

Guide to preparing a kangaroo management plan for Melbourne's growth corridors



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Glossary of Terms and Abbreviations

Abundance (population)	The number of kangaroos per hectare.
Active Open Space	Area of land allocated for the use for formal outdoor sports that includes playing fields and team sports such as football, basketball or cricket.
Responsive Management	A systematic approach for improving kangaroo management by monitoring management outcomes and using the results to update knowledge and adjust management actions.
ATCW	Authority to Control Wildlife.
BCS	Biodiversity Conservation Strategy
Biodiversity Conservation Strategy	The overarching strategy for the protection of biodiversity in the growth corridors of Melbourne.
Biomass	The dried weight of edible grasses and herbs in the macropod diet.
Browse	To feed on the leaves of shrubs, trees or ferns (as opposed to graze).
Capture myopathy	A condition associated with the stress of being captured which causes muscle paralysis and failure, at times including heart failure. Macropods are particularly susceptible to this condition.
Conservation Area	An area of high biodiversity value for Matters of National Environmental Significance and State significance identified in the BCS that will be protected and managed to meet the commitments to the Commonwealth in the Program Report.
EGK	Eastern Grey Kangaroo
Ha	Hectares
Home range	The territory of a social group of kangaroos.
<i>In-situ</i> management	Management of an <i>in-situ</i> population of kangaroos (see definition) as per an approved Kangaroo Management Plan.
<i>In-situ</i> population	A group of kangaroos which are being managed within a defined area which has been determined to be suitable to support them into the long term (post development). These areas are typically an appropriate Park or Reserve.
Graze	To feed on grass or forbs (as opposed to browse).
Growth corridors	Areas on the fringe of metropolitan Melbourne around major regional transport corridors that are designated for large-scale change, over many years, from rural to urban use.
KMP	Kangaroo Management Plan.
Land-locked	Kangaroos trapped in an area of land by development or other physical barriers on all sides.
Linear corridor	An area of land which will remain undeveloped for the life span of the Precinct's development and which provides a direct and safe passage for kangaroos to escape encroaching development to suitable refuge areas such as land outside of the Urban Growth Boundary or conservation reserves.
Macropod	Term for an animal of the marsupial family group Macropodidae, which includes kangaroos and wallabies.

Melbourne Strategic Assessment	An agreement between the Victorian and Commonwealth governments to undertake a strategic assessment of the Victorian Government's urban development program <i>Delivering Melbourne's newest sustainable communities</i> . The MSA evaluates impacts of the urban development program for Melbourne on Matters of National Environmental Significance protected under the <i>Environment Protection and Biodiversity Conservation 1999</i> (EPBC Act).
MNES	Matters of National Environmental Significance (as defined in the <i>Environment Protection and Biodiversity Conservation Act 1999</i>).
Mob	A group of kangaroos.
MSA	Melbourne Strategic Assessment
Passive Open Space	Area of land allocated for the use of passive recreation, play and unstructured activities (e.g. walking, cycling, etc.).
Potential Kangaroo Habitat	Total area of land (that is protective habitat) used when estimating the sustainable population limit of EGK for an in-situ kangaroo management scenario.
Precinct Structure Plan	A master plan for whole communities which usually cater for between 10,000 to 30,000 people.
Program Report	The Program Report identifies the processes and mitigation measures that the Victorian government will undertake to implement the MSA. The Program Report was endorsed by the Commonwealth Environment Minister on 2 February 2010.
Protective habitat	An area of habitat which can suitably shelter EGK (i.e. provides adequate space and edible biomass, consists of tree copses, gullies or valleys, and is a relatively safe and quiet environment).
Relocation	Relocation is the capture and removal of a kangaroo from an location that poses an immediate risk to animal welfare and human safety (such as existing urban areas or active construction zones) to the nearest suitable habitat. Relocation differs to translocation in that it is a responsive action to a high-risk situation; it is not a planned population control method.
Riparian areas	Areas along banks of rivers or streams.
RSPCA	Royal Society for the Prevention of Cruelty to Animals.
Sustainable Population limit	A sustainable population limit is an estimate of how many kangaroos may be able to be sustained within a given area while still meeting the management objectives for the land.
Translocation	Deliberate and mediated movement of wild individuals or populations from one part of their range to another.
UGB	Urban Growth Boundary
UGZ	Urban Growth Zone
Western Grassland Reserves	The Western Grassland Reserves comprise 15,000 ha of land in two large areas to the west of Melbourne identified as a future conservation reserve as part of the Victorian Government's commitments under the Melbourne Strategic Assessment. The reserves are designed to protect critically endangered grasslands, and to offset the ecological impact of urban growth in Melbourne's north and west.

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Introduction

About this guide

The *Guide to preparing a kangaroo management plan for Melbourne's growth corridors* explains:

- how development in Melbourne's growth corridors is affecting the eastern grey kangaroo (*Macropus giganteus*)
- the public safety, animal welfare and environmental protection rationale for kangaroo management
- how to determine if you need a kangaroos management plan (KMP)
- the process to identify suitable kangaroo management actions and prepare a KMP
- what a KMP must include.

The eastern grey kangaroo is common throughout Melbourne's growth corridors. Growth corridors are areas on the fringe of the metropolitan area around major transport corridors that are designated for large-scale change, over many years, from rural to urban use.

In this guide, *kangaroo* means the eastern grey kangaroo. This guide does not cover the management of swamp wallabies (*Wallabia bicolor*): they have different physical and behavioural characteristics and habitat preferences, so are likely to need a quite different approach to eastern grey kangaroos.

Although this guide is for use in Melbourne's growth corridors, readers may find some of its information useful in other peri-urban areas of Melbourne and in Victorian regional centres.

DELWP will monitor the implementation of KMPs and gather information about kangaroo management. It will make important new information or changes in its policy available on its website, and will periodically update this guide.

Melbourne's growth corridor development and the eastern grey kangaroo

In May 2014, the Victorian Government released *Plan Melbourne*, which estimates that Melbourne's population may increase to 7.7 million people by 2051. *Plan Melbourne* is one of several plans in recent years to note the increasing pressure of development in outer urban areas. For example, *Melbourne @ 5 Million*, published in December 2008, projected that 284,000 new dwellings would be built in growth areas by 2030.

In response to these growth pressures, the government established the *Delivering Melbourne's Newest Sustainable Communities* program to manage urban development in four growth corridors within Melbourne's expanded 2010 urban growth boundary.

The *Delivering Melbourne's Newest Sustainable Communities* program will result in extensive areas of grassland, grassy woodland and farmland being cleared for urban and industrial development in Melbourne's west, north, south east and Sunbury/Diggers Rest growth corridors (in the municipalities of Cardinia, Casey, Hume, Mitchell, Whittlesea, Melton and Wyndham) over the next 20–30 years.

The eastern grey kangaroo is a native species. They are macropods: animals of the marsupial family group *Macropodidae*, which includes kangaroos and wallabies. Eastern grey kangaroos

are widespread throughout Victoria, except in the state's north-west, where the western grey kangaroo (*Macropus fuliginosus*) and the red kangaroo (*Macropus rufus*) are more prevalent. Around Melbourne, eastern grey kangaroos are mostly found in the west, north and Sunbury/Diggers Rest growth corridors, where development steadily reduces their habitat.

The kangaroo's diet is mostly grasses, but it also browses on herbs and shrubs. Its preferred habitat is the boundary between open grassy areas (which provide forage) and shrubby or tree-covered areas (which provide shelter).

Kangaroos have benefitted since European settlement from increased fragmentation of treed areas, and from agriculture which provides improved grazing pasture and reliable water sources. Efforts to control wild dogs, dingoes and foxes have also increased their survival rates.

Although kangaroos are mobile animals and can move across large areas, they tend to be fairly sedentary and strongly attached to their home ranges. An eastern grey kangaroo's home range is about 1–4 km², most of the time. This is particularly true of females, which prefer to stay in social groups close to female relatives. Mature males will occasionally venture further, to mate with females of different social groups and sometimes to feed: studies have recorded a few individual males venturing up to 17 km. But on the whole, both sexes tend to be sedentary and attached to the territorial range of their social group (mob).

Because they are strongly attached to their home range, kangaroos can be reluctant to leave a place despite increasing development and disruption around them. This leads to kangaroos becoming landlocked (that is, trapped on all sides by development) in Melbourne's outer-metropolitan growth corridors. This occurs particularly if development is not staged in a way that minimises or prevents landlocking. When poorly managed, landlocking can harm kangaroos, threaten human safety and damage the environment.

Kangaroo management rationale

Traditionally, kangaroo management has mostly been a matter for farmers (if kangaroos threatened their crops and pasture) and for managers of peri-urban parks and reserves (if kangaroos threatened visitor safety and amenity and the environment, and if their welfare was at risk). If a kangaroo management situation arose, the landowner, DELWP and kangaroo management experts would work together to find a solution.

With the rapid pace and scale of development in Melbourne's growth corridors, a reactive approach to kangaroo management no longer works. Kangaroos are a large and conspicuous species, and landlocking brings them much more to the community's attention, greatly increases risks to their welfare and to public safety, and poses greater threats to the environment. A proactive approach is more effective, less expensive and less laborious than leaving kangaroo management till kangaroos become a problem.

Public and worker safety

Vehicle accidents due to collisions or near-misses with kangaroos are the most common and serious type of kangaroo-related threat to public safety. Collisions can result in death, trauma or injury to occupants of vehicles. With urban growth, there will be more roads, and more traffic.

Interactions between kangaroos and pedestrians can also be risky for the pedestrians, particularly if the kangaroos have become accustomed to people and have become bold or aggressive.

If kangaroos manage to enter a construction area, they can potentially harm workers.

Animal welfare

Animal welfare risks arise where kangaroos and people coexist. They include:

- starvation (due to reduced food sources caused by development, landlocking and overabundance of kangaroos)
- stress-related illness and disease (due to kangaroos becoming lost or landlocked, or overabundant)
- death and injury, sometimes with prolonged suffering (due to collisions with vehicles, confrontations with dogs and illegal control actions, such as hunting or poisoning)
- injury and stress (due to confrontations with humans)
- loss of natural behaviours (due to dependence on people for food, which is an adverse outcome of feeding wild kangaroos).

Oral necrobacillosis—known as lumpy jaw—is common in kangaroos. In its extreme state, it leads to large, bony swellings in the skull, and degraded periodontal structures (the gums, ligaments and bone which support the teeth). Kangaroos with lumpy jaw can find it hard to eat, and eventually starve. While the direct cause of the disease is unknown, studies show it is commonly associated with high densities of kangaroos (often, but not necessarily, in captivity), limited edible grasses and herbs, and heavy faecal contamination of pasture.

Studies of eastern grey kangaroos and other macropods have also identified other parasites, pathogens and diseases. Though no one affliction has caused widespread mortality across the species to date, these afflictions can have devastating effects on isolated populations.

If kangaroos manage to enter a construction area, the sounds and movement of vehicles and machinery, the unfamiliar and hazardous surroundings and the presence of people can easily stress the kangaroos, or worse, lead to their injury or death.

Environmental protection of remnant vegetation

The west, north and Sunbury/Diggers Rest growth corridors contain significant remnant grassy and grassy woodland ecological communities that are matters of national environmental significance, as defined in the *Environment Protection and Biodiversity Conservation Act 1999*. These include the natural temperate grassland and grassy eucalypt woodland of the Victorian Volcanic Plain.

Given the expected impact of development in the growth corridors, the Victorian and Commonwealth governments agreed to the Melbourne Strategic Assessment, an assessment of *Delivering Melbourne's newest sustainable communities* on matters of national environmental significance. The *Program Report* identifies the processes and mitigation measures the Victorian Government will undertake to implement the Melbourne Strategic Assessment.

The *Program Report* established protection targets and conservation outcomes for the remnant ecological communities and for the state and federally significant threatened flora and fauna they contain. It also identified 15,000 ha of land in two large areas to the west of Melbourne as future conservation reserves. The Victorian Government is reserving these areas, as the Western Grassland Reserves, to protect critically endangered grasslands and to offset the ecological effects of urban growth in Melbourne's south-east, north and west.

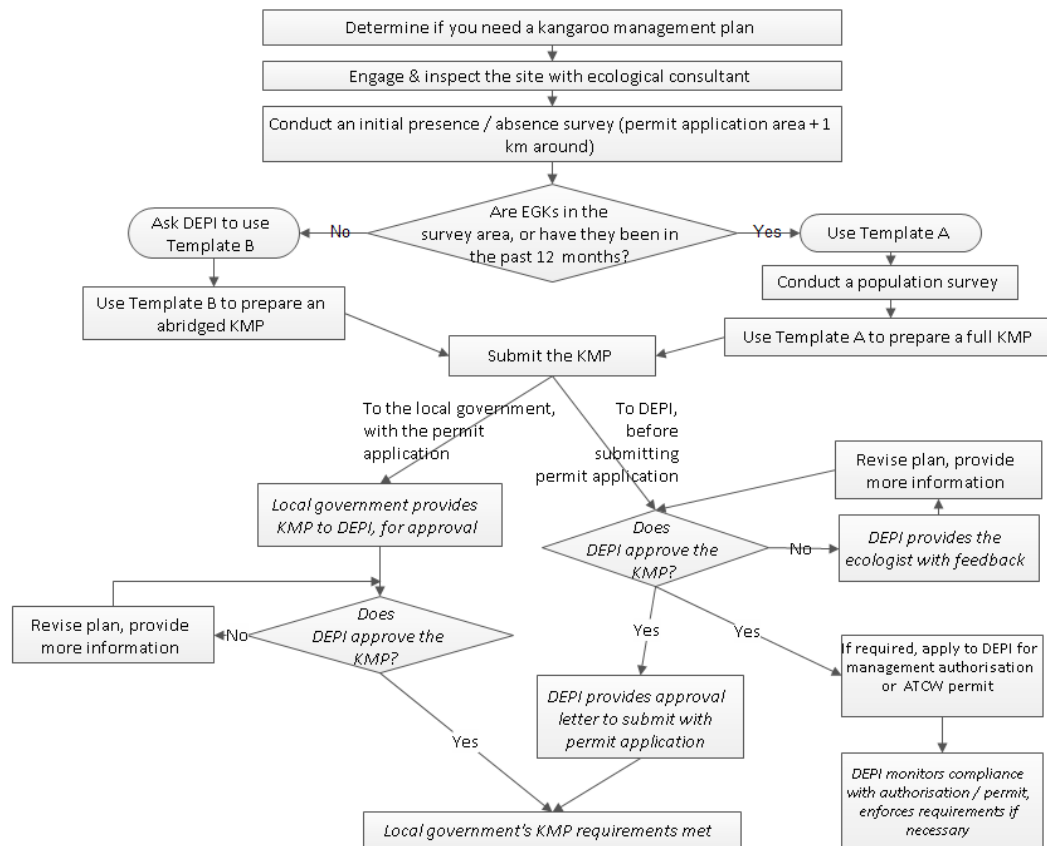
DELWP's *Biodiversity Conservation Strategy for Melbourne's Growth Corridors* (2013) identifies conservation areas. These are areas of high biodiversity value that will be protected and managed to meet the state's commitments to the Commonwealth to protect the threatened species and communities detailed in the *Program Report*.

Habitat loss as a result of urban development may increase kangaroo populations in conservation areas, and it is important that this does not compromise management objectives for these areas. For example, kangaroos have long occupied grasslands and grassy woodlands, and their grazing helps control grasses and weeds. However, conservation areas are managed to maintain biodiversity values (such as by ecological burning, slashing and mowing) so they do not need grazing kangaroos. If the kangaroos become over-abundant, they can overgraze, trample or flatten the vegetation. Eventually, this will damage the native understory (grasses and herbs) and slow the regeneration of shrubs and canopy species. Overgrazing is a greater problem if rabbits are present.

Damage to the native understory may also affect grassland species (such as the striped legless lizard and the golden sun moth). With overgrazing, trees may not regenerate, which can affect regenerating communities (such as grassy eucalypt woodland).

Preparing a kangaroo management plan

The figure below shows the main steps to preparing a kangaroo management plan. These steps are explained in the remainder of this guide.



Determine if you need a kangaroo management plan

Applications for subdivision

Under their planning schemes, local governments in growth corridors usually require a KMP with an application for subdivision.

DELWP must approve the KMP, and it must be submitted to and approved by the local government, before subdivision starts.

Precinct-wide KMPs

It is better for a KMP to cover a larger, rather than a smaller, area. This may mean that multiple landowners voluntarily collaborate to prepare one KMP covering multiple subdivisions, or a whole development area. The advantages of a precinct-wide KMP are:

- it costs less for each landowner than if they were to prepare their own KMP
- the actions of each developer will be coordinated across a much larger area, which provides opportunities for a more strategic plan
- it is less likely that kangaroos will be landlocked.

If a KMP has been approved in advance for land to which multiple permit applications would apply (such as would occur across a precinct structure plan area), the local government will usually require the permit application to include a design/management response statement outlining how the application is consistent with, and gives effect to any requirements of, the KMP.

Linear corridors

Some earlier versions of the permit application requirement (within the local government planning scheme) did not require a KMP if the land abutted a linear corridor.

The term *linear corridor* has been misinterpreted in the past. DELWP considers a linear corridor to be an area of land that will remain undeveloped as a precinct is developed, and which provides a direct and safe passage for kangaroos to escape encroaching development to suitable habitat (such as land outside the urban growth boundary, or conservation reserves). If a linear corridor does not provide long-term passage, there is a risk it will not be satisfactory for kangaroos.

DELWP does not consider an area of land to be a linear corridor if it:

- consists of recreational space and/or walking or cycling paths where regular interaction with people is likely
- crosses a road or highway
- is a road or rail reserve
- is longer than the average daily movement range of kangaroos (about 4 km).

DELWP will determine if an area can act as a linear corridor

Engage an ecologist

When preparing a KMP, a permit applicant must engage an ecologist with expertise and experience in kangaroo ecology and/or management. The ecologist should be experienced with the survey and management methods explained in this guide. Other consultancy staff who assist with surveys, monitoring or implementing management actions should also be experienced with the methods, or have been trained by the lead ecologist. The KMP must list all other ecologists involved in preparing it.

A permit applicant should engage an ecologist as early as possible in the planning process, and allow enough time to prepare the KMP.

Inspect the site with the ecologist

At the outset, the applicant and ecologist should meet to discuss the scope of the initial presence/absence survey (see below), and so the ecologist can gather information about the site. The meeting should preferably be on-site: this allows the ecologist to see the site and determine the most appropriate survey methods.

Depending on the circumstances, DELWP and other stakeholders may need to provide input at this meeting.

The ecologist should gather information at the site visit about:

- any past and current populations of kangaroos
- land ownership and management of the survey area, including the permit application area

- ecological values (such as native vegetation, threatened species and fauna)
- access to the site
- hazards (such as roads or quarries).

The ecologist should use this information to complete **4. Site description** in the KMP (p. 36 in Template A and p. 42 in Template B).

Conduct an initial presence/absence survey

The ecologist must conduct an initial presence/absence survey to establish if there are kangaroos in the survey area, or if there is evidence that kangaroos have been in the survey area in the last 12 months.

The survey area includes:

- the area for which the planning permit application is being made (or, in the case of one KMP being used for several applications, the whole development area)
- land extending for 1 km in all directions beyond the boundary of the permit application area, including parks, reserves and conservation areas.

Kangaroos are more likely to be present if there is protective habitat within 1 km of the permit application area. Protective habitat is land that provides adequate space and edible biomass; consists of tree copses, gullies or valleys; and is generally safe and quiet.

A survey should start with an assessment of protective habitat, using aerial images, within the survey area.

At least two ecologists should then conduct the on-site component of the survey together. They should ideally do so over three half-days, but this is flexible: the ecologists can make a judgement about the effort required based on the site size and terrain, and the survey methodology.

The ecologists should inspect the survey area, and particularly any protective habitat, from a distance, using binoculars. They should do this either in the early morning, or late afternoon, or both. Kangaroos tend to spend daylight hours resting, and to be most active during dawn / twilight hours and at night.

Where possible, the ecologists can conduct the survey from a vehicle, so they can reach all protective habitat sites within the whole survey area. Generally, kangaroos can be seen from 250 m or more, providing that vegetation, landscape or built features do not obstruct the line of sight. If there are no visual obstructions, observation points and transects can be up to 500 m apart: if there are, reduce the distances accordingly.

If the ecologists do not sight any kangaroos, they should visit the survey area during daylight hours to search for evidence that kangaroos have used the site. Such evidence includes kangaroo:

- faecal matter (pellets)
- tracks
- fur (which is often caught on wire fences)
- carcasses (including road kill) or other remains.

The ecologists might also contact the local government or VicRoads for information about vehicle collisions with kangaroos.

Choose a template

If the ecologist, after conducting the initial presence/absence survey, establishes that kangaroos are, or have been, in the survey area in the last 12 months, they must use **Template A**, for a **full KMP**.

If the ecologist establishes that kangaroos are not, and have not been, in the survey area in the last 12 months, they must state this in a letter or brief report, and send it to DELWP. If DELWP accepts their statement, the ecologist can use **Template B**, for an **abridged KMP**.

In all situations, DELWP reserves the right to require the ecologist to use Template A, for a full KMP.

Conduct a population survey

If the ecologist determines that kangaroos have used the survey area in the last 12 months, they must conduct a population survey to determine:

- the total number of kangaroos, or their estimated abundance (kangaroos per ha)
- the location of the kangaroos
- notable patterns of movement onto and across the permit application area
- any evident signs that any kangaroo is diseased or lame
- any other notable information.

The ecologist must determine the most suitable method(s) for conducting the population survey, given the topography of the survey area and the species to be surveyed.

The following are some methods that are suitable for a kangaroo population survey. An ecologist can use other methods, provided they are tried and tested, and suit the survey area. If DELWP considers a method unsuitable, it will require re-surveying with a suitable method.

Faecal pellet counting

The ecologist can estimate the kangaroo population by observing faecal pellet accumulation over a given number of days. This involves sampling within quadrats along a transect to estimate the number of kangaroos per ha. Ideally, they should record the GPS coordinates of the quadrats, in case they want to monitor the survey area in future. The ecologist then compares pellet counts with published deposition rates; or they compare the accumulation of pellets for each location to a control site of similar size and conditions, where the kangaroo density is known.

Direct counting

This involves directly counting every kangaroo in the survey area. This method is suited to smaller areas, such as many single-property developments in Melbourne's growth corridors.

To direct count, walk or drive around the perimeter of the survey area, tallying the population from a few different observation points. At least two people should do the survey: between them, they have a better chance of seeing all the kangaroos. They must take care to avoid

under-counting or double-counting, which they can do if they are poorly coordinated or if the kangaroos react and move about.

Do four separate counts, either at dawn or dusk when kangaroos are likely to be feeding. The accuracy of the count very much depends on the kangaroo population not being disturbed. The results are valid if at least three of the four counts produce similar results and the final population estimate should be an average of these (or of all four, if they all produced similar results).

Sweep counting

This involves a group of counters walking in line in one direction across an enclosed area, counting the kangaroos that move back through the line. Each person counts each kangaroo that moves between them and the counter to their left or right (this choice being made before the sweep begins). Counters should be spaced close enough to be able to see the person beside them. When the line reaches the far side of the enclosed area, all counters' totals are added together to get a total number of kangaroos for the site.

Sweep counting suits open grassy or open grassy woodland survey areas. It is not suitable for woodland or forested areas, where kangaroos can move ahead of observers without being detected because trees block observers' lines of sight. Depending on the size of the survey area, sweep counting requires more people to do the survey than other methods, and may therefore be a more costly option.

Distance sampling

Distance sampling (also called line transect counting) involves an observer either walking or driving an off-road vehicle along a transect line. As they observe one or more kangaroos, they stop and use a laser rangefinder to record the distance to the animal(s), and a compass to take a bearing from the line, so they can calculate the perpendicular distance from the transect to the kangaroo(s). They then use a formula (using the perpendicular distance) to estimate the proportion of kangaroos the survey missed. Finally, they add the observed and estimated number of kangaroos, to get a total for the site.

Distance sampling is suitable for large sites, as the observer can walk the single transect rather than spend time moving around the site. The method is suitable for open grassland or open grassy woodland areas but not for woodland or forest, where kangaroos can move away undetected.

Prepare the KMP, using the correct template


There are two templates at the back of this guide: Template A (for a full KMP) and Template B (for an abridged KMP). **Choose a template** (p. 8) has advice about choosing the correct template.

Follow the instructions below to use the template.

1. Copy the text of the whole template into a new document.
2. Read the table below to understand the requirements for each template.

Point	Full ... required?	Abridged ... required?
1. Cover page	Yes	Yes
2. Introduction	Yes	Yes
3. Kangaroo management rationale	Yes	Yes
4. Site description	Yes	Yes
5. Survey methodology	Yes	Yes
6. Population survey results	Yes	No
7. Plan goals	Yes	Yes
8. Staged development plan	Yes	Yes
9. Assessment of other management / preventative options	Assessment of other management options	Assessment of other preventative options
10. Management / preventative actions	Management actions	Preventative actions
11. Monitoring	Yes	No
12. Contingency planning	Yes	No

3. Read the general instructions **IN BOLD** below. Each numbered point in the template will tell you to do one or more of these things, so you must understand what they mean.

 **INCLUDE THE TEXT BELOW, AS-IS, IN THE PLAN**


Include the text in the template, unchanged, in your KMP. In **7. Plan goals** in the template, choose one or other of the blocks of text.

[] **SUBSTITUTE THE CORRECT DETAILS FOR THE WORDS IN SQUARE BRACKETS**


Change the words in square brackets so they apply to your KMP.

..... **REPLACE THE DOTTED LINES WITH THE CORRECT INFORMATION**

Delete the dotted lines and enter the required information.

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP**

Read the instructions, information and advice in this section, for the numbered point.

 **ATTACH THE INFORMATION BELOW**

Attach at the back of your KMP the information indicated (which include maps, summaries of previous surveys and records, and drawings).

4. Read the rest of the section below, which gives you specific instructions about what you must do for each numbered point in the template: the numbers below match the numbers in the template.
5. After you complete each point, delete the general instruction line (for example, the line that says ✂ **INCLUDE THE TEXT BELOW, AS-IS, IN THE PLAN**).

1. Cover page

Project, planning permit applicant and ecologist details

In this section, you put details about the site, the planning permit applicant and the ecologist (the lead ecologist and consultancy preparing the KMP, including the names of all other ecologists involved in preparing it).

The planning permit applicant is ultimately responsible for managing kangaroos on their property, and implementing the actions in the KMP. This is regardless of who undertakes the actions on behalf of the planning permit applicant.

Site induction

In this section, you indicate if the site induction for construction workers covers the KMP, and what they should do if they find evidence of kangaroos in the construction area.

The induction should cover, from the KMP, a brief review of **3. Kangaroo management rationale** and **6. Population survey results**. This will explain to workers why there is a KMP and tell them about kangaroos in the survey area.

The induction should cover, in detail, **10. Management / preventative actions** from the KMP, and workers' roles in implementing them. For more complex actions (such as fencing), you should use the information in **10. Management / preventative actions** to prepare specific instructions for workers.

The induction should cover what to do if they see kangaroos in the construction area, using the pointers on the next page. You might also want to print or photocopy the next page and put it on the noticeboard.

If you see a kangaroo in the construction area ...

- Let the kangaroo leave of its own accord.
- Don't herd the kangaroo: it is an offence under the *Wildlife Act 1975*. Herding can stress and confuse a kangaroo, and make it behave erratically. This can result in the kangaroo, and people, being injured.
- Try to identify where the kangaroo entered the construction area. Temporarily widening the entry point might encourage the kangaroo to leave through it. If the kangaroo leaves, securely close off the entry point as soon as possible.
- Report seeing the kangaroo to the ecologist (who might need to reassess the kangaroo management plan, and increase monitoring).
- If there are things attracting kangaroos (such as food, shade, water and habitat) in the construction area, contact the ecologist immediately about amending the site's kangaroo management plan to possibly remove the attractants.
- If the kangaroo is injured, or will not leave by itself, contact one of these agencies for advice:
 - Help for Wildlife (0417 380 687)
 - Wildlife Victoria (1300 094 535)
 - BADGAR emergency 24-hour wildlife rescue centre (1300 223 427).
- If a kangaroo is injured or killed in a construction area covered by a kangaroo management plan, the Department of Environment, Land, Water and Planning must be notified as soon as possible on 136 186.
- All people must obey standard construction area speed limits.

2. Introduction

The template has brief text that must be reproduced as-is in the KMP.

3. Kangaroo management rationale

The template requires you to explain the need for a KMP for this site, in terms of planning requirements. This explanation need only be brief, but should state clearly the drivers for the plan. For example, it might include:

- reference to the specific KMP requirement in the local planning scheme
- reference to any local government policy or activity that gives context to, or further explains, the requirement
- any examples or case studies, particularly about kangaroos, that illustrate the importance of kangaroo management to the local government.

The template also requires you to explain the need for the KMP in terms of human safety, animal welfare and environmental protection. There is further information about these rationales for kangaroo management in **Kangaroo management rationale** (p. 2). Using this information as a guide, briefly explain what it is about this particular site and its kangaroos that gives rise to human safety, animal welfare and environmental protection issues. For example, you might refer to and name local roads, exit routes, nearby developments or conservation areas to explain the rationale for kangaroo management in this location.

4. Site description

The template requires you to describe the site in terms of the following features.

a. Estimated current home range in the survey area

This is how much of the survey area kangaroos appear to be using, and if kangaroos are able to access adjacent areas or not.

b. Vegetation cover

Vegetation cover is, for example, a patch of native vegetation, pasture or bare earth. You need to know what vegetation cover there is, to determine if:

- the land is providing kangaroos with edible grasses and herbs
- whether or not kangaroos might be attracted to the area
- a vegetated area could be potential kangaroo habitat, when determining a sustainable population limit
- any native vegetation is present, and is to be retained for conservation purposes.

c. Threatened species and ecological communities

The presence of threatened flora, fauna and ecological communities in the planning permit area may affect the determination of the sustainable population limit.

DELWP's *Biodiversity Conservation Strategy for Melbourne's Growth Corridors* has determined the location and size of conservation areas designated for protecting specific threatened species and communities. If the KMP proposes to in situ manage kangaroos in a conservation

area, it must be clear that the management objectives for the area will not be compromised, including that grazing by kangaroos will not affect threatened values.

d. Protected flora and fauna

While conducting a survey, ecologists must be aware of protected wildlife and wildlife habitat within the survey area, and include this information with the site map.

To determine the presence of protected flora and fauna, the ecologist should review:

- any approved conservation management plan for the area
- maps from the biodiversity plan and/or threatened species action plan from the relevant precinct structure plan, if applicable
- the native vegetation precinct plan for the precinct, if applicable
- DELWP's *Vertebrate fauna translocation policy* (2012).

If anyone involved in the survey finds protected (native) wildlife that is injured or in immediate danger, they should contact a qualified wildlife rescue agency such as:

- Help for Wildlife (0417 380 687)
- Wildlife Victoria (1300 094 535)
- BADGAR Wildlife Rescue (1300 223 427).

If anyone involved in the survey finds any rare or threatened fauna or flora¹ not already recorded in the conservation management plan or the precinct structure plan, they should note its exact location and email the details to biodiversity.info@delwp.vic.gov.au.

e. Parks, reserves or conservation areas in, and abutting, the survey area

Undeveloped parks, reserves and conservation areas will be a major source of refuge and habitat for kangaroos as the growth corridors become increasingly urbanised. The presence or absence of these open spaces will influence the management approach. The KMP should also note parks, reserves and conservation areas connected with the survey area via a corridor or open space.

f. Landscape features

Landscape features should be identified (such as elevated rises, fences, dams and other water sources) influence management actions. For example, a dam may need to be drained or filled in to discourage kangaroos from remaining in an area. In other cases, a dam may be an important source of water in a reserve that is suitable for a small *in situ* population.

g. Major hazards

Major hazards (such as roads, quarries and deteriorating fencing) must be identified, so risks can be mitigated through the KMP.

¹ As listed in the *Environment Protection and Biodiversity Conservation Act 1999* or the *Flora and Fauna Guarantee Act 1988*, or in DELWP's advisory lists, at www.delwp.vic.gov.au.

Site map

The template also requires you to attach one or more aerial maps of the site, identifying key features.

5. Survey methodology

The template requires you to explain the methodology you used for the:

- initial presence/absence survey (for the full and abridged KMPs)
- population survey (for the full KMP only).

There is further information about methodological requirements for both surveys in **Conduct an initial presence/absence survey** (p. 7) and **Conduct a population survey** (p. 8).

The template also requires you to attach a summary of previous kangaroo surveys and records, if they are available.

6. Population survey results

This section is in a full KMP (Template A) only.

The template requires you to provide the results of the population survey, including:

- the total number of kangaroos or their estimated abundance (kangaroos / ha)
- the location of kangaroos surveyed
- notable patterns of movement onto and across the site
- any evident sign that any kangaroo is diseased or lame
- any other notable information.

There is further information about how to conduct the population survey in **Conduct a population survey** (p. 8).

7. Plan goals

The template has brief text that must be reproduced as-is in the KMP. However, you must choose between two blocks of text, depending on whether or not the KMP includes a staged development plan.

Development lifetime

The template requires you to state that the KMP is based on a consideration of the lifetime, and end-point, of the development. This means that you must consider—as you choose management options—what human safety, animal welfare and environmental risks there are and will be, and the kangaroo management outcomes you want:

- at the present, undeveloped state of the site
- during development
- when development is complete, and beyond.

The template also requires you to say whether by the end-point of development there will be no kangaroos on the site, or whether a sustainable population of kangaroos is likely to remain on, or adjacent to, the site in a specified park, reserve or conservation area.

To consider these things, you can ask questions like:

- will the developed area be completely urbanised, or will it include some sizable natural / open areas (over 20 ha) that could potentially provide kangaroo habitat
- what will be the purpose of any open space (for example, for conservation; for active or passive recreation; or encumbered for drainage, power lines or utilities)
- who will manage the open space?

There is further information about in situ management under **In situ management of a sustainable kangaroo population** (p. 28).

Responsive management

The template requires you to acknowledge that, to be successful, kangaroo management must be responsive. You can't know how exactly kangaroos will respond to the actions in the KMP, or what other unpredicted things may arise. Responsive management is a systematic approach to planning, managing and monitoring, whereby you adjust your KMP in light of how kangaroos actually respond to the initial management actions.

To continue moving toward your goals—to minimise risks to public safety, animal welfare and the environment—your KMP should specify initial management actions, and responsive actions to account for how kangaroos actually respond.

8. Staged development plan

Staged development should always be the first option you assess. You should include staged development in a full or abridged KMP, unless site circumstances clearly rule it out. If you decide that staged development is unsuitable or impossible, you must make this clear, and explain why, in the KMP.

The template requires you to explain the development stages, including the estimated dates for each stage, and how development will be staged to minimise the risk of kangaroos being landlocked.

You must also attach A3 or A4 drawings or plans for the staged development, including the estimated dates for each stage.

9. Assessment of other management / preventative options

This section is in both the full (Template A) and abridged (Template B) KMPs. However, in the full KMP, the context is managing a population of kangaroos using the survey area. In the abridged KMP, the context is preventing kangaroos from using the area.

The template requires you to assess the suitability of each of six management options that DELWP allows in a KMP:

- staged development
- exclusion fencing
- removing water points and edible grasses and herbs
- in situ management of a sustainable kangaroo population
- culling
- fertility control (in some cases, usually outside growth corridors).

The **Management actions** chapter (p. 23) has information about the six options, and information about three non-allowable options—translocation, herding and scaring—and why DELWP does not allow them. DELWP will not approve a KMP that includes non-allowable management options.

An option is suitable for your KMP if DELWP allows it, and if it will contribute to achieving the KMP's goals: that is, whether it is fit-for-purpose.

Using Table 1: Assessment of kangaroo management options, record:

- what the option is
- if the option is fit-for-purpose for your KMP
- management actions to implement the option.

10. Management / preventative actions

This section is in both the full (Template A) and abridged (Template B) KMPs. However, in the full KMP, the context is managing a population of kangaroos using the survey area. In the abridged KMP, the context is preventing kangaroos from using the area.

If necessary, consult with DELWP and other stakeholders about management actions.

Initial and responsive management actions

The full KMP must differentiate between:

- initial management actions, to minimise opportunities for kangaroos to enter the construction area (to be implemented immediately or in the short term), and
- responsive management actions, to plan for, and respond to, the unlikely event that kangaroos do enter the construction area (to be implemented if the initial actions do not fulfil the KMP's goals).

Template A requires you to complete Table 2: Initial and responsive management actions, by deciding if the management actions you listed in Table 1 are initial or responsive actions, and by providing further details about them.

All actions to be listed in Template B are preventative management actions.

Use Table 2 to record:

- each action you decide on
- steps to completing each action
- the deadline (or a time window, if necessary) for completing each action, whether it be before, during or after construction
- the performance indicator: that is, the yardstick against which you will measure if the action is successful
- who is responsible for the action.

Use the remaining columns in the table to record the outcomes of the action, as you go about implementing the plan after it is approved. Specifically, you record:

- the date that the action is completed
- if the action was successful

- any comments about the success or otherwise of the action, and any follow-on action required.

In situ management, culling

If the KMP includes in situ management, the template requires you to include:

- an assessment of the potential kangaroo habitat area within the open space, and an explanation of why this area can sustain a population of kangaroos indefinitely
- the sustainable population limit, the rationale for this limit and the methodology used to determine it.

There is further information about in situ management under **In situ management of a sustainable kangaroo population** (p. 28).

For culling, as an initial or responsive management action, the required further information is:

- authority to control wildlife (ATCW) permit application details
- details of contracted shooter(s), if already known
- the number of kangaroos permitted for destruction
- the method of destruction
- the timing of destruction
- the carcass disposal method.

There is further information about culling and the disposal of carcasses under **Allowable options: Culling** (p. 30).

11. Monitoring

This section is in the full KMP (Template A) only.

The template requires you to explain how you will monitor implementation of the KMP, including the monitoring methodology and frequency.

Each of the allowable management options has different monitoring requirements.

Staged development, exclusion fencing, removing water points and edible grasses and herbs

During staged development, if anyone sees a kangaroo in the construction area, they must report it immediately to the site manager. The site manager must:

- address the situation as advised in **Site induction** (p. 11)
- report the presence of the kangaroo(s) to the ecologist.

The ecologist should conduct a formal site visit, for monitoring purposes, every six months for the entire duration of development on the site, and for six months after works are completed. During this visit, the ecologist should determine whether kangaroos are using the survey area or not, using the methodology explained in **Conduct an initial presence/absence survey** (p. 7).

If kangaroos are present, the ecologist should use the methodology explained in **Conduct a population survey** (p. 8) and record:

- the total number of kangaroos

- any evident sign that any kangaroo is diseased or lame
- whether staged development is avoiding landlocking kangaroos (and, if relevant, any change in the degree of landlocking since the last assessment)
- any other notable information.

In situ management of a sustainable kangaroo population

More intensive monitoring than for other management options is needed if kangaroos remain on-site in protected areas under the in situ management option. Monitoring should occur every three to six months during the works period. DELWP will advise the actual frequency, which will depend on the circumstances. After works finish, DELWP might negotiate with the land manager for ongoing monitoring.

Monitoring of an in situ population of kangaroos should determine:

- the total number of kangaroos
- if there is any evident sign that any kangaroo is diseased or lame
- by a visual assessment, the availability of water, shelter and edible grasses and herbs
- if the in situ management is meeting animal welfare requirements
- any other notable information.

The ecologist must notify DELWP if any kangaroo is diseased or lame.

Allowable options: Culling

If kangaroos have been culled to reduce an in situ population, the ecologist should count the population every six months to ensure it is under the sustainable population limit.

If one or more kangaroos are destroyed because of disease or lameness, the ecologist should reassess the population within a month of that happening, to check that no other diseased or lame kangaroos have been overlooked. Following this reassessment, the ecologist should conduct the next regular, six-monthly sustainable population limit assessment.

The six-monthly sustainable population limit assessment should determine:

- the sustainable population limit and the number of kangaroos destroyed to return to within the limit
- if there is any evident sign that any kangaroo is diseased or lame
- by a visual assessment, the availability of water, shelter and edible grasses and herbs
- if the in situ management is meeting animal welfare requirements
- any other notable information.

The culling of kangaroos can pose logistical and public safety difficulties, and you may need to periodically reassess its suitability as a management option.

Fertility control

As DELWP will only approve fertility control as part of a trial or research project, the monitoring regime must be proposed as part of the design of the trial or project.

12. Contingency planning

This section is in the full KMP (Template A) only.

The template requires you to describe what action will be taken if:

- a kangaroo is sighted in a construction area
- a kangaroo is injured or killed in a construction area
- there is any visible sign that any kangaroo is diseased or lame
- there is a collision between a kangaroo and a vehicle
- a kangaroo is injured or killed by a dog
- other scenarios (due to specific site risks) eventuate.

For more information about what to do if any of these things occur, see:

- **Site induction** (p. 11)
- **Culling** (p. 30)
- **Disposing of kangaroo carcasses** (p. 31).

Submit the KMP

A planning permit applicant can submit a KMP in one of two ways.

They can submit the KMP to DELWP for approval, before submitting their permit application to the local government. DELWP will assess the KMP. When DELWP approves the KMP, it will provide the applicant with an approval letter to submit with their permit application to the local government.

Alternately, they can submit their KMP to the local government, together with their permit application. The local government will provide DELWP with the KMP. When DELWP approves the KMP, it will tell the local government.

In either case, DELWP may require the applicant to revise and resubmit the KMP, and will give them feedback about any necessary revisions. It may also require more information.

Site works cannot start until DELWP approves the KMP. You must allow enough time for:

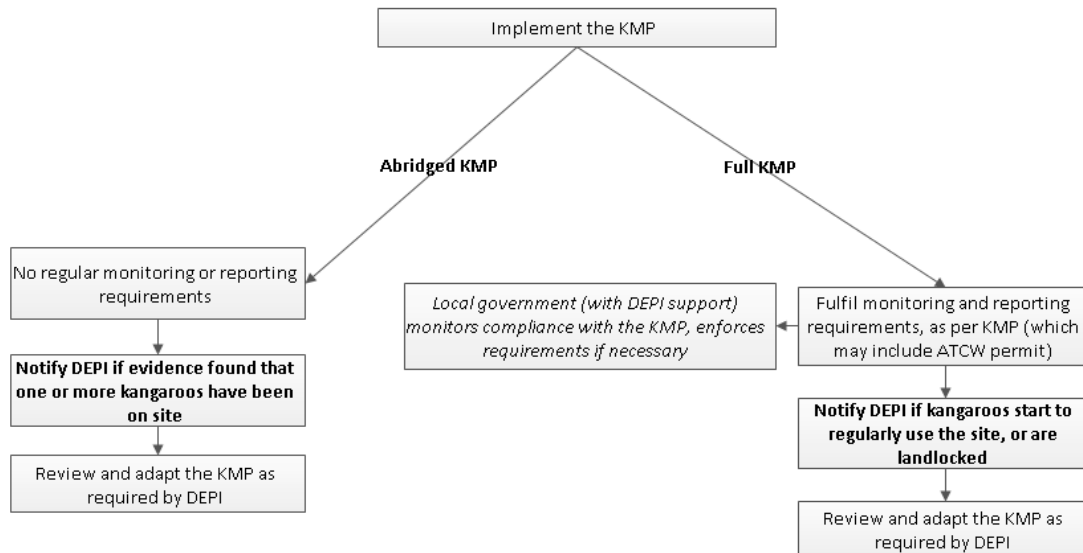
- any changes DELWP may require to the KMP before it approves it
- any management actions in the KMP, before on-ground works can start
- if the KMP includes in situ management of a sustainable population of kangaroos, meetings between DELWP, the landowner and the future land manager that will probably be required.

If you choose the second way to submit the KMP (with the planning permit application), you run the risk the application will be delayed if DELWP requires changes to, or more information about, the KMP.

Successful completion of this step means that the permit applicant will have met the local government's requirements for a KMP: it is outside the scope of this guide to advise about any other requirements the local government may have in relation to the permit application.

Implementing a kangaroo management plan

The figure below shows the main steps to implementing a kangaroo management plan. These steps are explained in the remainder of this guide.



Implement the KMP

You must submit the KMP, and DELWP must approve it, before site works start. Site works cannot start until DELWP approves the KMP.

When implementing the KMP, all people should follow applicable legislative, organisational and site-specific occupational health and safety requirements. Specification of these requirements is outside the scope of this guide.

For information about what to do if anyone sights a kangaroo in the construction area, see **Site induction** (p. 11).

Monitor implementation of the KMP

At **11. Monitoring**, the template requires you to specify how you will monitor implementation of the KMP.

For a full KMP, each of the allowable management options have particular monitoring requirements, explained at **11. Monitoring**. For an abridged KMP, you are not required to regularly monitor for kangaroos. However, you must notify DELWP if anyone sees one or more kangaroos on the site.

You must also notify DELWP if, after development starts, kangaroos start to regularly use the site, or are landlocked in the area. DELWP will advise you about how to amend the KMP. You must then submit the amended KMP to DELWP for approval.

Failure to notify DELWP and to manage a local kangaroo population may result in risks to animal welfare, public safety and the environment. It may also constitute wilful negligence if a kangaroo experiences, or is likely to experience, injury, pain or suffering.

DELWP-authorized officers have the power to investigate potential breaches of the *Wildlife Act 1975* and the *Prevention of Cruelty to Animals Act 1986*.

Fulfil reporting requirements

There are no reporting requirements for an abridged KMP.

For a full KMP, every six months, after completing monitoring activities, the ecologist must report on implementation of the KMP to the local government, DELWP and the permit applicant.

This report should include:

- a brief statement (1–2 pages) summarising progress to date and the success or failure of actions, drawing on the information in Table 2
- the updated Table 2, which is the record of management actions and how they are progressing
- reports from any site visits required for the particular management actions (that is, the staged development formal site visit, in situ management monitoring and the sustainable population limit assessment) that have occurred since the last report.

Review and adapt the KMP as required

If the monitoring determines that the KMP is not meeting its goals, you must reassess management options and actions. You must do this in consultation with DELWP, and revise and submit a new table of actions to DELWP within one month of determining the KMP is not meeting its goals.

DELWP may at any time intervene in the implementation of the KMP if it considers there is a risk to animal welfare, public safety or significant native vegetation or threatened species.

Management actions

Legislation applicable to management actions

Some management actions require active intervention with kangaroos. To ensure they do not unreasonably suffer or be distressed, all interventions must comply with:

- *National code of practice for the humane shooting of kangaroos and wallabies for non-commercial purposes* (Commonwealth of Australia, 2008)
- *Wildlife Act 1975* (Victoria)
- *Prevention of Cruelty to Animals Act 1986* (Victoria).

All wildlife in Victoria, including kangaroos and wallabies, is protected under the *Wildlife Act 1975*.

Management authorisations for particular activities

Some activities require a management authorisation from DELWP, including:

- spotlighting
- capture
- tagging or marking for research purposes
- scaring with noise (which takes place from a stationary position, but does not include herding, as explained below)
- darting
- manipulation of habitat outside of approved development areas (other than fencing).

Activities that do not require a management authorisation include:

- visual surveys during daylight hours
- fencing off kangaroo habitat (to exclude land).

DELWP will not issue a management authorisation for, and will not approve a KMP which includes:

- chasing or herding kangaroos: herding can greatly stress kangaroos and can injure them (for example, kangaroos that attempt to jump over or crawl under fences can eject their pouch young)
- using dogs to pursue, injure or kill kangaroos
- poisoning kangaroos
- supplementary feeding of wild populations.

For further information, or to apply for a management authorisation, please contact the DELWP Permits Coordinator (Port Phillip Region) on 136 186.

Authority to control wildlife

Some management actions require an authority to control wildlife (ATCW) permit from DELWP.

DELWP advocates the use, wherever possible, of non-invasive, non-lethal techniques to manage wildlife. However, in some kangaroo management situations, non-lethal techniques

may prove ineffective or may be determined unsuitable under a rigorous options assessment, as part of preparing a KMP.

Also, where DELWP endorses in situ management of kangaroos, an intermittent regime of population management will likely be required. In these circumstances, lethal control options may be necessary.

Where an approved KMP includes destroying kangaroos, an ATCW permit will be required.

DELWP considers all ATCW permit applications case-by-case, and only issues an ATCW permit where there is a demonstrable need to control numbers and after considering:

- the urgency of the situation
- other measures available to manage the situation
- past management
- the risk of not acting
- the local and broader environmental context
- the conservation status of the species.

To apply for an ATCW permit, use the form available at <http://www.dse.vic.gov.au/plants-and-animals/forms>. For more information, contact the ATCW Coordinator (Port Phillip Region) on 136 186.

Allowable options

Staged development

Staged development should always be the first option considered, and be included in a full or abridged KMP. Unless it is clearly unsuitable, a KMP must include a staged development plan.

Staged development is planning the order of each stage of a subdivision development to avoid landlocking kangaroos. It requires minimal human intervention. It should be used with other management options (such as removing attractants, or erecting exclusion fencing).

Staged development may not be suitable if:

- the land to be developed is the last undeveloped pocket in an already-developed area (that is, the development itself is landlocked), and the kangaroos clearly have nowhere to move
- the development is not a subdivision and/or occurs in only one stage
- the development has to proceed in a certain staging order (due to infrastructure constraints), regardless of the risk of landlocking kangaroos.

The general principle of staged development is that new development should abut existing development, and progress toward undeveloped areas. Where there are other developments adjacent or nearby, all landowners / land managers should try to work together, as early as possible in the development planning stages. That way, they can coordinate their actions to stage development across the whole area, which will minimise the possibility that they landlock kangaroos.

A staged development plan must:

- explain the development stages, including the estimated dates for each stage
- explain how development will be staged to minimise the risk of kangaroos being landlocked

- reflect the entire lifespan of the proposed development.

The ecologist should use the initial presence / absence survey and the population survey information to inform the staged development plan, to minimise the likelihood of landlocking kangaroos during development.

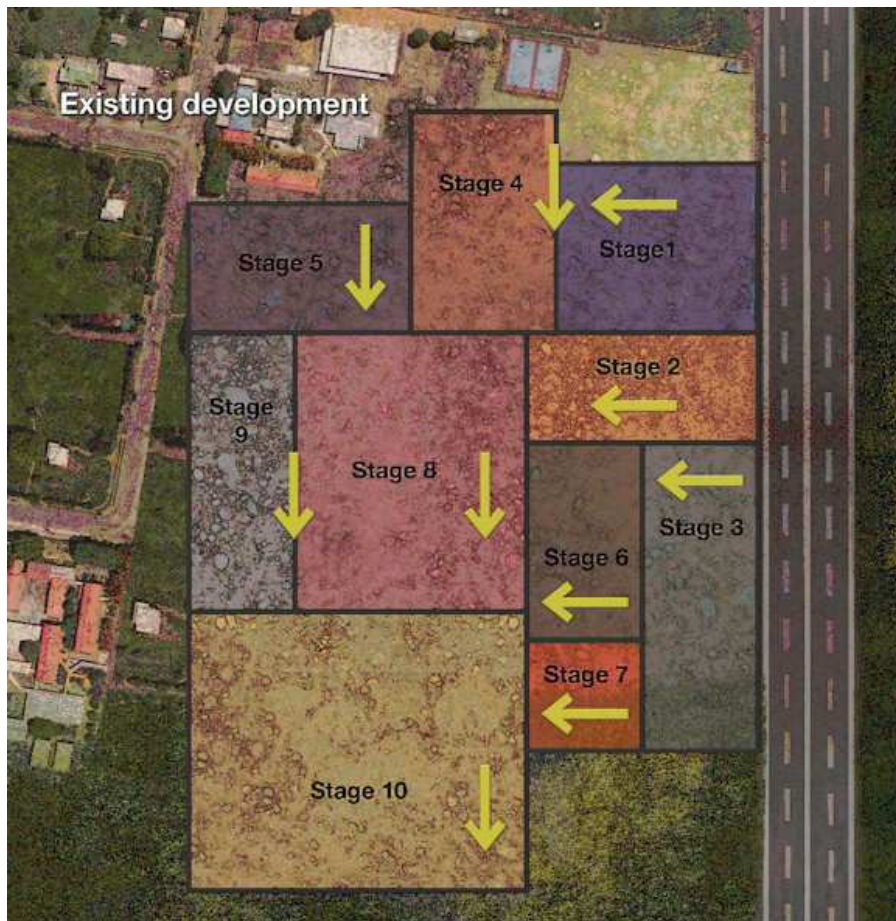
A staged development plan should consider exit routes for kangaroos and, where possible, show the predicted exit route. With a single large building project, this may mean that part of the development is delayed until the rest of the works are completed, so kangaroos have the time and space to leave the site. When this happens, the final part can be developed. Gaps between development and open space, and creek lines, can also be effective exit routes.

Exit routes should avoid potential hazards to kangaroos (such as nearby roads, fences, gates and quarries), whether kangaroos take the predicted route, or some other route. The plan should not make kangaroos cross roads. If this is not possible, the plan should include temporary or permanent kangaroo-crossing signage, in consultation with VicRoads and the local government.

Exclusion fencing may be needed to close off areas after a stage has started. Some fencing may be necessary to keep kangaroos from hazardous areas, or to guide them along the predicted exit route. Exclusion fencing is explained below.

Figure 2 illustrates how staged development may occur in an area adjacent to existing development. It shows how development starts close to hazardous or built-up areas (in this case, a major road and housing) and progresses toward undeveloped areas.

Figure 2: An example of staged development



Exclusion fencing

DELWP encourages the upgrading of standard construction fencing with kangaroo-proof features to serve as exclusion fencing around hazardous areas and future construction areas. Exclusion fencing is not a stand-alone action, but a temporary measure as part of staged development to protect kangaroos from hazards.

Exclusion fencing is kangaroo-proof fencing (that is, fencing with kangaroo-proof features) typically used to prevent access by kangaroos to:

- hazardous areas (such as busy roads or construction areas)
- future construction areas, as part of the staged development plan.

You can only use exclusion fencing if there are no kangaroos inside the area to be fenced: otherwise, you will landlock them. Also, you cannot set up a situation where kangaroos might become trapped inside the fencing. One-way gates in fencing allow kangaroos to leave a development area, and stop them returning.

Exclusion fencing is not a stand-alone option: it is fencing that both gives effect to staged development (by excluding kangaroos from areas where development has started, and protecting them from hazards in those areas), and protects them from other hazards.

Exclusion fencing, used with staged development, has the effect of progressively reducing the kangaroos' habitat, while leaving them with a longer-term route to neighbouring habitat, a route that is safe and avoids roads. However, there is no guarantee the kangaroos will move on—they may not, given their strong attachment to their home range—and you must not pressure them to do so. Pressuring them to disperse risks them crashing fences to escape, resulting in death or injury; increasing competition for nearby pasture; damaging the natural environment; moving them into residential areas; and increasing collisions with vehicles. And it may take a very long time for them to move.

Exclusion fencing must be designed to discourage kangaroos from trying to jump over, go under or push through it. This may cost more up-front, but will save on maintenance costs in the longer term. Standard fencing (which does not have a secured apron of wire mesh) is not suitable for exclusion fencing. Kangaroos tend to be reluctant to jump fences: they prefer to move along the fence line and take advantage of gaps underneath.

Exclusion fencing for kangaroos should:

- be chain-link (cyclone) fencing or deer mesh (also known as K wire)
- not be ring-lock-style fencing (which is an entanglement hazard)
- be high-tensile, heavy galvanised wire
- be at least 1.9 m high (deer mesh is produced in this size)
- have no barbs
- have no loose or open wires
- be completely free of holes and gaps in, and under, the fence to stop the kangaroos trying to escape, and to stop them being injured.

Prevent gaps at the base of the fencing by:

- having a secured mesh apron

- embedding the fence
- grading the fence line to eliminate dips
- using crushed rock or concrete footing underneath.

Other modifications to the fencing might be:

- making it more visible by marking the top with coloured tape, piping or tags: fences are more often damaged in low light (that is, at dawn and dusk) by kangaroos trying to pass through them, and they may be deterred from trying to jump the fence if they can clearly see how high it is
- sloping it outwards, so the top is leaning toward the direction of approach at a 45° angle: kangaroos clear high fences by getting as close to the fence as possible and taking a near-vertical jump, so angling the fence stops kangaroos getting close enough to the fence's edge to jump.

Fencing around construction areas should be temporary, so it can be moved as the staged development unfolds and the locations of hazards changes, as well as to prevent landlocking. Fencing can be more permanent if its purpose is to prevent access to permanent hazards (usually roads).

Fences need ongoing maintenance. Kangaroos are powerful animals and can damage fences (and seriously injure themselves) by trying to move through, under or over them.

While erecting and maintaining fencing can be costly and time-consuming, the costs are much less than some other options.

On the day (or the day before) fencing is installed, you must monitor the area to establish that there are no kangaroos present. You must also monitor the area the day after the fencing is installed, to check that no kangaroos are trapped inside it.

Removing water points and edible grasses and herbs

DELWP encourages the removal of water points and edible grasses and herbs on or near the site. It can be a straightforward, effective and non-invasive way to discourage kangaroos from moving into an area, or returning to their former home range.

Kangaroos are likely to continue foraging as long as food and water are readily available, despite disturbance to, or construction on, a site. As the growth corridors become increasingly developed, kangaroos will also likely congregate in areas where food and water are most available.

Removing water points means draining or filling in farm dams or other human-made water sources. While it is not clear whether this is effective with kangaroos, some research suggests that removing water points may have only a limited and localised benefit, as kangaroos may meet their water needs from lush, edible grasses and herbs if they are available. This is the case for the red kangaroo. Kangaroos will depend more on water points if edible grasses and herbs become drier. Kangaroos are highly mobile and may easily seek out alternative water sources in surrounding areas, although this is likely to become more difficult and risky as growth corridors develop over time.

You can remove edible grass and herbs—consistent with the precinct structure plan—by mowing, slashing or scraping the topsoil layer with heavy machinery before development starts. Kangaroos will not graze in an area where the edible grasses and herbs have been

completely removed. You should remove the edible grasses and herbs one to three days before installing fences. The ecologist should advise about when not to mow or slash, because of the risk of spreading high-threat weeds.

You should closely monitor for any regrowth—or erect exclusion fencing—because fresh, young grass shoots may attract foraging kangaroos.

Slashing vegetation is unlikely to be effective: it often results in new grass shoots, which grazing kangaroos find highly attractive. The land manager must be consulted if slashing is proposed on public land or in conservation areas, or on private land abutting public land, as it spreads highly invasive grassy weeds (such as needle grass).

Removal of any native vegetation (including native grasses) must be in line with the Victorian Government's *Biodiversity Conservation Strategy*.

Attractants should not be removed if the kangaroos are landlocked and cannot move away from the site to find food and water in the surrounding area, particularly during drought: otherwise, the kangaroos risk dehydration and starvation.

In situ management of a sustainable kangaroo population

In situ management of kangaroos in a defined, open-space area (that is, in a park, reserve or conservation area) is an allowable management option if the land manager, in consultation with DELWP, considers that the area can provide suitable habitat for kangaroos up to the sustainable population limit, without supplementary feeding and watering, and that doing so will not compromise other management objectives for the area.

Kangaroos might be managed in situ, for example, if there is an existing population which is providing an ecosystem service (such as controlling weeds by grazing), or is well-known and valued by the local community.

Ongoing population control is invariably part of managing kangaroos within a sustainable population limit, in situ.

Sustainable population limit

A sustainable population limit is an estimate of the number of kangaroos an area can sustain, without supplementary feeding and watering and while meeting management objectives for the area.

A KMP must use a sustainable population limit methodology, rather than other density models (such as carrying capacity). In recent years, kangaroo management has moved away from using carrying capacity (which is more suited to rural and farming areas, and is based on the availability of pasture) to sustainable population limit (which takes account of management objectives for animal welfare, human safety and environmental protection).

The sustainable population limit is expressed as a ratio (kangaroos / ha). Although there is scant research on the optimum ratio, ACT research for grassland and grassy woodland ecosystems suggests that grassland ecosystem values can be maintained with densities below 1.5 kangaroos / ha (that is, 150 per km²). Considering the urban nature of Melbourne's growth corridors, and the greater management complexity in urban areas, DELWP recommends a lower density, 0.6–1.0 kangaroos / ha (60–100 per km²) as a starting ratio for KMPs in the growth corridors.

The ecologist should determine the starting ratio (between 0.6 – 1.0) for the KMP in consultation with all relevant parties (such as the developer(s), current and future land owners / managers, DELWP and the local government) and considering local site conditions and context, the goals for the site, and any other factors (for example, if the parties want to take a more conservative, or a more experimental, approach).

Land managers must then regularly (typically, twice a year or more) monitor the kangaroo population to ensure the KMP is achieving its goals. If the starting ratio is too high, there may be human safety or animal welfare concerns, or ecological values may suffer. Over time, as the KMP is implemented and the kangaroo population monitored, the starting ratio can be reviewed.

Supplementary feeding and watering

In situ management must ensure the kangaroos are self-sustaining, and there should be no supplementary feeding and watering of them. If there is, the notion of a sustainable population limit has no meaning. Making the kangaroos dependent on people for food and water reduces their self-sufficiency and makes it likely they will approach humans for food. Kangaroos would also continue to breed up to the limit of the available food supply, increasing the quantity of food they demand.

Other management objectives

Kangaroo mobs in the growth corridors can seek refuge from urban development by moving toward parks, reserves and conservation areas. These areas often have other land management objectives (for example, conservation of native vegetation, or use of the area for active or passive recreation). These land management objectives must be respected.

DELWP discourages in situ management of kangaroos in nature conservation areas (as defined in the *Biodiversity Conservation Strategy*). High-density kangaroo populations can threaten the ecological integrity and significant floristic values of these areas. In other conservation areas, the population of kangaroos must be within the sustainable limit.

Ongoing population control

Where kangaroos are being managed in situ, you will probably need to take ongoing population control measures, to ensure numbers do not exceed the sustainable population limit. This may involve fertility control measures and, as it is extremely difficult to prevent some breeding, continuous on-site population reduction measures.

Determining if in situ management is suitable

To be suitable for in situ management, a site should:

- be capable of providing sheltering habitat for kangaroos up to the sustainable population limit
- have at least 25 ha of suitable habitat
- have a link to other open-space areas, so the population is not completely contained
- have a dependable water supply throughout the year, including during drought
- not have other grazing animals (stock) on it
- not have serious hazards in the vicinity (such as arterial roads or highways)

- not be used for active recreation (passive recreational use is unlikely to conflict with the presence of kangaroos)
- have edible grasses and herbs throughout the year, including during drought
- not have habitat zones and/or threatened flora that would be at risk from a carefully managed kangaroo population.

When determining the suitability of the site, you should:

- consider its long-term design and layout, not just the current layout
- exclude active open space (such as playing fields allocated for organised outdoor sports), vehicle tracks and buffers between major roads and open space
- consider how competing land uses (such as biodiversity and passive recreation) will reduce the actual amount of habitat available for the kangaroos
- consider adjacent and nearby kangaroo habitat and whether, and how many, kangaroos can move to it.

Culling

Culling kangaroos is not a preferred management option and should only be included in a KMP after a rigorous assessment of all options. DELWP acknowledges that culling is sometimes necessary, for example to keep numbers within a sustainable population limit.

Culling means reducing kangaroo numbers, typically by shooting, but also sometimes by darting to capture the kangaroo, followed by lethal injection. DELWP will not issue a permit to poison kangaroos.

A KMP will generally include culling as an responsive management option, if all other options fail. However, in some situations, immediate culling may be necessary to reduce the size of the population, or to euthanise particular kangaroos whose health is failing.

Culling might be necessary if:

- the kangaroos are landlocked by development and the land is not suitable for an in situ population
- the kangaroos were living in situ in manageable numbers, but the population now exceeds the sustainable limit: culling a small number of kangaroos on an as-needed basis will likely be part of an in situ management strategy
- in situ management is neither feasible nor humane, and there are animal welfare and human safety risks
- particular sick, diseased or injured kangaroos in an otherwise healthy population must be euthanised
- particular kangaroos have become accustomed to human communities and are becoming bold or aggressive.

In situ management situations and high-risk kangaroo management situations must be regularly monitored, and the intermittent culling of small numbers will most likely be part of the KMP. This is necessary to prevent rapid population expansion (which greatly amplifies the risks to human safety, animal welfare and the environment), and to avoid a comparatively costly and difficult management scenario.

The following animal welfare principles must be applied with respect to culling.

- The culling of kangaroos should only be included in the KMP after a rigorous assessment of all management options, as documented in Table 1 of the KMP.
- DELWP must authorise any culling. An ATCW permit outlines the conditions and requirements for culling, including the number of kangaroos to be culled, the culling technique, firearm standards and culling timelines. The landowner must submit a full KMP, approved by DELWP, with the ATCW permit application.
- Kangaroos can only be culled by a licensed shooter / darter. If it approves an ATCW permit application, DELWP can recommend a shooter / darter to undertake the culling.
- Culling must be done humanely, in accordance with the *National code of practice for the humane destruction of kangaroos and wallabies for non-commercial purposes*.
- To keep a kangaroo population within its sustainable limit, a landowner / manager must take a proactive approach that ensures minimal ongoing culling of kangaroos. They should prevent population levels reaching crisis point, to need a large cull.
- Dogs must not be used to kill, injure or pursue kangaroos.

Disposing of kangaroo carcasses

Where kangaroos have been culled or euthanised, the shooter / darter (who DELWP will approve) will be able to advise on, and possibly undertake, the disposal of kangaroo carcasses.

The preferred method of disposal is to send kangaroo carcasses to a knackery, rendering plant or appropriately licensed landfill. If this is not possible, a limited number of carcasses can be buried on private property, as long as the burial pit does not adversely affect the land, surface waters, ground waters or the air (that is, create odour).

A burial pit for kangaroo carcasses must be:

- on elevated land, with a slope of less than 5%
- at least 2 m between the water table and the base of the pit
- at least 200 m from any surface waters
- at least 300 m from neighbouring houses
- in soils that are not highly or moderately permeable.

Care should be taken to:

- cover the carcasses with at least 1 m of soil
- direct surface run-off away from the pit
- slightly mound the pit after backfilling.

Carcasses should not be left to rot in paddocks: this can pose a disease risk and can contaminate land and water.

Burning of dead stock is not permissible, unless instructed by DELWP.

Use of carcasses

Commercial use of destroyed kangaroos is not permitted in Victoria. No part of any kangaroo may be stored or processed in any shop or commercial / business premises (excluding licensed taxidermists).

The personal, non-commercial use of kangaroo carcasses destroyed under an ATCW permit is permitted. If any kangaroo products are removed from the property for which the ATCW permit was issued, the authority holder and the agent must keep a record or log of the ATCW permit number, the authority holder's / agent's name, and the date and number of kangaroos taken (whole or parts) from the property subject to the ATCW permit. The authority holder and agent must keep this record for three months after the ATCW permit expires, or for one month after all meat has been consumed, whichever is later.

A record is not required if the authority holder and agent do not remove any products from the property for which DELWP issued the ATCW permit.

Fertility control

A KMP should not include fertility control as a management action because of its limited effectiveness, significant labour and financial costs and animal welfare risks. However, DELWP may in some cases (usually outside growth corridors) allow a KMP to include a trial of fertility control methods, to add to research about effective and non-lethal population control methods.

Fertility control techniques include surgical procedures (for example, vasectomy), contraceptive implants, oral contraceptives and chemical sterilisation.

The effectiveness of fertility control techniques for kangaroos has been shown to be limited to smaller, captive groups of kangaroos, and to be less-effective over time. Little, if any, long-term effect on the numbers of larger, free-ranging mobs has been proven.

Studies of contraceptive use on wild populations of kangaroos show that they initially prevent pregnancy, but that their effects wane after a few years and they must be re-administered. It is also difficult and laborious to identify previously treated kangaroos and re-capture them to re-administer contraceptives. However, fertility control techniques could be effective with small populations that are closed to untreated males.

Some people see fertility control as a humane (and therefore desirable) option for controlling kangaroo populations. The reality is that fertility control techniques often need the kangaroos to be captured and anaesthetised. This risks capture myopathy (resulting from the stress of being captured), which causes paralysis and failure of the heart and other muscle groups. Fertility control techniques can also involve invasive surgical procedures and are labour-intensive, time-consuming and costly for the control of a common species.

Non-allowable options

Translocation

A KMP should not include translocation as a management action. Translocation is the removal (by humans) of one or more kangaroos from an area to another (predetermined) area for release. Translocating kangaroos involves capturing, sedating, handling and transporting them.

Kangaroos are particularly susceptible to capture myopathy, resulting from the stress of being chased before capture, being handled, or struggling to escape traps or nets. Capture myopathy causes paralysis and failure of the heart and other muscle groups. Sedation immediately after capture can reduce the risk of capture myopathy, but only an authorised person can administer sedatives, and they can complicate the kangaroo's release. Also, kangaroos cannot be tranquilised for long, as they cannot thermoregulate. This inability to thermoregulate can also result in capture myopathy.

If a kangaroo survives capture myopathy, it may try to return to its home range. Kangaroos—particularly females—have strong site fidelity. Translocated kangaroos have often been seen to wander, and to move long distances, exposing them to hazards including collisions with vehicles and attacks by dogs. If the recipient site is close to the original site, it could need to be fenced, to stop kangaroos moving back to the original site.

Translocated kangaroos face territorial disputes with other kangaroos. If the recipient site is the territory of other kangaroos, translocation will disturb their social structure and increase competition for food, habitat, water and mates. This competition might force the existing or translocated kangaroos into the surrounding landscape, to face a range of hazards.

It is usually very hard to find a site to which to translocate a large number of kangaroos that has enough water, edible grasses and herbs and habitat, and which does not face future development pressure. Also, the landowner / manager of the recipient site must agree to receive the kangaroos, to have a KMP for them, and to manage them long after they are established at the recipient site.

Translocation can also be costly and require a great deal of labour, and runs the risk of transferring disease, and result in poor genetic outcomes. For these reasons, wildlife management bodies rarely condone translocating wildlife.

A kangaroo will occasionally need to be relocated (for example, if it strays into an urban area or a construction area and poses an immediate risk to itself and to people). Relocation is not translocation: relocation is the removal of one kangaroo that is posing an immediate animal welfare or human safety risk, whereas translocation is a planned population control method. If a kangaroo is relocated, it should be to the nearest suitable habitat.

There are a variety of other drawbacks to sedating, transporting and monitoring kangaroos that further reduce its viability as a management option.

Controlled herding

A KMP should not include controlled herding as a management action. It is likely to result in stress or injury to kangaroos and is unlikely to be successful in the long term. DELWP will not issue a management authorisation for controlled herding.

Controlled herding requires the creation of fenced corridors to provide a predictable pathway through which kangaroos can move. The fenced corridors use kangaroo-proof fencing (including shade cloth that blocks out the surroundings) that makes it easier to drive the kangaroos forward. This option can be labour-intensive and complex to execute, and more so with larger mobs and longer corridors.

Herding is non-lethal but it can significantly stress kangaroos. It can also result in injury, death or the ejecting of pouch young if stress turns to panic and kangaroos behave erratically.

Building a fenced corridor with kangaroo-proof fencing requires a high degree of planning, and can make a KMP much more expensive. It may also be difficult to locate: a corridor that is safe for kangaroo passage must not cross roads, rail lines or public use zones.

Controlled herding using a fenced corridor may only have short-term effectiveness. Kangaroos are strongly attached to their home range, and may attempt to return after being herded from it. This method might be more effective if it is combined with the use of temporary exclusion fencing to prevent kangaroos from returning to their home range, but doing this imposes additional costs to install and maintain the fencing.

Also, kangaroos that are herded into unfamiliar territory may face territorial disputes with other kangaroos.

Scaring

A KMP should not include scaring as a management action in the growth corridors.

Scaring—not to be confused with herding—is done from a stationary position and aims to deter kangaroos from remaining in an area, rather than to drive them toward another area. Scaring involves frequently using loud noises (such as is made by non-lethal firearm cartridges), and sometimes lights, to frighten kangaroos away. If scaring is not done under suitable conditions, it can be risky for humans as well as kangaroos, particularly if the kangaroos panic. For example, frightened kangaroos fleeing across roads would be particularly dangerous.

It has mostly been used, with limited success, in low-density areas. There is a much higher level of hazards in the growth corridors—due to their urban-scale density and development activity—for frightened kangaroos, including roads and construction sites. As well, scaring involves making loud noise: this can upset nearby residents and is generally an unsuitable activity for an urban area.

As with herding, scaring may only have temporary success: kangaroos are a territorial species and are likely to return to the site after a short time. Also, kangaroos that are scared onto unfamiliar territory may face territorial disputes with other kangaroos.

Template A: Full kangaroo management plan

1. Cover page

- ✂ **INCLUDE THE TEXT BELOW, AS-IS, IN THE PLAN**
- [] **SUBSTITUTE THE CORRECT DETAILS FOR THE WORDS IN SQUARE BRACKETS**
- **REPLACE THE DOTTED LINES WITH THE CORRECT INFORMATION**

FULL KANGAROO MANAGEMENT PLAN

[NAME OF SITE, PROJECT]

[DATE OF THIS PLAN]

This full kangaroo management plan (KMP) has been prepared on behalf of [PLANNING PERMIT APPLICANT] by [ECOLOGIST]. It provides details of the planned management of eastern grey kangaroos at [SITE NAME AND ADDRESS].

Site

Site name:

Site address

Local government area:.....

Planning permit applicant

Company name:

Contact name:

Contact number: Email:

Ecologist

Company name:

Contact name:

Contact number: Email:

Names of all ecologists involved in preparing the KMP:

.....

Site induction

Does the site induction for construction workers cover this KMP, and what to do if they find evidence of kangaroos in the construction area?

Yes / No

Approved by Date

Name of DELWP officer

2. Introduction

 **INCLUDE THE TEXT BELOW, AS-IS, IN THE PLAN**

The habitat of the eastern grey kangaroo (referred to in this plan as 'kangaroo') in Melbourne's growth corridors is being reduced with the loss of grassland, grassy woodland and farmland as a result of urban growth and implementation of the *Delivering Melbourne's Newest Sustainable Communities* program.

If poorly managed, development in and around the habitat of kangaroos can landlock them, or force them to leave their home range in ways that endanger the safety and welfare of people and of kangaroos, and harm the environment.

This kangaroo management plan (KMP) has been prepared to minimise risks to people, kangaroos and the environment that result from development on the home range of kangaroos. It is a long-term, adaptable plan to minimise risks over the life of development at the site.

Development cannot start until the Department of Environment, Land, Water and Planning (DELWP) approves this plan.

3. Kangaroo management rationale

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.13)**

Explain the need for a KMP for this site in terms of:

- planning requirements (state the planning requirement of the planning scheme applicable to this KMP)
- human safety (for example, vehicle collisions and human interaction with wildlife)
- animal welfare (for example, stressed populations, disease and vehicle collisions)
- ecosystem health (for example, flora and fauna values, ecological communities present).

4. Site description

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.13)**

Describe the site in terms of:

- a) estimated current home range in the survey area
- b) vegetation cover
- c) threatened species and ecological communities
- d) protected flora and fauna
- e) parks, reserves or conservation areas in, and abutting, the survey area
- f) landscape features
- g) major hazards.

 **ATTACH THE INFORMATION BELOW**

Attach one or more aerial maps of the site, identifying key features.

5. Survey methodology



FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.15)

Explain the methodology you used for:

- the initial presence/absence survey
- the population survey.



ATTACH THE INFORMATION BELOW

Attach a summary of previous kangaroo surveys and records, if they are available.

6. Population survey results



FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.15)

Provide the results of the population survey including:

- the total number of kangaroos or their estimated abundance (kangaroos / ha)
- the location of kangaroos surveyed
- notable patterns of movement onto and across the site
- any visible sign that any kangaroo is diseased or lame
- any other notable information.

7. Plan goals



FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.115)



INCLUDE THE TEXT BELOW, AS-IS, IN THE PLAN

The goals of this KMP are to minimise risks to animal welfare, public safety and the environment through: **(CHOOSE ONE)**

- a staged development plan and other initial and responsive management actions
- immediate and responsive management actions: a staged development plan is not suitable, or cannot be modified, for this site.

This KMP is based on a consideration of the lifetime, and end-point, of the development. By the end-point of development **(CHOOSE ONE)**:

- there will be no kangaroos on the site
- a sustainable population of kangaroos is likely to remain on, or adjacent to, the site in a specified park, reserve or conservation area.

This KMP acknowledges that kangaroo management should be responsive to the changing needs and behaviours of the kangaroo population.

8. Staged development plan



FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.16)

Explain the development stages, including the estimated dates for each stage, and how development will be staged to minimise the risk of kangaroos being landlocked.

If you decide that staged development is unsuitable or impossible, you must make this clear, and explain why, in the KMP.

 **ATTACH THE INFORMATION BELOW**

A3 or A4 drawings or plans for the staged development, including estimated dates for each stage.

9. Assessment of other management options

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (p.17)**

Assess the suitability of each of the other allowable management options:

- exclusion fencing
- removing water points and edible grasses and herbs
- in situ management of a sustainable kangaroo population
- culling
- fertility control (in some cases, usually outside growth corridors).

Use **Table 1: Assessment of kangaroo management options** to record:

- what the option is
- if the option is fit-for-purpose for this plan
- details about the management actions to implement the option.

Table 1: Assessment of kangaroo management options

Option	Fit-for-purpose?	Management actions
<i>EXAMPLE:</i> Remove water points	Yes	<ul style="list-style-type: none"> • Fill in two farm dams in the north-east corner of the site, using development fill. • The precinct plan says the dams are not threatened species habitat: there are no salvage or translocation requirements. • The dams can be filled as part of building a road in the north-east corner.

10. Management actions

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (p.17)**

Drawing on the options assessment and supporting information in Table 1, use Table 2 to record initial and responsive management actions. Use Table 2 throughout the life of the KMP to record and detail the progress and outcomes of all actions.

Table 2: Initial and responsive management actions

Initial management actions

Management action	Steps	Deadline	Performance indicator	Responsible person	Date completed	Did the action work?	Comments / follow-on action

Responsive management actions

Management action	Steps	Deadline	Performance indicator	Responsible person	Date completed	Did the action work?	Comments / follow-on action

If the KMP includes an in situ management action, you must also provide:

- an assessment of the potential kangaroo habitat area within the open space, and an explanation of why this area can sustain a population of kangaroos indefinitely
- the sustainable population limit, the rationale for this limit and the methodology used to determine it.

If the KMP includes a culling management action, either as an initial or a responsive action:

- ATCW permit application details
- details of contracted licensed shooter(s) / darter(s), if already known
- the number of kangaroos permitted for destruction
- the method of destruction
- the timing of destruction
- the carcass disposal method.

11. Monitoring

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (p.18)**

Explain how you will monitor implementation of the plan, including the monitoring methodology and frequency.

12. Contingency planning

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (p.20)**

Describe what action will be taken in the event that:

- a kangaroo is sighted in a construction area
- a kangaroo is injured or killed in a construction area
- a kangaroo is diseased or lame
- there is a collision between a kangaroo and a vehicle
- a kangaroo is injured or killed by a dog
- other scenarios (due to specific site risks) eventuate.

13: Reporting and review

 **Follow the instructions below, and in Prepare the KMP (p.20)**

Compile a brief report (1 – 2 pages) on the result of the KMP

- Reporting should occur on a 6 monthly basis and provide information relating to the success of failure of any management option applied, until the subject land is fully developed

Template B: Abridged kangaroo management plan

1. Cover page

- ✂ **INCLUDE THE TEXT BELOW, AS-IS, IN THE PLAN**
- [] **SUBSTITUTE THE CORRECT DETAILS FOR THE WORDS IN SQUARE BRACKETS**
- **REPLACE THE DOTTED LINES WITH THE CORRECT INFORMATION**

ABRIDGED KANGAROO MANAGEMENT PLAN

[NAME OF SITE, PROJECT]

[DATE OF THIS PLAN]

This abridged kangaroo management plan (KMP) has been prepared on behalf of [PLANNING PERMIT APPLICANT] by [ECOLOGIST]. It provides details of the planned management of eastern grey kangaroos at [SITE NAME AND ADDRESS].

Site

Site name:

Site address

Local government area:.....

Planning permit applicant

Company name:

Contact name:

Contact number: Email:

Ecologist

Company name:

Contact name:

Contact number: Email:

Names of all ecologists involved in preparing the KMP:

.....

Site induction

Does the site induction for construction workers cover this KMP, and what to do if they find evidence of kangaroos in the construction area?

Yes / No

Approved by Date

Name of DELWP officer

2. Introduction

 **INCLUDE THE TEXT BELOW, AS-IS, IN THE PLAN**

The habitat of the eastern grey kangaroo (referred to in this plan as 'kangaroo') in Melbourne's growth corridors is being reduced with the loss of grassland, grassy woodland and farmland as a result of urban growth and implementation of the *Delivering Melbourne's Newest Sustainable Communities* program.

If poorly managed, development in and around the habitat of kangaroos can landlock them, or force them to leave their home range in ways that endanger the safety and welfare of people and of kangaroos, and harm the environment.

This kangaroo management plan (KMP) has been prepared to minimise risks to people, kangaroos and the environment that result from development on the home range of kangaroos. It is a long-term, adaptable plan to minimise risks over the life of development at the site.

Development cannot start until the Department of Environment, Land, Water and Planning (DELWP) approves this plan.

3. Kangaroo management rationale

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.13)**

Explain the need for a KMP for this site in terms of:

- planning requirements (state the planning requirement of the planning scheme applicable to this KMP)
- human safety (for example, vehicle collisions and human interaction with wildlife)
- animal welfare (for example, stressed populations, disease and vehicle collisions)
- ecosystem health (for example, flora and fauna values, and ecological communities present).

4. Site description

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.13)**

Describe the site in terms of:

- a) estimated current home range in the survey area
- b) vegetation cover
- c) threatened species and ecological communities
- d) protected flora and fauna
- e) parks, reserves or conservation areas in, and abutting, the survey area
- f) landscape features
- g) major hazards.

 **ATTACH THE INFORMATION BELOW**

Attach one or more aerial maps of the site, identifying key features.

5. Survey methodology

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.15)**

Explain the methodology you used for the initial presence/absence survey.

 **ATTACH THE INFORMATION BELOW**

Attach a summary of previous kangaroo surveys and records, if they are available.

7. Plan goals

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.15)**

 **INCLUDE THE TEXT BELOW, AS-IS, IN THE PLAN**

The goals of this KMP are to minimise risks to animal welfare, public safety and the environment through: **(CHOOSE ONE)**

- a staged development plan and other initial and responsive management actions
- immediate and responsive management actions: a staged development plan is not suitable, or cannot be modified, for this site.

This KMP is based on a consideration of the lifetime, and end-point, of the development. By the end-point of development **(CHOOSE ONE)**:

- there will be no kangaroos on the site
- a sustainable population of kangaroos is likely to remain on, or adjacent to, the site in a specified park, reserve or conservation area.

This KMP acknowledges that kangaroo management should be responsive to the changing needs and behaviours of the kangaroo population.

8. Staged development plan

 **FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (P.16)**

Explain the development stages, including estimated dates for each stage, and how development will be staged to minimise the risk of kangaroos being landlocked. If you decide that staged development is unsuitable or impossible, you must make this clear, and explain why.

 **ATTACH THE INFORMATION BELOW**

A3 or A4 drawings or plans for the staged development, including the estimated dates for each stage.

9. Assessment of other preventative options



FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (p.16)

Assess the suitability of each of the other allowable management options as ways to prevent kangaroos from using the site:

- exclusion fencing
- removing water points and edible grasses and herbs
- in situ management of a sustainable kangaroo population
- culling
- fertility control (in some cases, usually outside growth corridors).

Use **Table 1: Assessment of kangaroo management options** to record options that would prevent kangaroos from using the site, including:

- what the option is
- if the option is fit-for-purpose for this plan
- details about the management actions to implement the option.

Table 1: Assessment of kangaroo management options

Option	Fit-for-purpose?	Management actions
<i>EXAMPLE:</i> Remove water points	Yes	<ul style="list-style-type: none"> • Fill in two farm dams in the north-east corner of the site, using development fill. • The precinct plan says the dams are not threatened species habitat: there are no salvage or translocation requirements. • The dams can be filled as part of building a road in the north-east corner.

10. Preventative actions



FOLLOW THE INSTRUCTIONS BELOW, AND IN PREPARE THE KMP (p.17)

Drawing on the options assessment and supporting information in Table 1, use Table 2 to record and detail any preventative actions. Use Table 2 throughout the life of the KMP to record and detail the progress and outcomes of all actions.

5. References

AWMS (2011). AWMS Position on Urban Wildlife, Australian Wildlife Management Society (Online) <http://www.awms.org.au/pages/positionstatements/urban.html>.

Borland, D., Coulson, G. & Beveridge, I. (2010). Oral necrobacillosis ('lumpy jaw') in a free-ranging population of eastern grey kangaroos (*Macropus giganteus*) in Victoria. *Australian Mammalogy*. CSIRO Publishing.
http://www.publish.csiro.au/view/journals/dsp_journal_fulltext.cfm?nid=256&f=AM10031.

Burton, J. D. (1981). *Studies into aspects of lumpy jaw in macropods*. PhD thesis, Veterinary Science. Melbourne: The University of Melbourne.

Caughley, G. & Sinclair, A.R.E (1994). *Wildlife Ecology and Management*. Boston: Blackwell Science.

Coulson, G. (2011). "Overabundant kangaroo populations in southeastern Australia" in *Wildlife, Land and People; Priorities for the 21st century*. Proceedings of the Second International Wildlife Management Conference. Eds. Field, R.; Warren, R.J.; Okarma, H. and Siervert, P. Maryland, USA: The Wildlife Society.

Coulson, G., Nave, C.D., Shaw, G. & Renfree, M.B. (2008). Long-term efficacy of levonorgestrel implants for fertility control of eastern grey kangaroos (*Macropus giganteus*). *Wildlife Research*. Vol. 35, 520–524.

Coulson, G., Poiani, A. & Nave, C.D. (2003). A modified draw-string trap for capture of kangaroos at fences. *Australian Mammalogy*. Vol 25, 177-182.

DEWHA (2008). *The National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Non-Commercial Purposes*. Canberra: Department of Environment, Water, Heritage and the Arts, Commonwealth of Australia.

DPCD (2009). *Delivering Melbourne's Newest Sustainable Communities (Program Report)*. Melbourne: Department of Planning and Community Development.

DSE (2009). *Strategic Impact Assessment Report for the Environment Protection and Biodiversity Conservation Act 1999*. East Melbourne: Department of Sustainability and Environment.

DELWP (2013) *Biodiversity Conservation Strategy for Melbourne's Growth Corridors*. East Melbourne: Department of Environment, Land, Water and Planning.

DELWP (2014). "Wildlife Management", Department of Environment, Land, Water and Planning (website) <http://www.delwp.vic.gov.au/environment-and-wildlife/wildlife/wildlife-management>.

DSEWPAC (2011). *Survey Guidelines for Australia's Threatened Mammals: Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. Canberra: Department of Sustainability, Environment, Water, Population and Communities.

DTMS (2006). "Evaluation of Methods to Estimate Kangaroo Density" Territory and Municipal Services (website). Canberra: ACT Government.

DTMS (2010). *ACT Kangaroo Management Plan*. Canberra: Department of Territory and Municipal Services.

Effect of Culling. Report for the Kangaroo Management Advisory Panel. Canberra: Australian National University.

EPA Victoria (2009). Industrial Waste Resource Guidelines – Farm Waste Management. Publication IWRG641 (June 2009) EPA Victoria (online)
[http://epanote2.epa.vic.gov.au/EPA/publications.nsf/2f1c2625731746aa4a256ce90001cbb5/a8c064862438722bca2575e4004429a5/\\$FILE/IWRG641.pdf](http://epanote2.epa.vic.gov.au/EPA/publications.nsf/2f1c2625731746aa4a256ce90001cbb5/a8c064862438722bca2575e4004429a5/$FILE/IWRG641.pdf).

Fletcher, D. (2006). Population Dynamics of Eastern Grey Kangaroos in Temperate Grasslands. PhD Thesis Applied Science. Canberra: University of Canberra.

Higginbottom, K. and Skye, P. *Monitoring the fate of translocated Eastern Grey Kangaroos at the Gold Coast*, Gold Coast: Griffith University.

Hume I.D., Jarman P.J., Renfree M.B. and Temple-Smith P.D. (1989). Macropodidae, in *Fauna of Australia*. Vol. 1B Mammalia. Australian Biological Resources Study, eds. DW Walton and BJ Richardson. Canberra: Australian Government Publishing Service.

Jaremovic, R.V. and Croft, D.B. (1991). Social organisation of the eastern grey kangaroo (Macropodidae, Marsupialia) in South eastern New South Wales. *Mammalia*. Vol 55: 2, Pp169–186.

Menkhorst, P. & Knight, F. (2001). *A Field Guide to the Mammals of Australia*. Melbourne: Oxford University Press.

Menkhorst, P. (1995). *Mammals of Victoria: Distribution, Ecology and Conservation*. Melbourne: Oxford University Press.

Miller, E.J., Eldridge, M.D.B., Cooper, D.W., & Herbert, C.A. (2010). Dominance, body size and internal relatedness influence male reproductive success in Eastern Grey Kangaroos (*Macropus giganteus*). *Reproduction, Fertility and Development*, 2010, Vol. 22, 539-549 (available online) http://www.publish.csiro.au/?act=view_file&file_id=RD09061.pdf.

Olsen, P. & Braysher, M. (2000). *Situation Analysis Report; Current state of scientific knowledge on kangaroos in the environment, including ecological and economic impact and effect of culling*. Report for the Kangaroo Management Advisory Committee. Canberra: Australian National University.

Olsen, P. & Low, T. (2006). *Situation Analysis Report Update on Current State of Scientific Knowledge on Kangaroos in the Environment, Including Ecological and Economic Impact and effect of culling*. Report for the Kangaroo Management Advisory Committee. Canberra: Australian National University.

Parks, Conservation & Lands (2006). Report from Parks, Conservation and Lands to the ACT Commissioner for Sustainability and Environment for the Inquiry into Management of Lowland Native Grasslands. Parks, Conservation and Lands: Canberra. (available online) http://www.envcomm.act.gov.au/__data/assets/pdf_file/0010/169282/sub17_parks_wildlife.pdf.

Pople, A.R. (2004). Population monitoring for kangaroo management. *Australian Mammology*, Vol.26; 37-44.

Pople, T. & Grigg, G. (1999). 'Commercial Harvesting of Kangaroos in Australia', Background Document for Environment Australia. Department of Zoology, University of Queensland. (available online) <http://www.environment.gov.au/biodiversity/wildlife-trade/publications/kangaroo/harvesting/index.html>.

Rowden, P.J, Steinhardt, D.A. & Sheehan, M.C. (2008). Road crashes involving animals in Australia. *Accident Analysis and Prevention*. 40(6); 1865-1871.

Temby, I. (1992). *A Guide to Living with Wildlife: How to prevent and control wildlife damage in Victoria*. Melbourne: Department of Conservation and Environment.

Underhill, S.; Grigg, G.C.; Pople, A.R.; Yates, D.J. (2007). A physiological assessment of the use of water point closures to control kangaroo numbers. Brisbane: CSIRO Publishing. www.publish.csiro.au/journals/wr *Wildlife Research*, 2007, **34**, 280–287.

Walters, B. (2005). *Review of Kangaroo Management at Edithvale South Wetlands*, (Report prepared for Melbourne Water) EcoPlan Australia Pty. Ltd.

Wilson, M.E., Coulston, G., Shaw, G. and Renfree, M.B. (2013). Deslorelin implants in free-ranging female eastern grey kangaroos (*Macropus giganteus*): Mechanism of action and contraceptive efficacy. *Wildlife Research*. Vol. 40, published online 23 August.

Woolnough, A.P. (2005). Comparison of two techniques to survey macropod abundance in an ecologically sensitive habitat, *Australian Mammalogy* **27**: 69-72.

Zenger, K.R.; Eldridge, M.D.B. & Cooper, D.W. (2003). Intraspecific variation, sex-biased dispersal and phylogeography of the eastern grey kangaroo (*Macropus giganteus*). *Heredity* Vol. 91. pp.153 – 162.