseded the *Wildlife Conservation Act 1950*.

The Western Ringtail Possum is a nocturnal marsupial found in the wetter forests and woodlands of south-western Western Australia. It is predominantly arboreal, and feeds primarily on the leaves of Peppermint (*Agonis flexuosa*), Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*). During the day, Western Ringtail Possums shelter in 'dreys', a constructed platform of dense vegetation, or within the hollows of trees. The species is patchily distributed coastally from the southern Swan Coastal Plain to the Albany region, and inland in the forests of the Upper Warren region near Manjimup (Woinarski et al. 2014).

Primary threats to the species are a drying climate and increased extreme weather events as a result of climate change, inappropriate fire regimes, habitat loss and fragmentation, logging, and predation by introduced cats and foxes (Woinarski et al. 2014, Department of Parks and Wildlife 2017). As a result of these threatening processes, several authors have posited that Western Ringtail Possum populations have declined markedly in recent decades, with a decline of >95 % reported from the Upper Warren region, and an inferred population-wide decline of >80 % (Wayne et al. 2012, Woinarski et al. 2014). Consequently, the species is now listed as Critically Endangered at both state and federal level with a published estimate of only 3,400 adult individuals across the species' range (TSSC 2018).

Recent intensive survey work throughout much of the species' range has produced a population estimate of at least 18,500 individuals in the areas surveyed (Biota in prep.). This estimate is conservative, as it does not include unsurveyed forest and woodland areas, nor does it account for individuals in urban, peri-urban and agricultural areas. This survey work included the Albany Mounts (Biota 2019).

Western Ringtail Possums are known to occur throughout the Albany Heritage Park. A recent assessment of the Western Ringtail Possum population in the park was undertaken using a distance-sampling approach covering the extent of the park. A total of 96 observations (113 individual possums) was obtained from 17.3 km of transects walked (Figure 2.3). This indicated an average density of 4.13 possums per hectare and an estimated population of 1,100 ± 423 individuals in the park (Biota 2019). An earlier estimate obtained through distance sampling with more limited coverage, undertaken by Oyster Harbour Catchment Group and analysed by Biota, produced a population estimate of 767 individuals in the park (Biota 2018).

The application of density surface modelling to the observation data indicated that the averaged density quoted above was not uniform throughout the park, with the greatest densities (> 5 individuals per hectare) occurring in the central section of the park (Figure 2.4). Densities in the eastern part of the park are approximately 4 individuals per hectare, while densities are lowest in the western portion of the park and fall below 3 individuals per hectare in the far west.

The density estimates of Western Ringtail Possums in the Albany Heritage Park were comparable to those recently obtained in traditionally recognised strongholds for the species such as Tuart Forest National Park (Ludlow State Forest) east of Busselton (Biota in prep.). This indicates that the Albany Heritage Park contains high quality habitat for Western Ringtail Possums, particularly in the central and eastern sectors of the parks where the higher densities of possums were recorded. The density estimates for the park were also quite high compared to most areas surveyed in the Albany region, though similar densities were recorded in the City of Albany reserves in Walmsley (Biota in prep.).

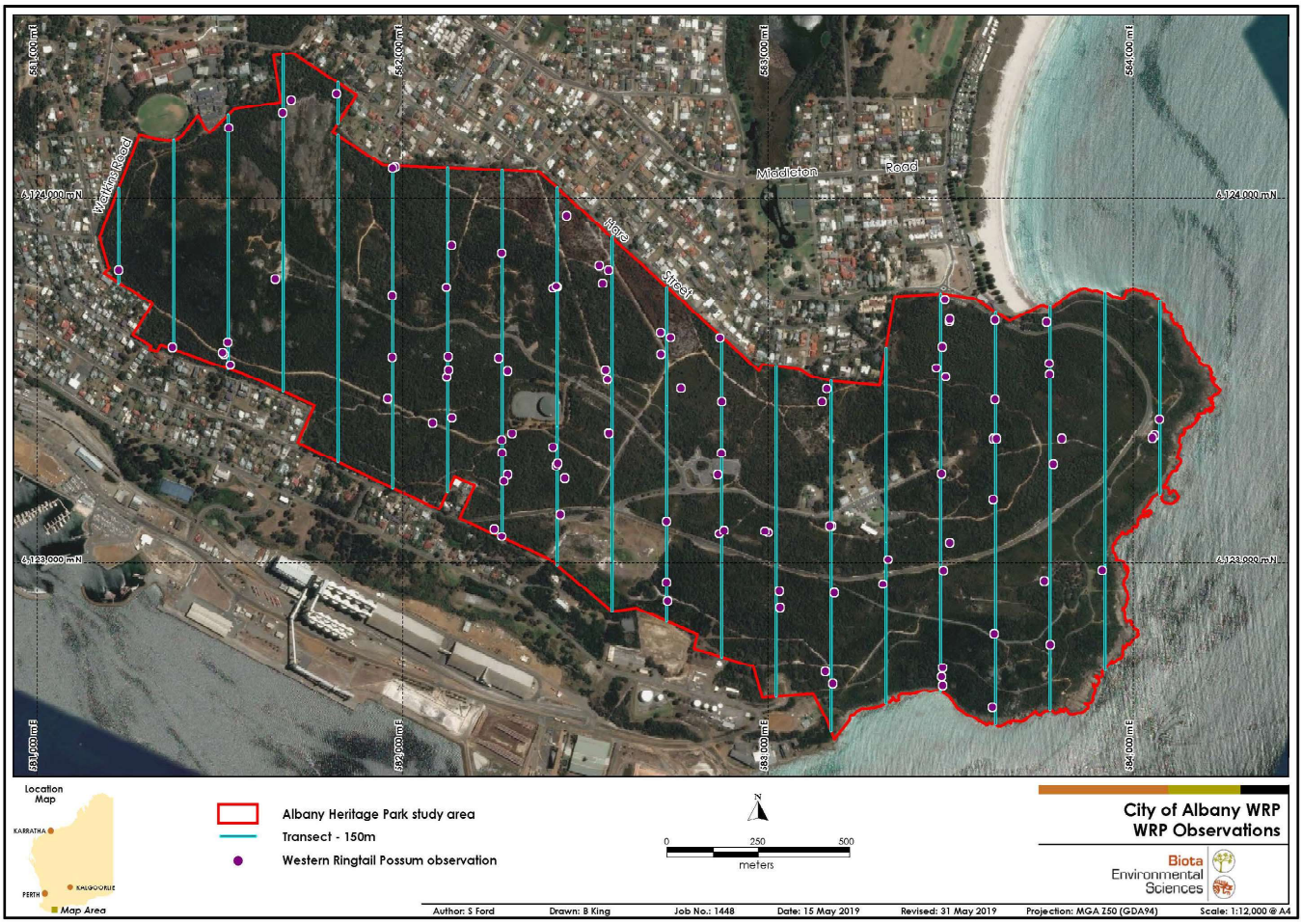


Figure 2.3: Distance sampling transect locations and Western Ringtail Possum observations.

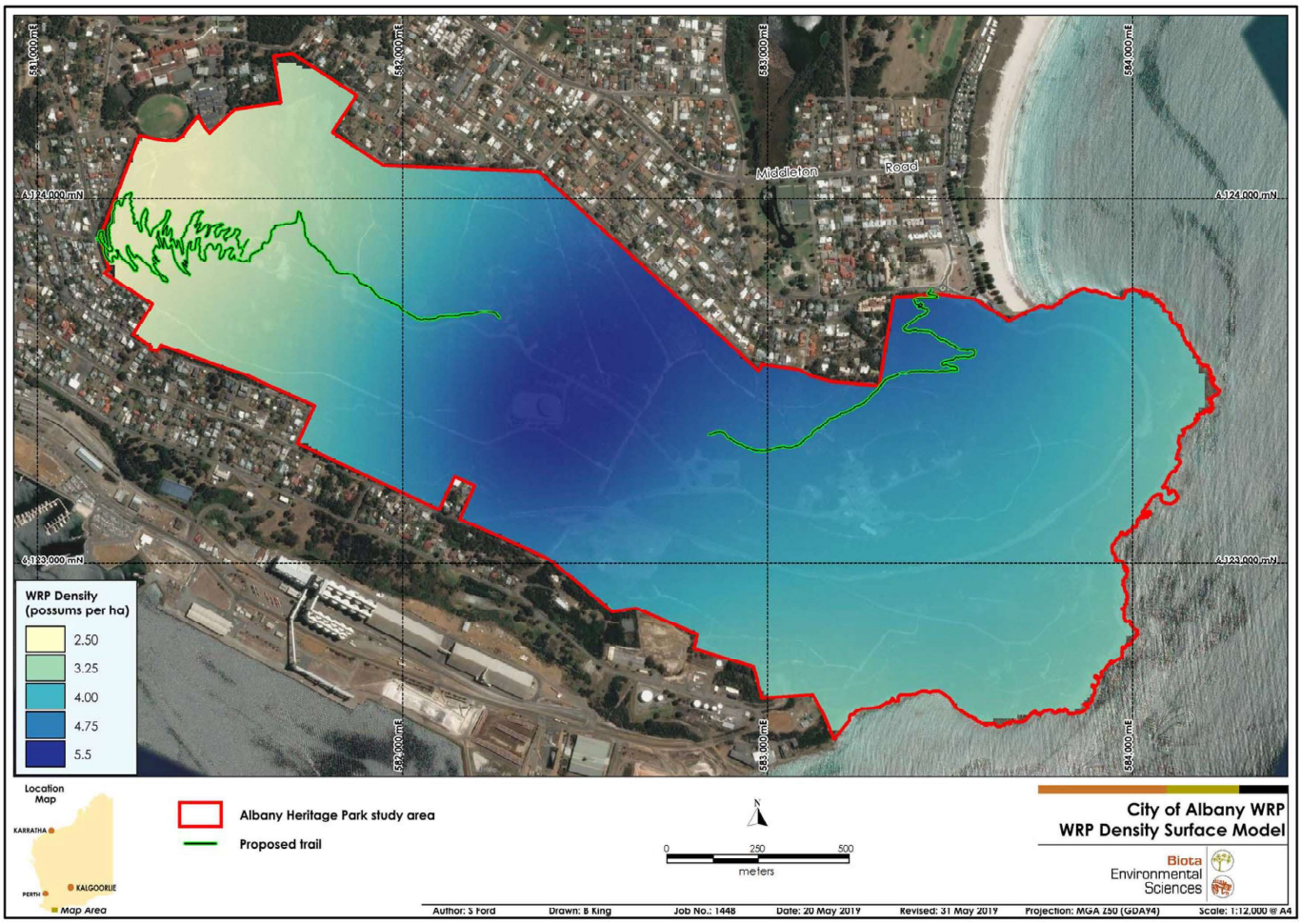


Figure 2.4: **Density surface model for Western Ringtail Possums in Albany Heritage Park (Biota 2019). Darker is higher density.**

The total number of Western Ringtail Possums within some areas of the Albany region studied recently by Biota was estimated at 1,781 (1,470—2,158) individuals (Biota in prep.). Hence, the population estimate of an additional 1,100 individuals within the Albany Heritage Park represents a significant increase to the total population estimate determined for the region to date. Note that these estimates do not include urban areas, unsurveyed reserves and National Parks, urban or peri-urban bushland remnants (such as the margins of Lake Seppings), so the true regional population is expected to be considerably greater.

Table 2.1: Comparison of density and population estimates for the Albany region (Biota in prep., 2019)

Site	Density estimate (possums/ha)	Population estimate
Albany Heritage Park	4.13	1,100
Bakers Junction	0.48	401
Down Road Nature Reserve	0.66	241
Gull Rock Nature Reserve*	0.06*	23*
Mill Brook Nature Reserve*	0.13*	195*
Mount Melville	2.45	238
Walmsley East	2.05	361
Walmsley West	3.62	583

* Limited sampling

Habitat critical to the survival of the species has not been clearly defined for the south-coast region, and as a result the Recovery Plan for the species indicates that all remnant habitat should be considered important (Department of Parks and Wildlife 2017). Hence, the entirety of the Albany Heritage Park is considered to be important Western Ringtail Possum habitat.

2.4 Impact Assessment Guidelines and their Application

The Western Ringtail Possum is a Matter of National Environmental Significance (MNES) species and as such we have referred to the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE 2013) in the assessment of potential impacts in this report. This guideline defines impacts to Critically Endangered species as significant as follows:

> *"An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:*
> - *lead to a long-term decrease in the size of a population*
> - *reduce the area of occupancy of the species*
> - *fragment an existing population into two or more populations*
> - *adversely affect habitat critical to the survival of a species*
> - *disrupt the breeding cycle of a population*
> - *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*
> - *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*
> - *introduce disease that may cause the species to decline, or*
> - *interfere with the recovery of the species."*

There is no specific guidance on defining significant impacts for Western Ringtail Possum in the Albany region, but we have referred to the *Significant Impact Guidelines for the Vulnerable Western Ringtail Possum (*Pseudocheirus occidentalis*) in the Southern Swan Coastal Plain* (DEWHA 2009) for guidance in preparing this assessment. That policy statement, and the guidelines for assessing significant impacts on Western Ringtail Possums contained therein, apply "*only to actions and impacts on the Western Ringtail Possum in the southern Swan Coastal Plain between Bunbury and Dunsborough*" (DEWHA 2009, pg. 1). As such, we have only used the information contained in that latter document for general guidance on potential impacts and management actions, and have primarily made an assessment against the significant impact criteria for Critically Endangered species contained in the MNES Significant Impact Guidelines (DoE 2013).

Potential impacts on Western Ringtail Possum by the proposed activities have been assessed based on the information regarding the proposed activities provided by the proponent, existing knowledge of habitat requirements, behaviour of and threats to the Western Ringtail Possum, an assessment of the habitat along the proposed Heritage Link Trail, a statistically-robust population estimate of the Albany Heritage Park (Biota 2019) and contextual population information from recent work across the species' range (Biota in prep.).

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3.0 Potential Impacts and Mitigation

Most potential impacts arise from clearing of vegetation, and these are dealt with first. Other less direct impacts such as mortality arising from increased predation and disturbance through trail use are dealt with subsequently. A summary of all potential impacts is presented in Table 3.1 at the end of the section.

3.1 Habitat Clearing

3.1.1 Potential Impact

Habitat loss is a primary threatening processes for the Western Ringtail Possum (Department of Parks and Wildlife 2017). A visual assessment of habitat along the proposed trail alignments indicated that suitable habitat occurred along the full lengths of the proposed trails, with the exception of some small areas of exposed granite with sparse low shrubs. The density surface model for the park indicates that large sections of the proposed track occur in the lower density western section of the park (Figure 2.4), though it should be noted that the estimated densities in this area are still in excess of two possums per hectare, which is relatively high in a broader regional context (Biota in prep.).

The total length of the proposed Albany Heritage Park Link trail is 6.6 km. When a clearing buffer of 2.8 m is applied, the Albany Link Park trail development will result in the clearing of 1.631 ha of potential Western Ringtail Possum habitat. Based on the recent survey of the Albany Heritage Park (Biota 2019), in which an average density of 4.13 Western Ringtail Possums per hectare was calculated, the clearing of habitat is expected to impact fewer than seven individual possums.

3.1.2 Mitigation

The completed trails are anticipated to have a footprint width of <1.8 m (Common Ground Trails 2015). The City of Albany aims to minimise vegetation clearing through trail design and construction methods employed. This includes the avoidance of trees over 10 m wherever possible. This will retain habitat for the Western Ringtail Possum, and also minimise the creation of breaks in the existing canopy cover. Impact of works on adjacent vegetation will be also be minimised by removing cleared vegetation and spoil from the site, rather than leaving it in situ. A rehabilitation plan for the Albany Heritage Park is being developed by the City's Reserves team, and will include the closure and rehabilitation of trails that are surplus to needs (i.e. are not included in the Concept Plan or are not fire access tracks).

3.1.3 Outcome

The small number of individual possums estimated to be affected by habitat clearing (<7) is insignificant relative to the total estimated population of 1,100 individuals within the park. Rehabilitation of existing cleared areas is likely to increase the native vegetation area with the Albany Heritage Park, directly offsetting any clearing associated with the development of the Albany Heritage Park Link trail. The impacts of the habitat clearing on the Western Ringtail Possum therefore do not appear to be significant (Section 4.0).

3.2 Direct Mortality

3.2.1 Potential Impact

There is the potential for possums to be killed or injured directly in the process of clearing vegetation. This would most likely occur if they were occupying a drey or hollow at the time of clearing, and did not move away during construction. This can occur when an individual feels threatened, and remains in a location it perceives to be safest. As discussed above, an estimate of fewer than seven individual possums are likely to inhabit the construction areas for the trail and this represents the maximum predicted number of individuals that could be directly impacted.

3.2.2 Mitigation

The number of individual possums estimated to be affected by clearing is small (seven individuals, or 0.64% of the estimated total population within the Albany Heritage Park). The City of Albany has proposed to avoid direct impact to possums through the following means:

- vegetation will be disturbed/shaken before clearing in an effort to disperse any possums that could be injured during clearing works;
- trail alignments will avoid all possum dreys; and
- clearing will be undertaken by hand or small machinery.

3.2.3 Outcome

Given the small number of individuals anticipated to be present in the areas to be cleared, and the mitigation measures proposed by the City of Albany, it is unlikely that any Western Ringtail Possums will be directly impacted by construction of the Albany Heritage Park Link trail.

3.3 Fragmentation

3.3.1 Potential Impact

Fragmentation of habitat has been identified as a key threatening process for the Western Ringtail Possum (Woinarski et al. 2014) as it increases the risk of predation, particularly in cases where canopy connectivity is broken as possums are more vulnerable to introduced predators when on the ground. Fragmentation of habitat also reduces the ability of individuals to recolonise areas after stochastic events, and may reduce gene flow between populations.

3.3.2 Mitigation

The City of Albany has proposed to reduce clearing of vegetation through careful trail design and construction works. In most cases, no trees over 10 cm diameter will be removed. This will maximise the retention of habitat for the Western Ringtail Possum, and also minimise the creation of breaks in the existing canopy cover. The majority of trails to be cleared are expected to have a footprint of <1.8 m (Common Ground Trails 2015). Canopy connectivity is not expected to be significantly affected by the proposed actions as the proposed tracks have been designed to be sufficiently narrow that arboreal fauna such as possums will be able to move across them in the canopy (Common Ground Trails 2015). These actions will reduce the potential of a barrier to movement of possums. It should also be noted that the existing tree canopy is also not naturally closed in some areas of the park, and possums have been observed crossing cleared paths.

3.3.3 Outcome

The trail footprint is anticipated to be less than 1.8 m wide (Common Ground Trails 2015). In some habitats in which Western Ringtail Possums were recorded during a recent study (Biota 2019), the natural distance between trees with canopy suitable for the species was considerably greater

than 1.8 m. The proposed length of the new trail (6.6 km) should also be considered in the context of the existing environment, which has a complex network of 15.5 km of sealed roads and 33.0 km of existing trails (for a total of 48.5 km), as well as disturbed areas. Despite these historical disturbances, and the existing environment having a high average density of potential barriers (approximately 182 m of road or trail per hectare), the park still supports a relatively high density of Western Ringtail Possums. It follows that there is no evidence that a narrow trail such as that currently proposed would present a barrier to the movement of possums.

3.4 Degradation

3.4.1 Potential Impact

The area of habitat impacted by the proposed development could extend beyond the directly cleared areas if habitat bordering the cleared trails becomes degraded through gradual trampling by trail users, ongoing track maintenance, increased run-off and erosion, and/or introduction of disease (such as *Phytophthora* dieback) and weeds. The Link Trail has been assessed for dieback as either uninterpretable or infested, with those uninterpretable areas most likely infested (Great Southern Bio Logic 2018).

The edge perimeter of existing clearing within the park (assuming roads and trails represent two edges, and cleared areas a single bounding edge) is 78.6 km (or 295 m of edge per hectare on average), not including edges of illegal trails. The development of the Albany Heritage Park Link trail would add a further 13.2 km of edges within the park, an increase of 16.8% on the existing potential edge impacts.

3.4.2 Mitigation

The City of Albany (in prep.) will implement mitigation measures to avoid the spread of *Phytophthora* dieback during construction of the trail, which will include:

- all machinery and equipment will be clean upon entry to the project area, to minimise the risk of introducing diseases or weeds to the project area.
- all machinery and equipment will be cleaned before moving from one site to another within the project area, to reduce the risk of spreading disease and weeds within the Albany Heritage Park.
- all machinery and equipment will be clean upon exiting from the project area, to avoid spreading disease or weeds to areas outside of the project area;
- low-risk dieback material will be used in areas of dieback free or uninterpretable vegetation; and,
- include trail features that will shake dirt from mountain bikes before entering uninterpretable areas.

Because much of the Albany Heritage Park is already infested by dieback, most emphasis will be on reducing the spread of dieback to uninterpretable areas, and to external locations. Additionally, once trails are built, they will be monitored for any erosion or weed encroachments. Finally, conditions are placed on organisers of events to ensure that spectators do not impact adjacent vegetation.

3.4.3 Outcome

The Albany Heritage Park has been classified as either dieback infested or uninterpretable (but likely to be infested)(Great Southern Bio Logic 2018). With strict controls suchs as those committed to by the City of Albany the risk of dieback spread to areas of the trail occurring in uninterpretable zones within the Albany Heritage Park is considered to be low. The City of Albany has also proposed monitoring of new trails for weeds, erosion and trail widening or misuse post-construction, to allow for corrective action if required. This would further mitigate degradation of vegetation adjacent to the trails.

3.5 Collision

3.5.1 Potential Impact

Loss of canopy connectivity, and the requirement to cross cleared trails, may result in the increased risk of collision with trail users, almost exclusively limited to mountain bikes.

Western Ringtail Possums are known to come to the ground to move between suitable vegetation, at least over short distances, and were observed on the ground on roads and trails during the recent surveys in the park . They are susceptible to vehicle strike when crossing roads. This suggests that the species may also be susceptible to collision with mountain bikes being used on the proposed trails. Most trail use is expected to be during the daytime, but nocturnal use (when possums are active) should not be discounted, as we observed five mountain bike riders using the trails at night time during the recent survey.

3.5.2 Mitigation

Most mountain bike activity is likely to occur during the daytime, when Western Ringtail Possums are not active, and are sheltering. Some nocturnal mountain biking should be anticipated, however. In this case, informative signs advising night-time users of the potential for possums to be on the ground, on the trails, and to be vigilant for that possibility, may help to reduce risk to the possums. Efforts to minimise loss of canopy connectivity, as discussed in Section 3.3.2 above, are equally applicable for this risk factor.

3.5.3 Outcome

There is little empirical evidence available to make an assessment of the risk of bike collision. The existing trail network in the park is already used for mountain biking, and possum densities remain high in the park, which suggests that bicycle collisions are not having a major impact on possums in the park. No collisions or Western Ringtail Possum mortality have been reported from trail users. These observations, plus the lack of overlap in the likely majority of trail use with nightly possum activity, suggest that the new trails proposed here would also not have a significant impact on the local population.

3.6 Increased Human Disturbance

3.6.1 Potential Impact

The provision of additional new trail infrastructure is likely to facilitate additional human usage of the area with the potential for additional disturbance impacts through mountain bike use and dog-walking. The potential impacts on Western Ringtail Possums are reduced by their nocturnal habits, as the majority of mountain bike usage would be expected to take place during the day. However, some night usage is expected, and a group of mountain bike riders were noted using the existing trails at night during the current assessment. Dog walking commonly occurs, and while dogs are required to be kept on leads, it has been noted that this is not always adhered to, which could result in predation of, or injury to, Western Ringtail Possums.

3.6.2 Outcome

We consider that it is unlikely that the associated increase in human activity in the park following this development will have a significant impact on Western Ringtail Possums. The park already receives significant numbers of visitors using an extensive existing network of trails and infrastructure, and Western Ringtail Possums still occur throughout the park at densities comparable to strongholds such as Tuart Forest National Park. Hence, it seems unlikely that human disturbance is having a negative impact on Western Ringtail Possums in the park.

Western Ringtail Possums are also known to occur extensively in urban areas around Albany (Department of Parks and Wildlife 2017), suggesting they are relatively tolerant of human disturbance. Finally, the majority of human activity in the reserve is expected to occur during the day, when disturbance impacts to possums are expected to be minimal. The City of Albany has proposed introducing additional signage to remind park users of the need to be watch out for possums while walking or mountain biking, and that dogs are required to be kept on a lead at all times.

Table 3.1 Summary of potential impacts and management actions for Western Ringtail Possums in the Albany Heritage Park

Action	Potential impact	Mitigation	Expected consequence
Clearing	Habitat loss through vegetation clearing	- Minimise area to be cleared as much as possible. - Avoid clearing trees over 10 m diameter. - Retain canopy connectivity over trails as much as possible. - Rehabilitate old trails that are not part of the CoA trail network.	**No significant impact** Clearing footprint estimated to cover 1.63 ha, or 0.61 % of the total area of the park. Retaining canopy connectivity over cleared paths will reduce the effective habitat loss further. Future rehabilitation of existing cleared sites can be used to further offset any habitat loss.
Clearing	Direct impact	- Vegetation to be disturbed/shaken before clearing to make sure no animals will be injured during clearing works. - Trail alignments will avoid existing possum dreys and hollow-bearing trees. - Clearing to be undertaken by hand or with small machinery.	**No significant impact** Small number of individuals anticipated to be directly impacted without mitigation measures (< 7). Suggested mitigation measures expected to result in no individuals being directly impacted.
Clearing	Fragmentation of habitat	- Retain canopy connectivity over trails as much as possible. - Avoid clearing trees over 10 cm diameter. - Investigate alternative means of retaining canopy connectivity (e.g. rope bridges) if natural connectivity cannot be maintained.	**No significant impact** Canopy connectivity is not expected to be significantly affected by the proposed action. Observations of possums using paths to cross between vegetation, and persistent high densities despite a complex network of cleared areas being present in the existing environment suggest that it is unlikely that the proposed trails would represent significant barriers for dispersal within the park.
Clearing	Degradation of habitat adjacent to trails	- All machinery and equipment to be cleaned prior to entering and exiting park, and prior to moving between different areas of the park, to minimise the risk of transferring diseases or weeds. - Low-risk dieback material will be used in areas of dieback free or uninterpretable vegetation. - Include trail features that will shake dirt from mountain bikes before entering uninterpretable areas. - Trails to be monitored for any erosion or weed encroachments post-construction.	**No significant impact** The main risk to vegetation adjacent to the trails lies in the spread of dieback. With strict controls suchs as those suggested by the City of Albany the risk of dieback spread between areas of the Albany Heritage Park is considered to be low. The City of Albany has also proposed monitoring of new trails for weeds, erosion and trail widening or misuse post-construction to allow for corrective action if required which would further mitigate degradation of vegetation adjacent to the trails.
Trail use	Collision with trail users	- Information signs to be provided advising riders of the potential for bicycle strikes, particularly at night, and to be aware of that possibility. - Minimise loss of canopy connectivity, as discussed above, to reduce need for possums to cross trails on ground.	**No significant impact** Existing trail network in the park is already used for mountain biking, and possum densities remain relatively high in the park, which suggests that bicycle collisions are not having a major impact on possums in the park. No collisions or Western Ringtail Possum mortality have been reported from users utilising these trails.

Action	Potential impact	Mitigation	Expected consequence
Trail use	Disturbance	- Public education and on-site signage may reduce potential impacts from disturbance. - Informational signage reminding trail users that dogs are required to be on a lead at all times.	**No significant impact** The park already receives significant numbers of visitors using an extensive existing network of trails and infrastructure, and Western Ringtail Possums still occur throughout the park at relatively high density. Western Ringtail Possums are known to occur extensively in urban areas around Busselton and Albany (Department of Parks and Wildlife 2017), suggesting they are relatively tolerant of human disturbance. The majority of human activity in the reserve is expected to occur during the day, when disturbance impacts to possums are expected to be minimal.

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4.0 MNES Significant Impact Assessment

We have assessed the potential impacts of the project against the guidelines for significant impacts on MNES species (DoE 2013), as outlined in Section 3.0. Assessment against these guidelines has been summarised in Table 4.1.

Table 4.1 Assessment against MNES Significant Impact Guidelines (after DoE, 2013).

Criteria. Is there a real possibility that the proposed action will:	Impact	Justification
Lead to a long-term decrease in the size of a population	None	The area proposed for clearing is approximately 0.6% of the area of the park, and is primarily comprised of narrow trails spread across the park rather than a large continuous portion of habitat. If canopy connectivity is retained over these trails, as intended, then the effective loss of potential habitat will be lower still. Approximately 7 individuals would be affected by the clearing, based on the average density of 4.13 individuals per hectare obtained during a recent study (Biota 2019), of the estimated 1,100 individuals occurring within the Albany Heritage Park. The potential to reduce the population over the short term is therefore negligible. Longer-term, potential additional impacting factors as presented in Table 3.1 when taken cumulatively, are not expected to significantly affect the local Western Ringtail Possum.
Reduce the area of occupancy of the species	None	Western Ringtail Possums occur throughout Albany Heritage Park, despite the existence of a network of cleared trails. Hence, we would expect them to continue to occur throughout the park.
Fragment an existing population into two or more populations	Not significant	Planned trail footprints are narrow, and canopy connectivity should be able to be retained over the trails, so it is unlikely that they will represent any significant barrier to dispersal within the park and hence fragment the population of the park. There is no evidence that existing trails within the park have fragmented the population, and possums have been observed crossing existing trails.
Adversely affect habitat critical to the survival of a species	Not significant	The proposed development is unlikely to significantly alter the habitat of the park, as weed and disease risks will be mitigated during construction.
Disrupt the breeding cycle of a population	None	There is no evidence that the existence of trails within the park is currently interfering with the breeding cycle of Western Ringtail Possums, with a relatively high density of possums recorded in the park, and subadults observed. Thus, there is no evidence to suggest that the proposed trails will have a significant impact.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	None	The proposed development is anticipated to have negligible impact on Western Ringtail Possum habitat within the Albany Heritage Park, and an extremely low likelihood of causing a decline in the species.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	None	The primary invasive threats to Western Ringtail Possums are cats and foxes, which are already established in the park and surrounding areas.

Criteria. Is there a real possibility that the proposed action will:	**Impact**	**Justification**
Introduce disease that may cause the species to decline	Not significant	There is no evidence that disease is currently a significant direct threat to Western Ringtail Possums. No Western Ringtail Possums are proposed to be translocated or introduced to the Albany Heritage Park as a result of this proposal. There is therefore no potential vector for disease spread. Plant pests and diseases may indirectly impact possums by degrading habitat, but the majority of those listed in the Western Ringtail Possum recovery plan are unlikely to be introduced or exacerbated by the proposed actions (e.g. they are not transmitted by moving soil, or are naturally occurring and only have a significant impact in certain environmental conditions). Dieback caused by *Phytophthora cinnamomi* is the major exception, but is already present within the park. Additionally, the City of Albany has committed to a number of mitigating actions to prevent the spread of weed and disease during construction of the trail.
Interfere with the recovery of the species	None	There are no specific actions outlined in the recovery plan for the species that would be contravened by the proposed development. The broad recovery objectives of the plan are relevant, in particular that *"Habitat critical for survival for western ringtail possums is identified and protected in each key management zone"* (Department of Parks and Wildlife 2017, pg. 35) and that *"Threatening processes that are constraining the recovery of western ringtail possums are mitigated in each key management zone"* (Department of Parks and Wildlife 2017, pg. 37). We consider that the negligible, localised impact likely to arise from the development of the proposed trails will not interfere with the recovery of the species.

5.0 Management Recommendations

We consider that the proposed development is unlikely to have a significant impact on Western Ringtail Possum populations in Albany Heritage Park. We consolidate and summarise here the City of Albany's proposed management actions with some additional recommendations.

1. Minimise vegetation clearing
Minimising the extent of the clearing for this development will reduce the potential impact on possums through loss of habitat. This can be achieved by upgrading existing trails in lieu of clearing new trails, and restricting the clearing of new trails to the minimum required tread width. Restricting clearing in this way will also make it easier to retain canopy connectivity over the trail (see Recommendation 2 below), reducing the distance possums need to move on the ground where they may experience predation risk. Cleared vegetation and spoil will also be removed from site to minimise the disturbed area.

2. Retain canopy connectivity
Overstorey canopy connectivity should be maintained across the trails wherever possible to further reduce the potential impacts of increased predation and bicycle strike by eliminating the need for possums to come to the ground and cross trails. This also has the unrelated benefit of shading the trails for human users. We recognise that in some instances the maintenance of canopy connectivity over the trails may not be possible due to safety concerns (e.g. falling branches), but canopy connectivity has been retained over some existing trails within the park, and the vegetation structure should allow for some connectivity to be retained along a significant proportion of the proposed new trail network. The development concept plan indicates that trails "*will be sufficiently narrow as to allow tree-dwelling fauna to move across the canopy as they currently do*" (Common Ground Trails 2015, pg. 16), which suggests that canopy connectivity will be retained where possible.

3. Investigate methods to improve canopy connectivity if required
If comparable canopy connectivity cannot be retained in some areas, alternative methods to improve connectivity may be investigated as a means to allow possums to move more easily across trails with less risk of predation and bicycle strike. Rope bridges have been successfully employed in several areas to improve habitat connectivity and reduce road kill rates for arboreal mammals (Weston et al. 2011). Western Ringtail Possums have also been shown to adapt to using rope bridges installed across roads near Busselton (Yokochi and Bencini 2015). However, the response of Western Ringtail Possums to rope bridges has varied, with very little usage recorded for a similar bridge installed near Bunbury (Chambers and Bencini 2016), and thus the efficacy of this approach in different situations remains unclear (Department of Parks and Wildlife 2017). Therefore, retaining natural canopy connectivity should be the preferred approach, and alternatives such as rope bridges should only be considered if this is not possible in some areas.

4. Retain large trees
The clearing of larger trees should be avoided, particularly those with hollows for denning, and large peppermints with a diameter at breast height greater than 10 cm (DEWHA 2009). This will reduce any potential habitat loss impact by retaining important habitat trees. The City has indicated that path alignments have been planned to avoid the need to clear trees with diameter at breast height greater than 10 cm wherever possible.

5. Clearing to be conducted by hand or with small machinery
Conducting clearing activity by hand or with small machinery rather than larger, heavier machinery, will reduce the risk of possums being killed or injured during the clearing process. This approach also allows clearing to be restricted to the minimum area required as much as possible, and gives more flexibility to re-align cleared areas to avoid clearing larger trees and maintain canopy connectivity over cleared areas. The City has indicated that clearing will be undertaken by hand or with small machinery.

6. Public education and signage

Public education may reduce potential impacts from disturbance and bicycle strikes. On-site signage can be provided to encourage public awareness of Western Ringtail Possums within the Albany Heritage Park. Signage associated with mountain biking and dual use of the trail should make mountain bikers aware of the potential for bicycle strikes, particularly at night, and encourage dog owners to walk with their dogs on leads. Signage should also include contact details for appropriate local wildlife rescue organisations able to rehabilitate any injured possums found on trails, and contact details for reporting any dead possums found. A "no-blame" approach is recommended to bicycle strikes to encourage people involved to report injured and dead possums. Signage can be complemented by information sheets or presentations targeted at local mountain biking groups and other trail users.

6.0 Monitoring

6.1 Population Monitoring

In terms of numbers of individuals at risk, the potential impacts to Western Ringtail Possums arising from the proposed Albany Heritage Park Link trail are very minimal relative to the overall population inhabiting the park. This means that monitoring the impact of just the proposed trail in a statistically meaningful way is not feasible, and would be of little value given the assessed level of impact and overall risk to the possum population in the park.

However, the City of Albany may considering monitoring the overall population of the Albany Heritage Park in order to determine whether current and future use of the park are cumulatively impacting possums. For this to be effective, population estimates in other control areas that are not subject to the same level of community use as the Albany Heritage Park, such as Mt Melville, Walmsley West and Walmsley East, would need to be obtained as context for the results in the park. Such an approach could identify any differences in localised population trends within the park relative to those occurring on a wider, regional scale. This could be achieved using a similar distance sampling approach to that recently employed to estimate the population on the mounts (Biota 2019). Frequency of monitoring would be determined by City of Albany in consultation with the relevant regulators. We would recommend annual monitoring for at least the first three years, with a reduction to every three years if no significant site-specific declines were detected.

6.2 Bicycle Strike Monitoring

There is little quantitative data available on the impact of bicycle strikes on Western Ringtail Possums. We consider that the bicycle strike impacts are not likely to be sufficient to significantly impact the possum population in the park, but we recommend that park users be encouraged to report deceased or injured possums within the park and that a register of direct impacts such as these is maintained.

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