



**NSW NATIONAL PARKS & WILDLIFE SERVICE**

# **Shanes Park**

**Review of Environmental Factors**



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Cover photo: Existing trail in the south-west of the Shanes Park reserve. National Parks and Wildlife Service/DPIE

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Environment, Energy and Science  
Department of Planning, Industry and Environment  
Locked Bag 5022, Parramatta NSW 2124  
Phone: +61 2 9995 5000 (switchboard)  
Phone: 1300 361 967 (Environment, Energy and Science enquiries)  
TTY users: phone 133 677, then ask for 1300 361 967  
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967  
Email: [info@environment.nsw.gov.au](mailto:info@environment.nsw.gov.au)  
Website: [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au)

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# Executive summary

## Introduction

This Review of Environmental Factors (REF) and supporting documents have been prepared by the NSW National Parks and Wildlife Service to assess and mitigate potential impacts associated with establishing a feral predator-free area at Shanes Park, in western Sydney. The Shanes Park reserve was transferred from the Commonwealth to the Minister for Energy and Environment in December 2020. The land is currently held under Part 11 of the *National Parks and Wildlife Act 1974* and will be gazetted as a national park following further consultation with Aboriginal groups.

## The proposal

The proposal involves the construction and operation of conservation fencing and associated infrastructure, the removal of all feral predator and herbivores (to the greatest extent practicable) to support the reintroduction of up to 30 locally extinct fauna species. The proposal will result in the restoration of ecological processes and remnant vegetation and the effective management of fire and the prevention of unlawful activity.

## Proposal objectives

The objectives of the proposal are to:

- establish and maintain viable populations of reintroduced species in the new feral-predator free area
- maintain or improve the trajectory for extant resident fauna (including threatened species) within the new feral-predator free area
- improve the ecological health and ecosystem function within feral-predator free area
- eliminate (or reduce to ecologically insignificant levels) threats to reintroduced and extant resident fauna and their habitat.

In addition, the western Sydney site has an important role in increasing the awareness and understanding of threatened species, ecological communities, threatening processes and their management. This will be achieved through the future development of visitor experiences, although it is outside of the scope of this REF.

## Options considered

Consideration has been given to reasonably feasible alternative sites, designs and management options that may also achieve the proposal objectives.

Shanes Park was identified through an assessment against broad criteria, requiring judgements based on available science, experience and operational requirements.

Western Sydney was identified as a suitable region using a spatial multi-criteria analysis which aims to maximise conservation outcomes and benefit the greatest diversity of priority species. From here, sites within western Sydney were considered based on:

- the number of species (both reintroduced and extant) that will benefit
- practicality and feasibility of establishing and maintaining infrastructure associated with the feral predator-free area

- the scale and quality of future visitor experience
- environmental, social and cultural impacts associated with site establishment works
- the extent of ecosystem restoration achievable.

These decisions were made in consultation with key stakeholders, both internal and external to the government.

## Statutory and planning framework

This REF and supporting documents have been prepared in accordance with the requirements of Section 5.5 of the *Environmental Planning and Assessment Act 1979*, Clause 228 of the *Environmental Planning and Assessment Regulation 2000* and the publication ‘*Is an EIS Required?*’ (Department of Planning 1995) specifying a ‘duty to consider environmental impact’.

The assessment has also taken into account the provisions of the (NSW) *Biodiversity Conservation Act 2016*, the (C’t’h) *Environment Protection and Biodiversity Conservation Act 1999*, and other relevant legislation.

Accordingly, this REF will:

- undertake an analysis of the environmental, economic, physical and social implications of the proposal
- describe the environmental impacts associated with the proposal and develop environmental safeguards for each environmental component where deemed necessary.

## Community and stakeholder consultation

A significant level of consultation has been undertaken with the broader community as part of the site selection process.

This REF will be placed on public exhibition for a period 30 days. Members of the public are invited to ‘have their say’ on the proposal.

## Environmental impacts

Category of impact	Significance of impacts		
	Extent of impact	Nature of impact	Environmentally sensitive features
Biophysical	<p>The proposed activity will involve the construction of a predator proof fence, fire trails and other associated infrastructure. This will require the removal of 5.308ha of extant vegetation around the perimeter of the reserve.</p> <p>The project will involve the removal of feral predators and</p>	<p>The proposal will result in short-term impacts, including vegetation removal.</p> <p>The proposal will, significantly improve the ecological condition of the site, through complete removal of the impacts of a number of Key Threatening Processes currently having an adverse effect on the reserve,</p>	<p>There are a number of threatened flora and fauna present throughout the reserve. This REF outlines mitigation measures to ensure impacts to any off-target species are minimised.</p> <p>The proposal is not likely to have a significant impact on threatened species, populations or</p>

Category of impact	Significance of impacts		
	Extent of impact	Nature of impact	Environmentally sensitive features
	<p>herbivores, followed by the reintroduction of locally extinct, threatened and declining fauna species. The proposal will also involve the effective management of weeds, fire and illegal activity.</p>	<p>including feral animals, weeds and fire</p> <p>In addition to this, the predator proof fence will significantly reduce, or eliminate the level of illegal activity taking place within the reserve, which currently results in significant environmental impacts.</p> <p>Up to 10 ha of disturbed areas within the fenced area will be actively regenerated by way of assisted natural regeneration over the course of the project.</p>	<p>ecological communities listed under the BC Act.</p> <p>The proposal is not likely to have a significant impact on threatened species, populations or ecological communities, migratory species, or Matters of National Environmental Significance within the meaning of the EPBC Act. A referral to the Australian Government's Department of Agriculture, Water and the Environment is not required.</p>
Socio-economic	<p>There is currently no public access to the Shanes Park reserve. Despite this, the reserve is widely used by the local community for illegal activities, such as trail bike riding, four-wheel driving, firewood collection and dog walking. All these activities have adverse impacts on the natural environment. The predator proof fence will reduce this illegal public access. There is a level of passive recreation that occurs, such as bushwalking and bird watching. Public access in a more passive scope will be permitted from 2023.</p>	<p>The restriction of this illegal activity will result in a significant decrease in the associated adverse impacts. The project will also raise the awareness and understanding of our threatened species, the factors impacting on them and appreciation for, the value of native wildlife and healthy native ecosystems.</p>	<p>The community has become accustomed to using the reserve for these activities. Restricting this access will be a contentious point within the community. Consultation with the community is ongoing to manage expectations and clearly reiterate the primary objectives for the reserve; conservation and education.</p>
Cultural	<p>Impacts on Aboriginal heritage are being assessed through a</p>	<p>It is possible that the proposed activity will have an impact on</p>	<p>Ground disturbance during the vegetation removal and fence</p>



Category of impact	Significance of impacts		
	Extent of impact	Nature of impact	Environmentally sensitive features
	separate <i>Aboriginal Cultural Heritage Assessment Report</i> , which is currently underway. A <i>heritage assessment</i> is also occurring concurrently to understand the heritage values of the reserve.	Aboriginal cultural heritage values at the site. Consultation with the Aboriginal communities is ongoing. Given the location of the predator proof fence and associated infrastructure, no impact on any items of European heritage significance is expected.	construction phase could impact items of Aboriginal heritage significance. The <i>Aboriginal Cultural Heritage Assessment Report</i> will assess this.

## Justification and conclusion

This REF has been prepared to assess and mitigate potential impacts associated with establishing a feral predator-free area at Shanes Park. The proposal will result in:

- removal of up to 4.79 ha of native vegetation, listed as either critically endangered, or endangered ecological communities under the *Biodiversity Conservation Act, 2016* (NSW) or the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
- removal of a number of plant species listed under the BC Act, including 100 *Dillwynia tenuifolia*, 50 *Grevillea juniperina* subsp. *juniperina*, 2 *Hibbertia puberula* and 50 *Pultenaea parviflora*
- removal of up to 56 hollow-bearing trees are likely to require removal for fence construction. Within other portions of Shanes Park, hollow-bearing plants would be retained.

Impacts will be managed through mitigating measures such as minimising vegetation clearing wherever possible, assisted natural regeneration of over 10 hectares of disturbed vegetation within the fenced area, repurposing of coarse woody debris and improved habitat condition throughout the reserve through effective management of weeds, fire and illegal activity.

The proposal is not likely to have a significant impact on threatened species, populations or ecological communities listed under the BC Act.

The proposal is not likely to have a significant impact on threatened species, populations or ecological communities, migratory species, or Matters of National Environmental Significance within the meaning of the *EPBC Act*. A referral to the Australian Government's Department of Agriculture, Water and the Environment is not required.

The loss of small to medium sized ground mammals, reptiles and amphibians has been significant, with this guild being noticeable absent from the reserves across western Sydney. In the absence of these species, the overall health and functioning of the ecosystems within the Cumberland Plain has diminished.

The project will significantly improve the ecological condition of the site through the removal of all feral animals, the return of up to 30 species of locally extinct wildlife, the restoration of ecological processes and remnant vegetation, the effective management of fire and the prevention of unlawful activity (tracks, dumping of rubbish etc.). A number of threatened

species use the site and will benefit from the project, including speckled warbler, scarlet robin, and rose robin.

The project will also raise the awareness and understanding of our threatened species, the factors impacting on them and appreciation for, the value of native wildlife and healthy native ecosystems. The proposal will provide a significant educational opportunity for western Sydney, and allow a platform for engagement with local communities, environmental groups and Aboriginal communities.

There is strong scientific consensus that a network of feral predator free areas is as an essential part of a broader conservation strategy to protect and restore our most vulnerable native species (NESP 2019; Legge et al. 2018).

Shanes Park is one of 7 feral-free areas either established or being established in NSW national parks providing a conservation benefit to over 50 threatened species. This project is one of the most significant wildlife restoration projects in the State's history.

## Background

Australia has the worst mammal extinction in the world. At least 34 Australian mammal species have become extinct since European settlement, with feral cats and foxes the main drivers for at least two-thirds of these losses (Legge et al. 2018; Radford et al. 2018; Woinarski et al. 2015). The range and abundance of surviving mammals continues to decline significantly across Australia.

Feral cats and foxes also impact on bird (Garnett et al. 2011; Woinarski et al. 2017), reptiles (Woinarski et al. 2018; Chapple et al. 2019), and amphibian species (Woinarski et al. 2020).

Feral cats are found throughout mainland Australia and are estimated to kill 1.5 billion native animals every year. In New South Wales, cats are thought to impact 117 threatened species, more than any other feral animal species (Coutts-Smith et al. 2007).

A network of feral predator-free areas is an essential part of NPWS' strategy to protect and restore our most vulnerable native species.

The NPWS Feral predator-free area program represents one of the most significant threatened fauna restoration projects in NSW history. The project builds on the successful Reintroduction of Locally Extinct Mammals (RoLEM) program which has established 3 feral-free areas in western NSW and has reintroduced 8 species that were previously extinct to New South Wales. The establishment of 4 large feral cat and fox-free areas at various locations across New South Wales (including a site in western Sydney) will deliver a measurable conservation benefit for at least 50 threatened animal species, including:

- the re-establishment of 12 mammal species currently listed as extinct in New South Wales, including iconic species such as the greater bilby, western quoll and eastern bettong
- the establishment of new populations of threatened and protected species which are locally extinct – priority species will include the critically endangered long-footed potoroo, the eastern quoll and bushfire-affected species such as the smoky mouse
- an improvement in the trajectory, or reduction in extinction risk, for another 21 threatened extant animal species, including bushfire-affected species such as the red-legged pademelon, and iconic species such as the koala and malleefowl
- a significant conservation benefit for an additional 20 or more extant threatened animal species.

The initiative will, in turn, improve, enhance and restore essential ecosystem function and processes.

The initiative is partly funded by the NSW Environmental Trust for \$20.3 million, with most of these funds to be expended over its first 4 years. NPWS will cover other costs, including ongoing costs. The initiative will be independently evaluated in its tenth year.

Reflecting the central role of national parks in securing our biodiversity, the project will deliver an exceptional ecological return and position NPWS as a world-leader in rewilding, restoration ecology and feral predator control.

## Western Sydney site

### Site selection process

An initial assessment identified Castlereagh Nature Reserve as a preferred site in western Sydney. This assessment compared a number of potential sites against a set of criteria, including ecological suitability, environmental impacts, and operational feasibility. An initial assessment of all sites across western Sydney identified 10 sites that satisfied some criteria for a feral predator-free area. Further study and consideration reduced this number to 4 potential sites, with Castlereagh Nature Reserve being initially selected for the proposal.

A proposed amendment to the *Castlereagh, Agnes Banks and Windsor Downs Nature Reserves Plan of Management* was released for public comment on 22 January 2021. This amendment facilitated the establishment of a feral predator-free area and subsequent fauna reintroductions.

In response to community feedback, NPWS conducted additional detailed assessments across a number of priority sites throughout western Sydney, including recently transferred land at Shanes Park. The Shanes Park reserve was identified as providing, on balance, the best site for establishing a large feral predator-free area and reintroducing locally extinct native wildlife.

In selecting the Shanes Park reserve, NPWS has taken into account a range of factors including size, habitat suitability, the number of species that will benefit, including the expected carrying capacity of the site for priority species, opportunities for public engagement, the cost and practicality of establishing, maintaining and operating a FFA, and other environmental and cultural impacts and benefits.

### The predicted outcomes of the activity include:

#### Species outcomes:

The western Sydney site will support the reintroduction of up to 30 locally extinct species and provide a measurable conservation benefit for at least 10 other threatened species, including:

- re-establishment of the eastern bettong (currently considered extinct in New South Wales)
- establishment of new populations of **threatened** species which are locally extinct, which may include the eastern quoll, koala, New Holland mouse, brush-tailed phascogale, bush stone-curlew and green and golden bell frog
- establishment of new populations of **protected** species that are locally extinct, including brown antechinus, southern long-nosed bandicoot, bush rat, common dunnart and emu. All translocations are subject to the outcomes of detailed translocation planning
- up to 20 additional locally extinct and declining reptile and frog species will also be reintroduced
- a significant conservation benefit for a number of extant threatened species
- successful reintroduction and establishment of locally extinct species resulting in a representation of species assemblages before the introduction of feral animals.

Note: all translocations are subject to approval of Translocation Plans as per the *DPIE Translocation Operational Policy*.

**Ecological processes and function outcomes:**

- Improved ecosystem function over time within the feral-predator free area through the restoration of ecological processes such as seed and spore dispersal, soil engineering and predator-prey relationships.
- Introduced predators replaced with native predators, reducing total predation pressure on native prey species.
- Introduced grazers replaced with native grazers, reducing total grazing pressure on native vegetation.
- Improved habitat conditions for a number of threatened flora species present on site.

The western Sydney site will also result in an improvement in the ecological health and functioning of endangered ecological communities.

In its urban setting, the site will provide an opportunity for public visitation, including visitation services such as tours.

# 1. Brief description of the proposed activity

Proposal name	The construction and operation of conservation fencing and associated infrastructure, control of feral predators and herbivores (to the greatest extent practicable), to support the reintroduction of locally extinct species at Shanes Park in western Sydney		
Name of NPWS park or reserve	Shanes Park 'reserve' – land that is currently held under Part 11 of the NPW Act		
NPWS Area	Cumberland Area, Greater Sydney Branch		
Location of activity	Shanes Park reserve		
Council	Blacktown City Council		
NSW State electorate	Macquarie		
<b>Estimated duration of project</b>			
Proposed commencement date	January 2022	Proposed completion date	December 2022 (establishment), reintroductions and management will be ongoing

# 2. Proponent's details

<b>Contact name</b>	Luke Mitchell
<b>Position</b>	Acting Senior Project Officer, Cumberland Area
<b>Street address</b>	122 Scheyville Road, Scheyville NSW 2756
<b>Postal address</b>	PO Box 4070 Pitt Town NSW 2756
<b>Contact numbers</b>	(02) 4580 2750
<b>Email</b>	luke.mitchell@environment.nsw.gov.au

## NPWS/DPIE proponents

<b>Area Manager or Section Manager</b>	Katie Littlejohn katie.littlejohn@environment.nsw.gov.au
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## 3. Permissibility and assessment pathway

### 3.1 Permissibility under NSW legislation

#### 3.1.1 National Parks and Wildlife Act 1974

##### Objects of the NPW Act (s.2A)

The activity is consistent with the following objects of the *National Parks and Wildlife Act 1974* (NPW Act) :

- conservation of habitat, ecosystems and ecosystem processes [s.2A(1)(a)(i)] – the removal of feral predators and herbivores and the reintroduction of locally extinct species will lead to the restoration of ecosystem processes and function including predicted increased levels of seed and spore dispersal and soil engineering
- biological diversity at the community, species and genetic levels [s.20A(1)(a)(ii)] – through the reintroduction of locally extinct species; and restoration of endangered ecological communities
- fostering public appreciation, understanding and enjoyment of nature and their conservation [s.2A(1)(c)] – through increased awareness and understanding of threatened species, communities, threats and their management, including the incorporation of scientific research and application of traditional knowledge.

Adverse effects to the values for which the land has been acquired for reservation under the NPW Act [consistent with s.2A(3)(b) of the NPW Act] will be minimised through careful design, incorporating best practice methods for construction of conservation fencing and associated infrastructure, removal of feral animals and reintroduction of locally extinct species.

In addition, there has been consideration of the principles of ecologically sustainable development [as required under s.2A(2) of the NPW Act] in the following aspects of the project:

- this REF's careful evaluation of the potential for serious or irreversible damage to the existing environmental values of the reserve and the risk-weighted consequences of various options with the aim of avoiding those impacts (precautionary principle)
- project's desired outcome is to maintain or enhance the health, diversity and productivity of part of the Cumberland Plain environment for the benefit of future generations (intergenerational equity)
- the fundamental goal of the project is the enhancement of native biodiversity and ecological integrity [conservation of biological diversity].

##### Reserve management principles (s.30E–J)

Shanes Park 'reserve' is yet to be gazetted under the NPW Act. It is currently land that has been acquired under Part 11 of the Act. The site is to be reserved as a national park, and the proposal would be consistent with section 30E of the Act, specifically:

- The conservation of biodiversity, the maintenance of ecosystem function, the protection of geological and geomorphological features and natural phenomena and the maintenance of natural landscapes [s.30E(2)(a)] – through the removal of feral predators and herbivores to prevent further degradation of the site's values, and the reintroduction of locally extinct species including so-called 'ecosystem engineers'

including fungivores (bandicoots and bettongs), will result in the restoration of ecosystem function.

- The conservation of places, objects, features and landscapes of cultural value [s.30E(2)(b)] – there are a variety of conservation values and heritage items present on site. These items will be assessed to allow informed decisions on their long-term management. The addition of conservation fencing will protect these items from the illegal activity currently present on site.
- The protection of ecological integrity of one or more ecosystems for present and future generations [s.30E(2)(c)] – the removal of feral predators and restoration of ecosystem function will preserve the ecological values of the site in the longer-term
- Provision for appropriate research and monitoring [s.30E(2)(g)] – there will be ample opportunity for research into the impacts of the pest control and reintroductions by NPWS, others in the Department of Planning, Industry and Environment and external organisations such as universities.

The activity is consistent with the reserve Statement of Management Intent.

### **NPWS/EES management powers and responsibilities (s.8 and s.12)**

The activity is consistent with the functions of the Secretary and NPWS as outlined in the following sections of the NPW Act:

- carrying out of works and scientific research considered by the Deputy Secretary to be necessary for the preservation, protection and management of the reserve [s 8(3)(a) and s.8(3)(c)] – this includes the construction and operation of conservation fencing and associated infrastructure, removal of feral predators and herbivores, reintroduction of locally extinct species and monitoring, evaluation and reporting
- the conservation and protection of reserves and wildlife [s.12(a) and s.12(b)] – this includes the establishment of the feral predator-free area, control of feral predators and reintroduction of locally extinct species
- the conduct of research or monitoring and public education related to reserves and wildlife [s.12(h) and s.12(i)] – this includes the proposed research, monitoring, evaluation and reporting of the activity, including education and communication.

### **3.1.2 Biodiversity Conservation Act 2016**

The biodiversity conservation objectives of the *Biodiversity Conservation Act 2016* (BC Act)

The activity will contribute to:

- conservation of biodiversity and ecological integrity
- facilitate ecological sustainable development
- improve and share knowledge including local and Aboriginal knowledge, about the status and values of biodiversity and of ecosystem services and the effectiveness of conservation actions

An assessment of significance for threatened species and ecological communities as listed under the BC Act can be seen in Appendix A. The proposal is unlikely to significantly impact any threatened species or communities listed under the BC Act.

The proposal identifies key threatening processes relevant to the proposed activity, with methods to mitigate the impacts of these.



### **3.1.3 Rural Fires Act 1997**

The objectives of protecting life and property and protection of the environment

A reserve fire management strategy will be prepared within 3 months of gazettal, which will outline the fire management objectives, bush fire risks, and risk management strategies within the reserve. Consultation with Cumberland Bushfire Management Committee will ensure that the reserve fire management strategy aligns with the objectives of the Cumberland Bush Fire Risk Management Plan. The proposal will involve a 7.5 m cleared corridor around the boundary of the reserve, with the predator proof fence situated approximately in the centre of this corridor. A 6 m fuel free zone will not be maintained from the fence as per s.76 of the *Rural Fires Act 1997* (RF Act). This fence will prevent arson attacks which frequently occur on site. The addition of boundary fire trails will facilitate fire management activities and assist in containing any fires within the reserve, and prevent fires originating off-site affecting Shanes Park reserve.

The Shanes Park reserve is addressed in a current Fire Access and Fire Trail (FAFT) plan created by the Cumberland Bushfire Management Committee.

A Fire Management Strategy for the reserve is in preparation.

#### **Planning for bushfire protection**

The proposal is consistent with the objectives of Planning for Bushfire Protection 2019. The improved fire trail system will better allow the containment of any fires in the Shanes Park reserve and prevent impacts on neighbouring residential properties. The proposed boundary trails will improve separation between neighbouring buildings and the reserve.

## **3.2 Assessment pathways**

### **3.2.1 Environmental Planning and Assessment Act 1979**

The activity may be undertaken without development consent under the provisions of Clause 65(1)(a) of State Environmental Planning Policy (Infrastructure) 2007 as it is

- on land reserved under the NPW Act or acquired under Part 11 of the NPW Act
- for a purpose authorised under the NPW Act.

The activity is not designated development under Schedule 3 of the Environmental Planning and Assessment Regulation 2000.

The activity is not State Significant Infrastructure under Schedule 3(7) of the State Environmental Planning Policy (State and Regional Development) 2011, and is not of a similar kind to such an activity.

The activity is not designated development under the SEPP (Coastal Management) 2018 as:

- it is not on land mapped as littoral rainforest or coastal wetland.

The activity is not declared to be exempt development under an environmental planning instrument or fails to fully meet the requirements for exempt development.

It is noted that, while conservation fencing may be considered exempt development in some situations, the height of the proposed fencing and the scale of the associated ground disturbance and clearing means it does not meet the standards of exempt development (under Schedule 1 of the Infrastructure SEPP) and the definition of 'minor impact' (under s.1.6 of the *Environmental Planning and Assessment Act 1979*).

Further, the project is considered a 'use of land', including a change in existing land use, through restricted public access and the reintroduction of locally extinct species. A 'use of land' is included in the definition of 'activity' under s.5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), requiring a consideration – to the fullest extent possible – of the environmental impacts of the proposal under s.5.5 of the EP&A Act.

### **3.2.2 Coal Mine Subsidence Compensation Act 2017**

The activity involves the erection or alteration of an improvement within a mine subsidence district.

Not applicable

### **3.2.3 Fisheries Management Act 1994**

The activity affects fish, fish habitat or marine vegetation, including threatened species.

The activity involves the excavation of or deposition in 'water land' including land that is only intermittently submerged by water.

Consultation with Fisheries NSW is underway as per Clause 199 of the *Fisheries Management Act 1994*.

### **3.2.4 Heritage Act 1977**

The activity is on land that contains:

- an item listed on the State Heritage Register (SHR)
- an item not listed on the SHR but identified by NPWS as being of potential state significance
- an item listed on the NPWS Heritage and Conservation Register under s.170 of the Heritage Act (contained in the Historic Heritage Information Management System)
  - a place, building landscape feature or moveable heritage item older than 25 years

Not applicable – no items are listed under s.170 of the Heritage Act, or the State Heritage Register in the Shanes Park 'reserve'.

The places, buildings, features or moveable heritage items within the reserve that are older than 25 years are unaffected by the proposed activity.

### **3.2.5 Marine Estate Management Act 2014**

The activity affects or directly adjoins a marine park or aquatic reserve, and works are likely to affect plants or animals within the marine park or aquatic reserve.

Not applicable

### **3.2.6 Environment Protection and Biodiversity Conservation Act 1999**

The activity is on land that contains the following, or the activity may affect:

- nationally listed threatened species and ecological communities, or listed migratory species

Matters of national environmental significance (MNES) which may be affected by the proposal include:

- Critically Endangered Ecological Communities and Endangered Ecological Communities under the EPBC Act.
- Nationally listed threatened plant species.

These are described in Section 8.4 of this REF. An assessment of the significance of impacts on MNES is included in Appendix A as per Significant Impact Guidelines and summarised in Section 9.7.

On 28 February 2012, the Commonwealth Government approved all actions associated with the development of the Western Sydney Growth Centres as described in the *Sydney Growth Centres Strategic Assessment Program Report*. The proposed action is associated with the development of the Western Sydney Growth Centres and is consistent with the Report. As such, separate referral is not required under the *Environmental Protection and Biodiversity Conservation Act 1999*.

### 3.3 Permissibility under NSW legislation

#### 3.3.1 Fisheries Management Act 1994

- The activity affects fish, fish habitat or marine vegetation, including threatened species.
- The activity involves the excavation of or deposition in ‘water land’, including land that is only intermittently submerged by water.

Consultation with Fisheries NSW is underway as per Clause 199 of the *Fisheries Management Act 1994* (FM Act).

### 3.4 Consistency with National Parks and Wildlife Service policy

Policy name	How proposal is consistent
DPIE Translocation Operational Policy	As required by the policy, single species and multi-species translocation plans will be prepared for each proposed reintroduced species in accordance with the <i>Biodiversity Conservation Act 2016</i> . All translocation proposals will be prepared in consultation with species experts. This includes consultation with relevant Recovery Teams to advise on likely requirements for founder individuals for translocations. Translocation proposals will be subject to peer review by a minimum of two scientists, including one Department scientist and one external independent scientist. Relevant animal ethics committee (AEC) approvals will be required under the <i>Animal Research Act 1985</i> . The translocation proposals will include an assessment of the risks associated with genetic diversity and how this will be estimated and increased/maintained.
NPWS Boundary Fencing Policy	In some locations a fence will be aligned on common boundary. The proposal is consistent with the policy in the level of clearing (up to 6 metres on from the fence line – para.14) and environmental assessment (paras.16–18).  Due to the special needs of the project, the proposed fencing is not of a type that would typically be suitable for installation on a park boundary. As such, NPWS would be fully responsible for the fence’s installation and maintenance costs.
Greater Sydney Branch Pest	The Greater Sydney Branch Pest Management Strategy (BPMS) includes NPWS Cumberland Area wide priority programs for controlling weed and feral animal species and the protection of assets from these risks. New

Policy name	How proposal is consistent
Management Strategy:	programs specific to Shanes Park will be added. A separate feral animal management plan will be prepared to guide the eradication of feral predators and herbivores from the fenced area.
NPWS Vertebrate Pesticide Standard Operating Procedures (SOP) and NPWS Firearms Management Manual	Control of feral animals will be conducted in line with the BPMS and Feral Animal Management Plan and will use a range of conventional techniques, including trapping, shooting and baiting. Use of new techniques will be considered where available, pending approval and authorisation. This control will be delivered in accordance with relevant Codes of Practice (including animal welfare requirements), the EPA/Australian Pesticides and Veterinary Medicines Authority (APVMA) permits as per the NPWS Vertebrate Pesticide SOP, and all relevant risk assessments to be determined prior. Use of firearms will be consistent with the NPWS Firearms Management Manual and shoot plans.
Protecting Aboriginal Cultural Heritage	Aboriginal cultural heritage is present on the site. Any potential impacts to these heritage items will be assessed through an <i>Aboriginal Cultural Heritage Assessment Report</i> currently underway. This report will identify these potential impacts, mitigating measures and allow for consultation with the Aboriginal community on the project.
Cultural Heritage Conservation Policy	A <i>heritage assessment</i> will be undertaken to identify heritage values present on site. The proposed activity will not have any impact on heritage values of the site.

### 3.5 Type of approval sought

#### NPWS proponents

Internal NPWS approval\* or authorisation, including expenditure.

## 4. Consultation – general

Consultation has been held with direct neighbours and key internal and external stakeholders through the site selection and planning and approval process. This includes initial consultation as part of the process to amend the plan of management for the original proposed site at Castlereagh Nature Reserve.

A Communication and Engagement Plan will be prepared and implemented to guide community engagement and consultation throughout the project, and in particular timely and accurate information to the community during site preparation and construction.

The Communication and engagement plan will include (as a minimum):

- details and timing of proposed activities to affected residents and key interest groups, including changed traffic and access conditions
- contact name and number for enquiries.

All businesses, residential properties and other key stakeholders (e.g. schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.

The plan provides for continued consultation at identified stages of the project.

## **4.1 Consultation required under Infrastructure SEPP**

### **4.1.1 Local Council (clauses 13, 14, 15 and 15A)**

#### **Local council infrastructure or services (such as stormwater, sewer, roads)**

Discussion has been held with Blacktown City Council in regard to the broader proposal and how the proposed fencing could impact neighbouring areas. Consultation will be ongoing throughout the proposal.

### **4.1.2 National park or other EI-zoned land (clauses 16(2)(a) and 16(2)(b))**

#### **Development on land zoned EI or on or adjacent to land reserved or acquired under the NPW Act**

The activity is supported by the Minister for Energy and Environment, NPWS Deputy Secretary and the Regional Advisory Committee. It is subject to the outcomes of this Review of Environmental Factors.

### **4.1.3 Roads or maritime (clause 16(e) or Schedule 3)**

#### **Traffic-generating development on main roads**

Discussion has been held with Transport for New South Wales in regard to the broader proposal and the fence alignment to enable vegetation management on the outside of the conservation fencing to be undertaken within the road verge in some locations. Consultation is ongoing.

## **4.2 Consultation requirements under NPW Act for leases and licences**

The proposed activity does not require a lease or licence under s.151.

## **4.3 Targeted consultation**

### **4.3.1 Adjacent landowners**

Consultation is ongoing between adjacent landowners and NPWS.

The Statement of Management Intent was published in November 2021, outlining the intent for the reserve. A draft plan of management will be prepared following further public consultation including on site information sessions, and a publicly exhibited discussions paper.

The draft plan of management will be publicly exhibited for a period of 90 days to allow targeted community feedback. Consultation will continue through this process.

Blacktown City Council has been consulted regarding the neighbouring urban development to the north and east of the site, in Marsden Park.

### **4.3.2 Wider community consultation and notification of works**

In December 2020, the establishment of a feral predator-free area was announced to take place at Castlereagh Nature Reserve, in western Sydney. This was followed by the release of a draft amendment to the *Castlereagh, Agnes Banks and Windsor Downs Plan of Management*. This amendment to the plan of management facilitated the establishment of a feral predator-free area. Following community feedback, further assessment into potential sites was undertaken, with the decision to relocate the project to the Shanes Park reserve.

The Statement of Management Intent for the Shanes Park reserve was published in November 2021, outlining the intent for the reserve. This was done following internal and external consultation with local environmental groups and other relevant stakeholders.

A draft plan of management will be prepared following further public consultation, including on site information sessions, and a publicly exhibited discussions paper. The draft plan of management will be placed on public exhibition in accordance with the NPW Act. Following this, a finalised plan of management will be executed and made available publicly.

Consultation with local Aboriginal communities is ongoing as part of a concurrent *Aboriginal Cultural Heritage Assessment Report*. Additional consultation with these communities is underway in regard to finding a suitable Aboriginal name for the reserve.

### **4.3.3 Interest groups and notification**

A number of environmental and conservation community groups throughout western Sydney have been identified with significant interest in the project. NPWS is currently working to identify other groups with interest in the project. Consultation with these groups and individuals is and will remain ongoing.

## **5. Consultation – Aboriginal communities**

### **5.1 Native title consultation requirements**

The activity falls under the definition of a low-level activity as per subdivision 24L of the Native Title Act. This subdivision describes fencing and gates as being excluded from the category of buildings and other structures.

### **5.2 Other parks**

Consultation with local Aboriginal community is ongoing through the completion of an Aboriginal Cultural Heritage Assessment Report. Work is ongoing with Darug communities and the Deerubbin Local Aboriginal Land Council regarding an Aboriginal name for the reserve, and collaboration potential with local Aboriginal communities.

## 6. Proposed activity

### 6.1 Location of activity

<b>Park name</b>	Shanes Park 'reserve' – land held under Part 11 of the NPW Act.		
<b>Description of location</b>	NPWS Shanes Park 'reserve' is the former Airservices Australia site, located in the suburb of Shanes Park in Western Sydney. The reserve is adjacent to the suburbs of Marsden Park and Wilmot.		
<b>Lot/DP</b>	Lot 1 DP447543		
<b>Street address</b>	Stoney Creek Road, Shanes Park NSW 2747		
<b>Site reference</b>	Easting: 295897	Northing: 6267688	MGA zone: 56

### 6.2 Description of the proposed activity

The proposal will involve the following key elements:

- The construction of a 10.08 km feral predator fence enclosing an area of approximately 550 ha in the Shanes Park 'reserve' (*Figure 1*). The style and standard of fence (illustrated in *Appendix C*) will prevent ingress by feral predators, including foxes, dogs and cats, and egress by ground-dwelling animals.
- No internal fences will be constructed within the fenced area other than temporary fencing (e.g. a temporary holding pen), if required, to facilitate the effective release of particular species, which would be specified in the approved translocation proposal. Any such temporary fencing would be installed and removed without material impact on the environment.
- The conservation fence will require a 7.5 m-wide area to be cleared (4.5 m internal and 3.0 m external clearing width), resulting in the removal of about 5.308 ha of vegetation.
- The clearing corridor will be aligned as such to minimise impacts on an existing berm around the perimeter of the reserve. The corridor will be inside the reserve relative to the berm. The exception is in areas in which the gap between the site boundary and the berm is larger than 7.5 m, in which the corridor will be between the boundary and the berm.
- Management of this area including the removal of feral animals and other interventions such as dedicated fire management, habitat restoration and weed control.
- The establishment of ancillary facilities to support the construction and operation, including temporary onsite storage, installation of surveillance, monitoring equipment in the reserve and outside the feral-free area, with a footprint either within the 5.308 ha mentioned above, or within the existing cleared hardstand in the reserve.
- The construction and maintenance of up to 10.08 km of new fire trails to enable access for the construction and maintenance of conservation fencing. These will fall within the same 5.308 ha footprint that aligns with the predator proof fence. Selected existing trails within the reserve will be upgraded/repared to enable fire management within the fenced area.
- The reintroduction of locally extinct animal species such as eastern bettong, eastern quoll, koala, New Holland mouse, brown antechinus, long-nosed bandicoot, bush rat and common dunnart subject to relevant assessments and approvals.
- The construction and operation of a visitor centre is **out of scope** for this REF.

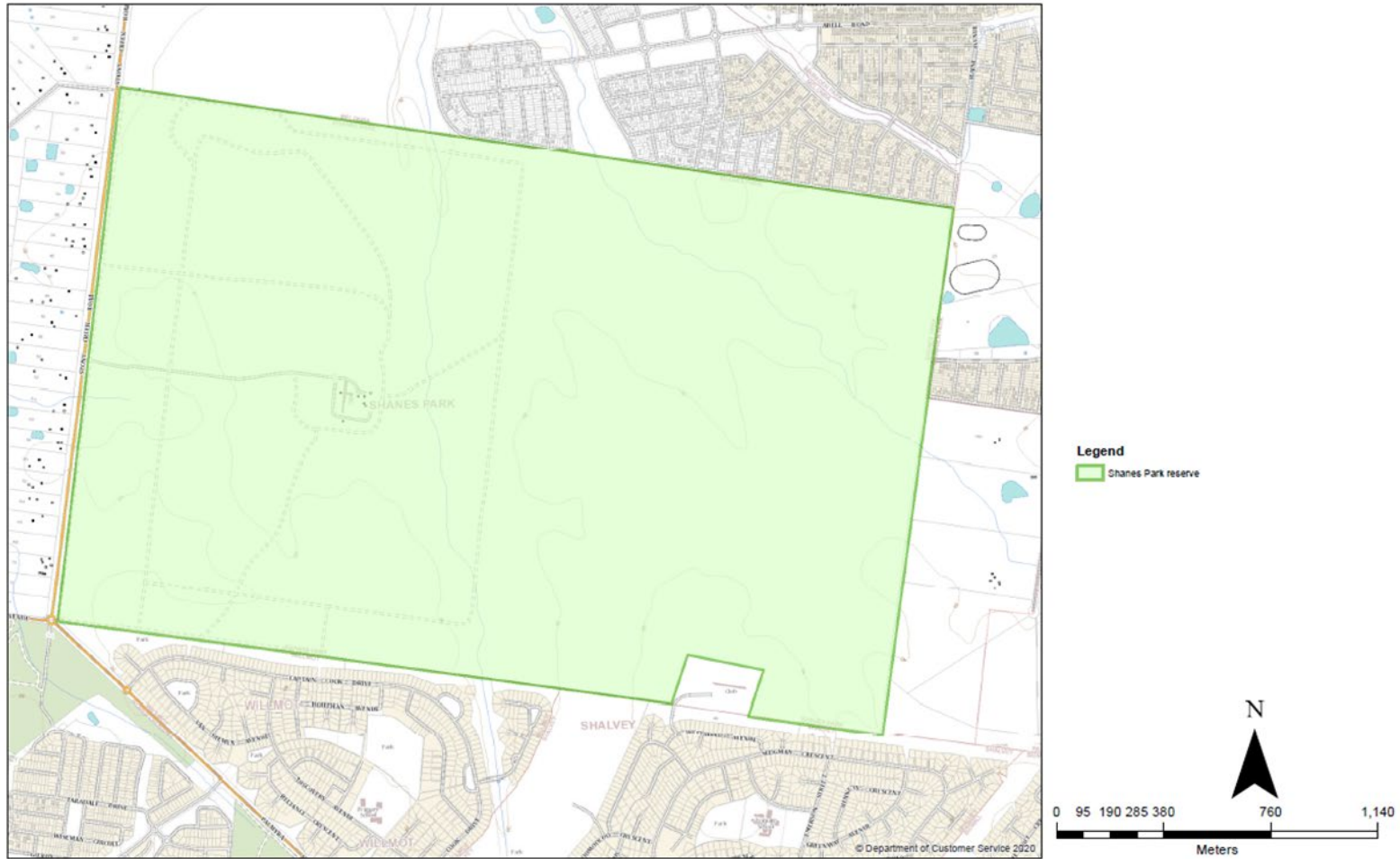


Figure 1 Reserve overview



## 6.2.1 The proposed activity: pre-construction, construction, operation and remediation

The proposed activity involves a number of stages, listed below:

### Pre-construction:

- Detailed planning and identification of suitable sites.
- Consultation with internal and external stakeholders such as neighbours, community groups, local environmental groups and the aboriginal community has been ongoing and will continue throughout.
- Planning and approvals including the preparation of a statement of management intent.
- Completion of an approved environmental assessment (the subject of this REF).
- Collection of baseline ecological health monitoring data.
- Completion of detailed engineering drawings illustrating the fencing specifications and wet crossing designs.
- Completion of *Aboriginal Cultural Heritage Assessment Report* and *Heritage Assessment* to accurately assess and address impacts on cultural heritage values.

### Construction

- Vegetation management, including the removal of vegetation, repurposing of coarse woody debris, and mulching of removed vegetation.
- Construction of access trails to allow long term maintenance for fence, fire, feral animal and weed control and program management. This will include the implementation of an *Erosion and Sediment Control Plan* and the standards identified in the *RFS Fire Trail Design, Construction and Maintenance Manual*.
- Construction of predator proof fence, connection to solar array, vehicle and pedestrian gates.

### Post construction

- Removal of feral predators, and feral herbivores (to the greatest extent practicable).
- Reintroduction of locally extinct, threatened and declining animal species.
- Monitoring, evaluation and reporting on species, threats and ecological health.
- Ongoing maintenance and park management activities.

## 6.2.2 The activity footprint (size of the area of impact)

The activity footprint of the proposed vegetation management to accommodate the predator proof fence, associated fire trails and ancillary services can be seen in *Figure 2 and Figure 3*, and totals 5.308ha.

All ancillary facilities will be located within existing cleared areas in the central precinct. This will accommodate materials and machinery set down sites, temporary on-site storages and a central location for logistics and operational matters.



Figure 2 Impact footprint of the proposed activity



Figure 3 Alignment of the impact footprint

## 6.2.3 Proposed construction methods, materials and equipment

### Vegetation management

The vegetation management will occur in accordance with the following specifications:

- A fence line corridor of 7.5 m (3 m outside and 4.5 m inside the fence) will be cleared of all vegetation. At designated passing bays the width of the interior trail will be widened to 6m, and turnaround will include a turning circle with a 22 m diameter.
- Vegetation removal will use a broadacre forestry mulcher followed by tree loppers, or an excavator with a mulching arm, to remove trees with a diameter at breast height (DBH) of greater than 20 cm. Hollow-bearing trees will be removed under the following guidelines:
  - hollow-bearing trees to be removed will be clearly marked
  - fauna should be removed passively (i.e. ushering) from the zone of disturbance prior to the entering of machinery
  - when removing hollow-bearing trees, surrounding areas should be cleared, before inspecting the hollow with a camera. If fauna is present, the tree will be left for one night before being felled to allow the fauna to move on
  - following felling, hollows and the surrounding area are to be checked again to ensure no trapped or injured fauna are present
  - trees should be shaken by being tapped by an excavator or similar prior to felling in an attempt to scare fauna from hollows
  - if the tree is being removed in stages, the hollow-bearing branch should be the last to be removed
  - trees should be felled in a manner that avoids disturbance to surrounding vegetation
  - the removal of hollow-bearing trees will be avoided altogether where possible.
- Trees to be removed with a diameter at breast height of 20 cm or greater should be retained within the subject site and repurposed as coarse woody debris on the ground and/or suitable hollow limbs suspended in vegetation that is retained to provide habitat. This will be done in accordance with the following specifications:
  - any native trees with a DBH greater than 20 cm will be identified and excluded from the mulching
  - these native trees with a DBH greater than 20 cm (hereby referred to as target trees) will be felled leaving the root ball in place to prevent erosion
  - the remaining stump will then be ground down using the forestry mulcher
  - the felled target tree will then be cut into sections of 3-5 m in length
  - these sections will then be loaded into a tip truck using a 14 t excavator (or similar)
  - the truck will then relocate the debris to locations suitable for redistribution
  - a smaller excavator (8 t or similar) will be waiting at this location
  - this smaller excavator will then redistribute the coarse woody debris around the designated sites
  - the coarse woody debris will be distributed in piles of 3-5 logs, with piles at least 15 m apart.
- Suitable sites for the redistribution of coarse woody debris include decommissioned trails and areas of relatively open vegetation that are low in coarse woody debris in which access is possible with minimal vegetation disturbance.
- Dangerous or overhanging trees or branches within 20 m of the predator proof fence will be assessed, and potentially trimmed to avoid potential future impacts on fence integrity.

- All remaining vegetation within the fence corridor clearing envelope is to be mulched and spread across the corridor to reduce soil erosion potential.
- Stumps will be mulched to ground level rather than being ripped and removed
- There will be no windrows left along the fence line corridor.

### Construction of fire trails

Fire trails will be constructed to enable access for the construction and ongoing management of the fence. The fence will be slightly offset from the centre of the 7.5 m corridor, allowing 4.5 m on the inside of the fence and 3.0 m on the outside of the fence.

The inside (4.5m) trail will be constructed in accordance with the *RFS Fire Trail Design, Construction and Maintenance Manual* to a standard of a Category 1 vehicle carrying capacity, including:

- a minimum of 4 m in width, with 4 m in vertical clearance
- a minimum inner radius of 6 m at curves
- a grade of less than 15 degrees
- a crossfall of less than 6 degrees
- passing bays every 250 m, that can be either:
  - a widened section of 6 m width and 20 m length
  - a turnaround, as below
- turnarounds, consisting of a turning circle of a 22 m diameter.

Passing bays and turnaround will accommodate existing trail intersections where possible.

The external 3.0 m trail will be constructed as a management trail, involving the removal of vegetation and basic earthworks such as grading.

### Fence construction

The conservation fence is designed to prevent incursion of feral animals into the feral predator-free area. The proposed fence design is based on proven and successful projects in western NSW under the Reintroduction of Locally Extinct Mammals project.

The proposed fence would be 1.8 m high, with a floppy top and 2 hot (electric) wires. In addition, the fence has 2 'skirts' that lay flat on the ground on the inside and outside of the fence, extending 450 mm and 300 mm respectively. These will be pinned into the ground to prevent incursions. The bulk of the fence is constructed from netting, with 30 mm aperture on the lower section and 40 mm on the upper section. The smaller holes on the lower section are designed to prevent small rabbits entering the fenced area (see diagram in *Appendix C*). The top 2 sections of netting that would be installed on the fence will overlap (as opposed to being 'butt-joined') to improve the strength across the join (see diagram in *Appendix C*). There would be a second overlapping section extending up from the base (the area most subject to macropod impact).

Up to 3 vehicle and pedestrian gates will be included at strategic points to provide access and emergency exits from within the proposed feral-free fenced area. Upon completion of the fence line clearing, strainer assemblies will be installed at corners.

Strainers will consist of posts and rails and be designed as bases for wire tensioning. A single plain wire will be installed at ground level to provide a sight line for the installation of pickets and intermediate posts.

Intermediate posts (posts 1.8 m above ground level, 80 mm nominal bore) will be spaced every 400 m, or where extra strength or support is required. Intermediate posts will be concreted into the ground.

Pickets (1.8 m above ground level) will be spaced every 5 m. Pickets will be installed mechanically, using a post knocker that will ram them to a depth of 600 mm. Following installation of posts and pickets, 6 horizontal plain support wires (2.5 mm diameter) will be strung, spanning the height of the fence (making a total of 7 horizontal plain wires, including the sighter wire). The plain wires will be tensioned back to the strainers and tied off to the pickets using tie-wire. Hot wire 'stand-offs' will then be installed. The stand-offs are 160 mm long rods that support the electric wires and keep them clear from the body of the fence to prevent shorting out. The stand-offs will be bolted to the pickets at 1000 mm and 1300 mm above ground level. Insulators will be fitted later in the construction process. Netting will then be installed.

Three rolls of netting are used:

- 1800 mm wide roll for the upper vertical section, including the 600 mm floppy top (40 mm aperture)
- 1200 mm wide roll for the lower vertical section and external skirt (30 mm aperture)
- 900 mm wide roll for the lower section and internal skirt (30 mm aperture)
- all netting will be 1.4 mm gauge.

Netting is connected to the plain support wires using 'c-clips' that are installed using pneumatic guns. At this point, lengths of 3.15 mm plain wire will be threaded in the netting that forms the floppy top to help hold its shape so that it is effective in excluding any feral animals that climb the fence. These will be installed at every picket, and two between pickets.

Electric wires will then be installed, threaded through insulators on the stand-offs, and connected to a solar-powered electric fence energiser. Two energisers will be installed at diagonally opposite sections of the fence to ensure consistent voltage is maintained around the perimeter.

The final items for installation will be gates at strategic locations on the fence perimeter to enable vehicle and pedestrian access. The proposed vehicle gates are sliding gates that will roll on tracks set into a concrete plinth (*Appendix C*). The vehicle gates will have a fixed-angle top to prevent feral incursions. All gates will be padlocked (keyed alike). Pedestrian gates will involve a double gate system illustrated in *Appendix C* and will be located with vehicle gates.

There will be minor variations in the fence design through construction to accommodate local variances in terrain (such as distance between posts and pickets).

A diagram illustrating the design for the fence is provided in *Appendix C*.

### *Wet crossings*

A design is being prepared which will allow vehicular access across these wet crossings, for the maintenance of the fence, while allowing the fence to accommodate floodwater. These crossings will be designed specifically to avoid the use of traditional culverts, which would be very accommodating of incursions. This design will ensure that in times of flood no adverse impacts on neighbouring properties are experienced. A north-west wet crossing is present at the northern boundary, which will require trail construction suitable for wet marshland areas, construction will involve geotextiles and rock as per the *Rural Fire Service Fire Trail Design, Construction and Maintenance Manual* (Soil Conservation Science 2017).

#### **6.2.4 Ancillary facilities to support construction and operation**

The proposal involves the establishment of ancillary facilities to support the construction and operation, including temporary onsite storage of materials used in construction and maintenance, installation of surveillance, monitoring equipment in the reserve and outside the feral-free area.

Temporary on-site storage will be established within the central precinct (*Figure 4*) at the reserve. It will be placed on an existing modified area of mown grass. The remaining ancillary services will be located entirely within the existing activity footprint.

Existing buildings on-site will be utilised where appropriate and safe to do so. Temporary structures will primarily be modular construction (containerised) and transported in and installed upon footings. Any structures will be constructed in accordance with the department's Construction Assessment Procedures and the NPWS Facilities Manual and associated policies and of a colour which is sympathetic to the natural setting.



**Figure 4** The building compound within the Shanes Park reserve



### **6.2.5 Construction and maintenance of management trails**

There are many management trails within the proposed feral predator-free fenced area. A number of trails will be retained, as shown in *Figure 5*. These trails are to be maintained to the standard required by the Rural Fire Service (RFS) to support response to fires (RFS 2017).

Existing trails that are not to be maintained are to be used as sites for the redistribution of coarse woody debris as per section 6.2.1.

The new internal boundary trail being constructed as part of the proposed activity will be done so to the RFS Fire Access and Fire Trail (FAFT) standards for a Category 1 Fire Trail. This will include the construction of a passing bay every 250 m, and turnarounds every 500 m, be a minimum of 4m in width in its entirety, a minimum inner radius of 6m at curves, a grade of less than 15 degrees and a crossfall less than 6 degrees. The external boundary trail located outside the predator proof fence will be a management trail with a width (2.55 m) only suitable for a side by side vehicle. The locations of passing bays and turnarounds can be seen in *Figure 6*.

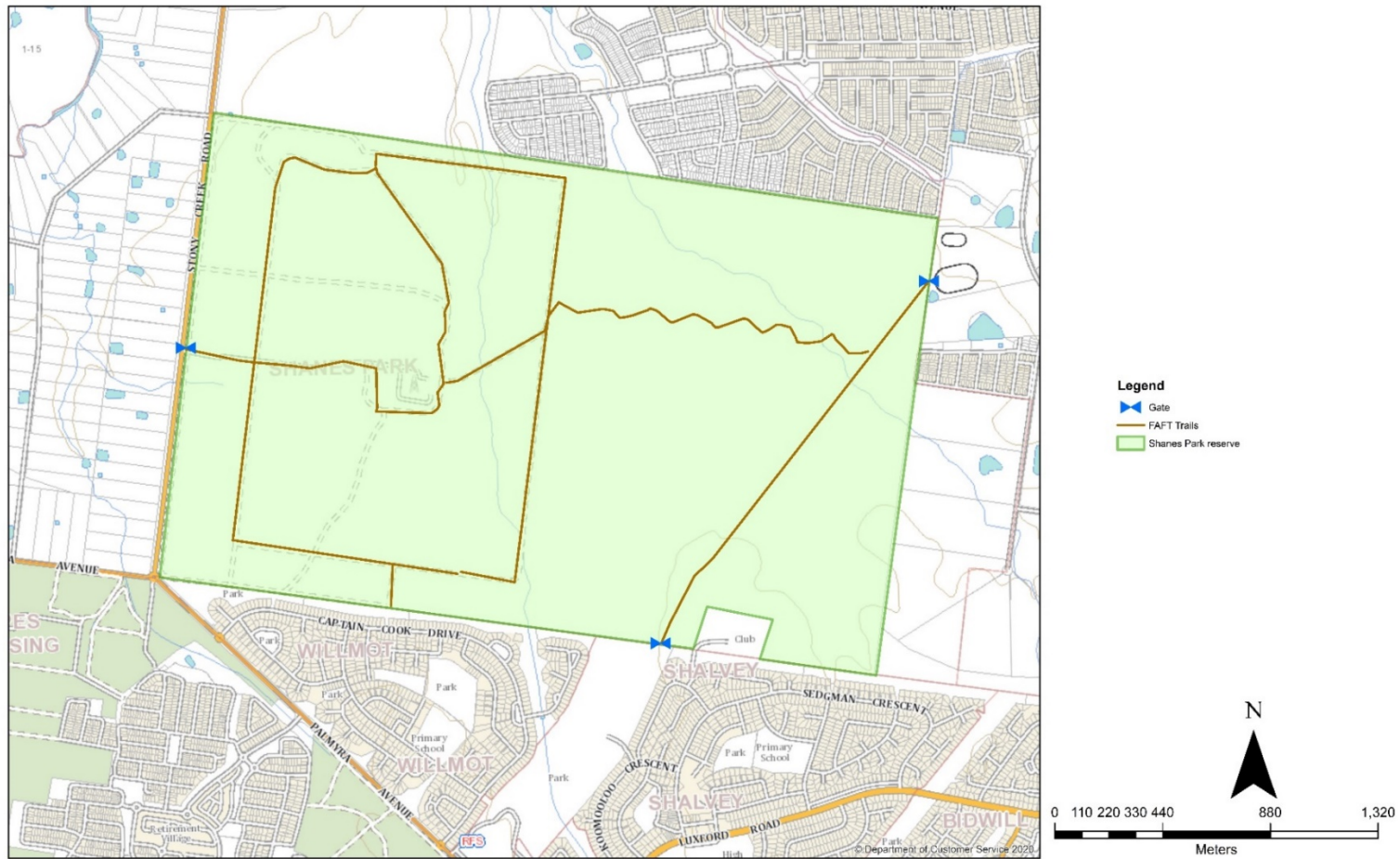


Figure 5 Trails within the reserve to be retained

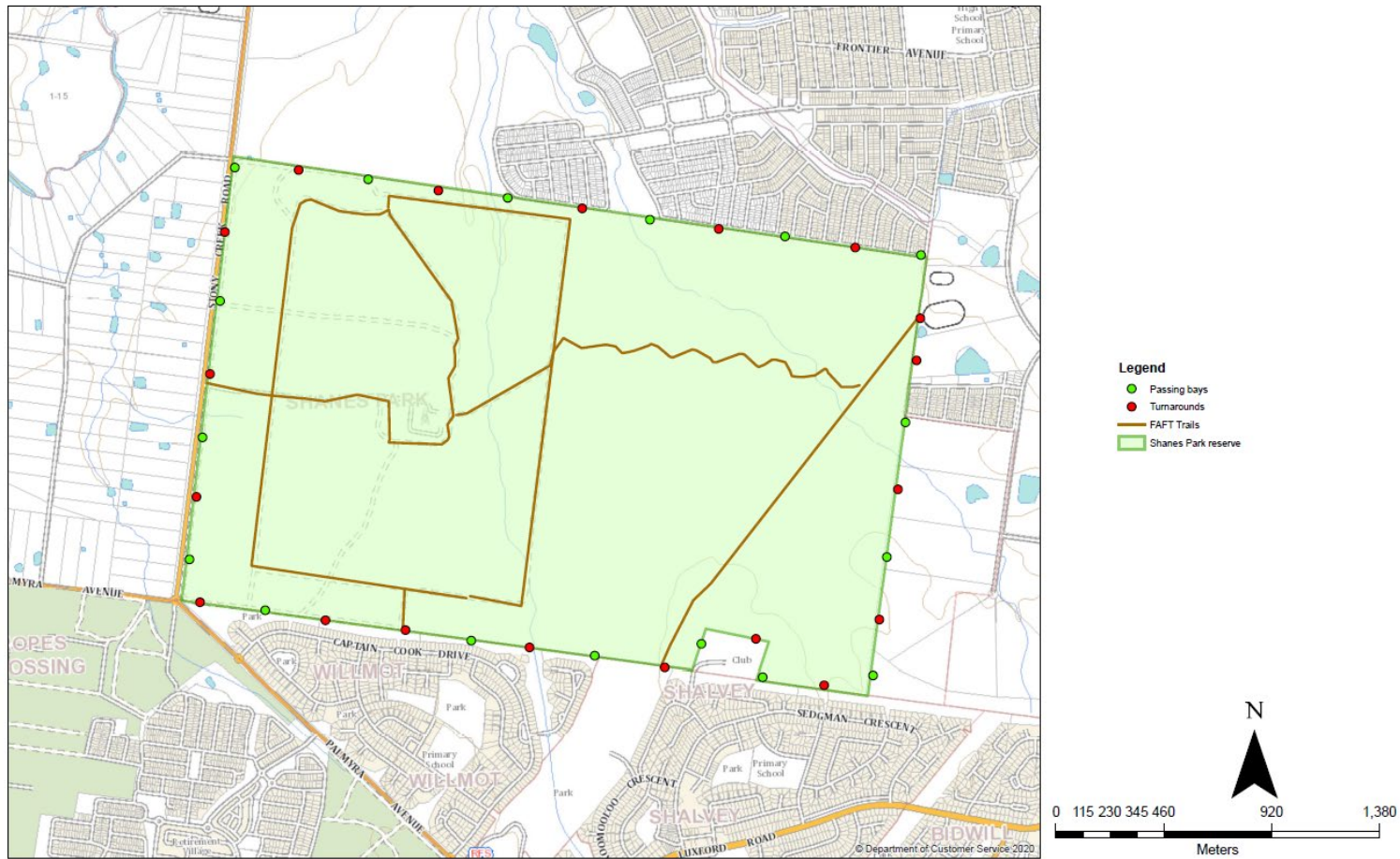


Figure 6 Locations of passing bays and turnarounds

## **6.2.6 Eradication of feral predators and herbivores from proposed feral-free fenced area**

The eradication of feral predators and herbivores (to the greatest extent practicable) within the proposed fenced area will be delivered through intensive control programs informed by a comprehensive monitoring program. These works will be summarised in a future feral animal management plan. The feral animals known to be in the area that could be subject to control are cats, foxes, wild dogs, goats, pigs, rabbits and hares. Other species may be included in the feral animal management plan if identified as posing significant risk. All feral animal control will be conducted in accordance with standard operating procedures (SOPs) developed by the Invasive Animal CRC; with the NSW Vertebrate Pest Control Manual; and with NPWS Pesticide SOPs and Firearms Management Manual. The Feral Animal Management Plan will specify the use of a range of conventional techniques, including trapping, shooting and baiting, in accordance with relevant Codes of Practice (including animal welfare requirements) and the EPA / Australian Pesticides and Veterinary Medicines Authority (APVMA) permits. Experimental and emerging techniques will be considered and deployed if appropriate.

### **Phase 1**

A monitoring program will be implemented, consisting of remote camera traps deployed in an array throughout the proposed fenced area, spot lighting patrols and sand plots on tracks. Eradication effort and impact will be recorded and, together with the data from the monitoring program, the results will be used to refine the eradication program. Monitoring will be carried out prior to and ongoing throughout the Phase 2 control program.

### **Phase 2**

Once the fence is at 'lock-up' stage, intensive control of feral predators and herbivores will be conducted. The tactical deployment of eradication effort and tools will be modified in response to the information generated by the monitoring program. Typically, the eradication tools will include:

- use of poison baits and bait delivery devices
- ground shooting, including for euthanasia of trapped feral animals
- cage and soft jaw trapping
- lures and attractants or fodder points may be used in association with control techniques for feral predators and herbivores.

Shooting will be conducted under shoot plans approved by NPWS and carried out by authorised personnel. Feral animal control programs will be consistent with policy and legislation (as outlined in section above). Additional separate risk management documents are required for some techniques, including an Authorised Control Officer Risk Assessment for poison baiting.

### **Verification of feral predator-free status**

The proposed fenced area will be monitored using remote camera arrays, sand plots, scat sampling, scent-detection dogs and spotlighting. Verification of feral predator-free status will be determined through assessing activity of feral animals over time. Where there has been no activity detected on camera or on sand plots for 1-2 months, an 'interim feral-free status' will be declared. To ensure all feral predators have been removed, intensive monitoring will continue for a further 2 months post 'interim feral-free status', after which the area will be declared 'feral predator-free'. Once declared feral-free, regular monitoring for the presence of feral predators and herbivores will continue inside the fence (using remote camera traps

and sand plots on tracks) to ensure any incursions are detected. Daily patrols of the fence line will identify any damages to the fence allowing incursions, resulting in immediate repair. Any incursions will be responded to as per the Feral Animal Management Plan.

### **6.2.7 Control of large macropods from fenced area**

Over-abundance of large macropods (eastern grey kangaroo, and possibly swamp wallaby) within the feral predator-free area is a potential risk to both fence integrity and ecological function. Released from predation pressure, macropods inside the predator proof fence are likely to increase unsustainably. Overgrazing on native grasses from macropods can already be observed throughout the reserve. This impact on vegetation could also reduce the prospect of success for reintroduced species. NPWS will monitor this macropod pressure as per the *Ecological Health Monitoring Framework* and adopt an adaptive management approach. Any intervention to the extant macropod population is outside the scope of this REF. If macropod control or relocation is required NPWS will develop a macropod management plan to assess options and inform preferred options to manage populations inside the fenced area.

### **6.2.8 Reintroduction of locally extinct species**

In April 2021, Professor in Terrestrial Ecology, Christopher Dickman, and William La Marca, PhD candidate from the University of Sydney, were engaged by the National Parks and Wildlife Service to provide a list of species that were considered potential candidates for reintroduction in sites in western Sydney (*Appendix F*). The list of species is based on specimen records, sightings, distribution modelling, reports or other accounts, knowledge of their habitat requirements and their historic ranges.

Twelve priority species that formerly occurred in western Sydney but have become locally extinct because of feral cats and foxes will be considered for reintroduction, including:

- eastern bettong
- brown antechinus
- eastern quoll
- brush-tailed phascogale
- southern Long-nosed bandicoot
- New Holland mouse
- common dunnart
- bush rat
- koala
- emu
- bush stone-curlew
- green and golden bell frog.

Expert advice provided to the National Parks and Wildlife Service in relation to amphibians and reptiles is as follows:

- there are an estimated 15 extant species (common) that will benefit from removal of feral animals
- there are an estimated 14 extant species (declining) that will benefit from removal of feral animals in conjunction with habitat augmentation/rehabilitation and or supplementation of numbers

- there are an estimated 17 locally or regional extinct species that are being considered as candidates for reintroduction
- there are another 20 species that require further assessment/investigation but could be candidates for reintroduction.

Examples of the locally or regional extinct species include Ornate Burrowing Frog, Rainbow Litter Skink and Diamond Python. The report will be published on the Department of Planning, Industry and Environment's website.

This illustrates the importance of the Shanes Park reintroduction project – the loss of around 30 species (probably more) represents an exceptional loss of biodiversity with significant impacts on ecosystem function. The Shanes Park project is designed to return locally extinct species and restore ecological processes on a nationally significant scale.

The first reintroduction of locally extinct animals is planned for November 2022.

Reintroduction of candidate species will occur over several years. Details relating to the timeline for reintroduction of each species, the number of individuals of each species to be released, the source populations and a range of other relevant issues will be identified as part of science-based planning for the translocation, including the preparation of formal translocation plans. These plans will be informed by expert advice and review.

### **6.2.9 Asset protection and strategic fire management to protect infrastructure**

The protection of life and property, including community assets from the adverse impacts of fire, is a legislative requirement and the primary fire management objective of the NPWS.

The relevant Bush Fire Risk Management Plan and Reserve Fire Management Strategies will be prepared to adequately identify built and natural assets and prioritise strategies for their protection.

NPWS propose the establishment of an Asset Protection Zone (APZ) around the outside perimeter of the feral predator-proof fence. Fuel reduction within the APZ will aim to reduce the overall fuel hazard to below the rating of 'high' (the target for an APZ) with the intention of reducing the risk of fire within the zone and to assist with suppression of fires in this zone. This will be largely achieved by regular and ongoing mechanical works. The finalisation of these Asset Protection Zones is subject to the approval of the reserve fire management strategy.

Reduction of fuels within the Strategic Fire Advantage Zones can be achieved using both hazard reduction burning, and the mechanical removal of ground debris, shrubs and sub-canopy trees.

A program of burns will be carried out within the feral predator-free area prior to, during and following reintroductions. These burns will be planned to optimise outcomes from an ecological, cultural and safety perspective. Where possible, these will be designed to achieve mutual outcomes for community safety and biodiversity. The strategy will be based on tolerable fire intervals for species, and ecological communities with a number of over-arching principles to ensure that a diversity of age classes/life stages of vegetation communities are present across the reserve.

### **6.2.10 Monitoring, evaluation and reporting**

NPWS has developed a detailed draft Ecological Health Monitoring Framework (EHMF) for this site. The draft EHMF will be used to guide how the NPWS will monitor, evaluate and report performance against the project objectives, outputs and outcomes identified for the western Sydney rewilding site over the short, medium and long term. The EHMF will also

provide for continuous improvement and adaptive management to ensure that the best available evidence (including lessons learned from successes and failures) continues to inform the program.

Indicators are selected to monitor trends in:

- reintroduced and extant native species
- ecosystem function and ecological processes
- threats.

## **7. Reasons for the activity and consideration of alternatives**

### **7.1 Objectives and reasons for the proposal**

The primary objectives of the program are to:

- establish and maintain viable new populations of locally extinct within the feral predator-free area
- maintain or improve the trajectory (as measured by population size, abundance, occupancy, or extent) of extant resident fauna (including threatened species) within the feral predator-free area
- improve ecological health/ecosystem function within the feral predator-free area
- eliminate (or reduce to ecologically insignificant levels) threats to reintroduced and extant resident fauna and their habitat.

In addition, the western Sydney site has an important role in increasing the awareness and understanding of threatened species, communities, threatening processes and their management. This will be achieved through a program to enhance visitor experience at Shanes Park but is outside of the scope of this REF.

The feral predator-free area will operate as an anchor (foundation) supporting site-based and broader landscape scale conservation by:

- preventing the extinction of highly threatened species which will not survive in the presence of feral cats and/or foxes
- providing secure long-term protection, and increasing the wild population, of species which are suppressed by cats and/or foxes
- restoring ecological processes through the return of digging mammals etc.
- through research and innovation, generating knowledge that can be applied to mitigate the impact of feral predators and other threats across the landscape (i.e. improve conservation outcomes 'beyond the fence')
- establishing insurance populations of threatened species until a time in which fox control in fox control in isolated urban reserves can occur without the risk of ongoing reinvasion. This will provide source populations to allow the restoration of populations, when feasible, across a landscape. Furthermore, this will allow an insurance population in the case of stochastic events
- promoting public awareness of, and appreciation for, the value of native wildlife and conservation.

## Reasons for the initiative

Scientific publications have established:

- Australia has the highest number of mammal extinctions in the world (Burbidge and McKenzie 1989; McKenzie et al. 2007).
- Over 30 mammal species are now extinct (>13% of all terrestrial Australian mammals) and another 60 listed as threatened (Woinarski et al. 2014, Legge et al. 2018).
- In New South Wales, 26 mammal species have become extinct since European settlement, and around 50-60% of surviving mammals are threatened with extinction.
- Predation by the introduced red fox (*Vulpes vulpes*) and feral cat (*Felis catus*) is the key driver in almost all of these extinctions, and in the ongoing decline of many extant species (Short and Smith 1994; Abbott 2011; Woinarski et al. 2015, Radford et al. 2018). Feral cats and/or foxes have been shown to have a significant impact on some bird (Garnett et al. 2011; Woinarski et al. 2017), reptiles (Woinarski et al. 2018; Chapple et al. 2019), and amphibian species (Woinarski et al. 2020).
- The number of species considered at risk of extinction continues to rise (NSW EPA 2018).
- Some monitoring programs indicate population reductions of >90% in multiple species over the last 2 decades, even in large conservation reserves (Woinarski et al. 2015). Most conservation reserves under current management will fail to conserve and recover such predator-susceptible species (Woinarski et al. 2018).
- The effective control of feral predators is essential for the recovery of many of our most threatened species, especially small to medium sized mammals and ground-dwelling birds.
- Despite current conservation efforts, there is no effective strategy for landscape scale control of feral cats and landscape scale fox control has mixed results and limitations (including restrictions for control of foxes in urban areas) (Radford et al. 2018).
- A number of species with a high – extreme susceptibility to predation are dependent upon permanent and intensive predator control, and in some cases entirely dependent upon feral predator-free – safe havens (Legge et al. 2018, Radford et al. 2018).
- There is strong scientific support for the establishment of feral predator-free areas using conservation fencing as an essential component of any overall strategy to prevent further extinctions and promote the recovery of our most susceptible species (Ringma et al. 2017; Legge et al. 2018; Legge et al. 2019). A network of these enclosures is necessary to complement the conventional reserve system and is required in the short to medium-term to prevent extinction of predator-susceptible threatened mammal species (Legge et al. 2019).

## Reasons for the western Sydney site

- The loss of small – medium sized ground mammals has been significant, with this guild being noticeably absent from the reserves across western Sydney.
- There has been a significant reduction in the assemblages of reptiles and amphibians throughout this landscape.
- In the absence of these species, the overall health and functioning of the ecosystems within the Cumberland Plain has diminished.
- The site is readily accessible by the public, thereby facilitating increased public awareness of, and appreciation for, the value of native wildlife.

Australian small to medium sized terrestrial mammals have been in significant decline since European settlement some 200 years ago (Woinarski et al. 2015), and western Sydney is no



exception. The ecological importance of these mammals and the function they provide cannot be understated (Haouchar et al. 2016). The eastern bettong for instance, is believed to have been mycophagous (having a diet based on fungi), a conclusion based off its extant Tasmanian population (Rose 1986). This species is now considered completely extinct from the Australian mainland. Prolific digging in the search of fungi results in high levels of bioturbation. This bioturbation provides essential ecosystem functioning by improving soil quality and seed germination success resulting in a greater biomass (Haouchar et al. 2016; Dundas et al. 2018).

Predator-free areas have been identified as a key component in the conservation of mammals in Australia (Ringma et al. 2018). With pressures from feral predators increasing (Woinarski et al. 2017), creating a network of predator-free safe havens is the most effective and achievable tactic in the medium term (NESP 2018). Raising awareness on the importance of these networks, and their achievability in an urban interface is a critical outcome of this proposal.

A feral predator-free site in western Sydney presents an opportunity to study the outcomes of such a project in a dense urban interface. Such a location enables research that could prove critical in the long-term conservation of the Cumberland Plain, by providing opportunities to study this ecosystem in the absence of feral predators, providing a 'reference site'.

## 7.2 Consideration of alternatives

### 7.2.1 Alternative sites

Consideration has been given to a number of alternative sites in western Sydney that meet the program objectives.

The assessment has taken into account a range of factors including land tenure, permissibility, reserve size, topography including drainage lines, access, management operations, facilities and constraints, risk of catastrophic events such as fire and flooding, environmental, cultural and social values and impacts, habitat suitability and condition for selected species proposed for reintroduction, presence of easements, roads, and utilities, and level of support from adjacent landholders and the broader community. A large number of reserves were considered and assessed under these criteria, including:

- Bents Basin State Conservation Area
- Gulguer Nature Reserve
- Castlereagh Nature Reserve
- Cattai National Park
- Mulgoa Nature Reserve
- Scheyville National Park
- Shanes Park
- Wianamatta Nature Reserve
- Wianamatta Regional Park
- Windsor Downs Nature Reserve.

Castlereagh Nature Reserve, Windsor Downs Nature Reserve, the Shanes Park reserve and Wianamatta Regional Park were identified as being the most suitable and considered in more detail.

An initial assessment identified Castlereagh Nature Reserve as a preferred site in western Sydney. Consideration was then given to a range of factors (listed below) in selecting the final site:

- the number of native species that will benefit including:
  - the number of locally extinct species to be reintroduced (and the likely population size of each, based on the area and suitability of habitat at each site)
  - extant fauna that will benefit from feral animal removal
- establishment and maintenance costs (including perimeter length, topography, and management risks such as fire, vandalism, drainage/culverts and the timeframe for completion)
- the scale and quality of the visitor experience; including the location, natural setting and accessibility, together with the cost of implementing visitor programs
- environmental, cultural and social impacts associated with construction of predator proof fence and supporting ancillary infrastructure, including impacts on plant and animal species, ecological communities, connectivity, Aboriginal and historic heritage values, and recreational use
- the anticipated extent of broader ecosystem restoration based on current condition and the benefits associated with the exclusion of feral animals, focussed management and reintroductions
- the view of stakeholders was recognised and considered against these factors.

A proposed amendment to the *Castlereagh, Agnes Banks and Windsor Downs Nature Reserves Plan of Management* was released for public comment on 22 January 2021. This amendment facilitated the establishment of a feral-predator free area and subsequent fauna reintroductions.

In response to community feedback, NPWS conducted additional detailed assessments across a number of priority sites throughout western Sydney, including recently transferred land at Shanes Park. The Shanes Park reserve was identified as providing, on balance, the best site for establishing a large feral predator-free area and reintroducing locally extinct native wildlife.

In selecting the Shanes Park reserve, NPWS has taken into account a range of factors including size, habitat suitability, the number of species that will benefit, including the expected carrying capacity of the site for priority species, opportunities for public engagement, the cost and practicality of establishing, maintaining and operating a feral predator-free area, and other environmental and cultural impacts and benefits.

## **7.2.2 Alternative designs**

Consideration has been given to multiple alternate fence alignments within the preferred sites to avoid and minimise potential environmental, cultural and social impacts. The alignment within the Shanes Park reserve was selected to maximise the size of the feral predator-free area while minimising environmental impacts. Alternative alignments would have resulted in a higher ratio of vegetation impacted to vegetation fenced.

## **7.2.3 Alternate construction and management options**

Consideration has been given to options for reducing the overall impact of the construction of the conservation fencing, including reduced setbacks where possible and agreements with neighbouring landholders for ongoing access for maintenance. The proposed design (*Figure 2*) involves an impacted corridor of only 7.5 m in width. This allows for a Category 1 trail on the internal side of the predator proof fence, and a 2.5 m management trail on the

external side of the predator proof fence. This footprint cannot be reduced without significant sacrifices to access and park management activities, including fire management. This 7.5 m footprint was designed to minimise the vegetation removal associated with the establishment of the site. Other feral predator-free areas have used cleared corridors of up to 15 m in width, to manage the risk of tree fall damage to the fence. To reduce this risk, regular patrol of the site will involve ongoing tree assessments with pruning where necessary.

#### **7.2.4 Taking no action**

The Shanes Park reserve is currently subject to significant levels of illegal activity. This includes firewood collection, trailbike and four-wheel driving and vegetation clearing. As a result, the vegetation within the reserve is in moderate to poor condition. These impacts extend to ecological communities and reduce habitat for threatened fauna species. Additionally, the high abundance of feral predators, such as cats and foxes prevent the natural restoration of these ecosystems. In addition to providing a platform for improved community engagement, education and compliance, the proposed activity will result in a conservation outcome that cannot otherwise be achieved.

#### **7.2.5 Justification for preferred option**

The Shanes Park reserve was identified as providing, on balance, the best site for establishing a large feral predator-free area and reintroducing locally extinct native wildlife.

In selecting the Shanes Park reserve, NPWS has taken into account a range of factors including size, habitat suitability, the number of species that will benefit, including the expected carrying capacity of the site for priority species, opportunities for public engagement, the cost and practicality of establishing, maintaining and operating a feral predator-free area, and other environmental and cultural impacts and benefits.

Shanes Park feral predator free area will deliver major benefits, including:

- return of locally extinct species
- an increase in populations of extant fauna threatened by cats/foxes
- improvement in ecological health through:
  - removal of feral herbivores
  - restoration of ecosystem processes such as digging and predation.

The project aims to restore areas, as far as practicable, to a condition similar to what those areas would have been over 250 years ago, before the arrival of feral animals, when the Australian bush was alive with small native animals.

Other benefits of establishing feral-free fenced areas:

- research opportunities to increase knowledge in long term management of threatened species and populations
- unique visitor opportunities, to enhance the community's awareness and understanding of our threatened species, the factors impacting on them and the benefits of healthy native ecosystems
- exchange of animals between sites, to strengthening genetic diversity and contribute to threatened species conservation at a national scale
- opportunities to work collaboratively with Aboriginal traditional owners and communities on restoring Country.

## 8. Description of the existing environment

The 'subject site' is 559 hectares in size and is located at Shanes Park in western Sydney, approximately 40 km west-north-west of the Sydney CBD, and about 10 km north-east of Penrith town centre, within the adjacent Blacktown Local Government Area (LGA).

The reserve is the site of the former Airservices Australia Llandilo International Transmitting Station, and is currently accessed off Stoney Creek Road, and is north-east of Wianamatta Regional Park (Figure 1).

A number of management trails are present within the site and are currently in poor condition.

This portion of the LGA is situated within an urban to semi-rural landscape characterised by residential dwellings, small agricultural lots, commercial businesses, Council parklands and some open areas that support bushland. North adjacent to the site is a new future residential development. To the east is future residential development, industrial areas, and extant privately owned bushland. South of the reserve are the residential suburbs of Wilmot and Shalvey. To the west of the reserve is the semi-rural suburb of Shanes Park.

### 8.1 Natural values

#### 8.1.1 Geology, geomorphology and topography

The Penrith 1:100,000 Soil Landscape map sheet (Bannerman et al. 2010) identifies that the subject site is located within three landscapes, being (Figure 7).

- Berkshire Park Alluvial Landscape
- Blacktown Residual Landscape
- South Creek Alluvial Landscape.

Natural elevations within the subject site range from 15 m to 50 m ASL.

Topography within the study area is characterised by flat terrace tops dissected by present day small unnamed drainage channels and narrow drainage lines, with small remnant surfaces occurring to the east and south are at a slightly higher elevation (approximately 20 m); gently undulating rises with local relief 20–40 m and slopes generally >5% but occasionally up to 10%; broad crests and ridges (200–600 m) and rounded with convex upper slopes grading into concave lower slopes; flat to gently sloping alluvial plain with occasional terraces or levees providing low relief. Slopes <5% (Bannerman and Hazelton 2011).

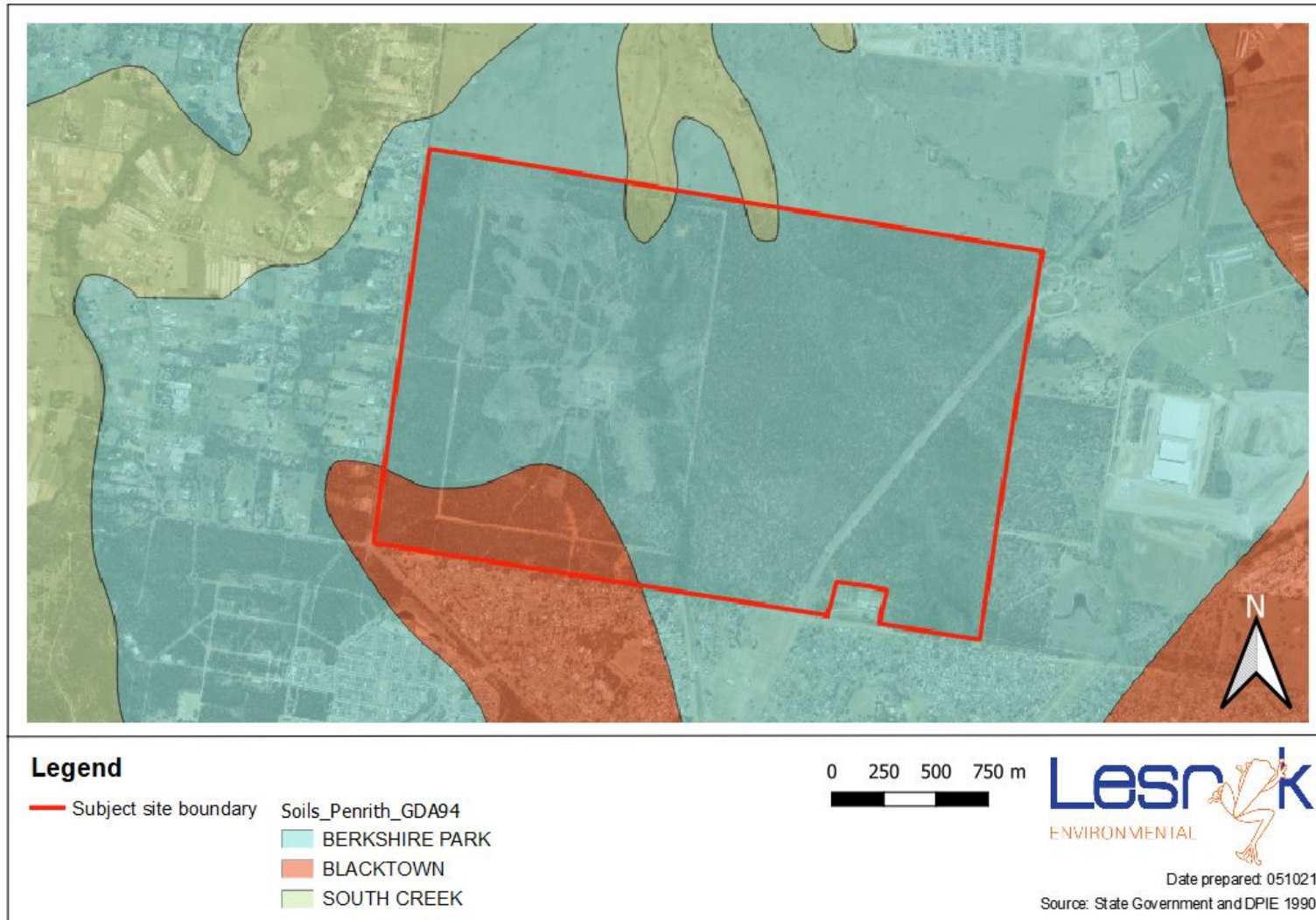


Figure 7 Soil landscapes

### **8.1.2 Soil types and properties (including contamination)**

The Berkshire Park Landscape soils are weakly pedal orange heavy clays and clayey sands, often mottled; ironstone nodules are common; large silcrete boulders occur in sand/clay matrix; with solods, yellow podzolic soils, red podzolic soils, chocolate soils, structured plastic clays and structured clays (Bannerman and Hazelton 2011). Limitations are very high wind erosion hazard if cleared; gully, sheet and rill erosion on dissected areas; localised seasonal waterlogging; localised flood hazard; impermeable soils and low soil fertility (Bannerman and Hazelton 2011).

The Blacktown Landscape is shallow to moderately deep hard-setting mottled texture contrast soils; red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines (Bannerman and Hazelton 2011). Limitations are localised seasonal waterlogging, localised water erosion hazard; moderately reactive highly plastic subsoil and localised surface movement potential (Bannerman and Hazelton 2011).

The South Creek Landscape is often very deep layered sediments over bedrock or relict soils; structured plastic clays or structured loams in and immediately adjacent to drainage lines, where pedogenesis has occurred; red and yellow podzolic soils are most common on terraces with small areas of structure grey clays, leached clay and yellow solodic soils (Bannerman and Hazelton 2011). Limitations are flood hazard, seasonal waterlogging; localised permanently high water tables; localised water erosion hazard, and localised surface movement potential (Bannerman and Hazelton 2011).

Consultation of the EPA contaminated lands record (search criteria – Suburb – Shanes Park; LGA – Blacktown) did not indicate the presence of any contaminated land near the subject site (Environment Protection Authority 2021).

Visual inspections of the areas to be disturbed by the fencing proposal conducted during the course of a site inspection did not identify any instances of materials that could be hazardous such as asbestos. Urban refuse has been deposited at a number of locations within, and in proximity to, the proposal area, none considered to support hazardous materials.

Reference to the NSW Government's online Sharing and Enabling Environmental Data in NSW (SEED) resource, indicates that Shanes Park is not expected to be underlain by acid sulfate soils (NSW Government 2021).

### **8.1.3 Watercourses, waterbodies and wetlands (including their catchment values)**

Within the reserve, 2 unnamed creeks (branches of South Creek/Wianamatta Creek) are present; one traversing south-north through the centre of the reserve, with the second traversing the north-eastern corner. Both drainage lines originate to the south of Shanes Park, and both have urban catchments. Due to the urban development of the area to the south of Shanes Park, including the suburbs of Willmot, Shalvey, Bidwill and Lethbridge Park, stormwater inputs to these during heavy rainfall periods are expected to be having a negative impact on the water quality within each of these creeks.

It is noted that, upstream of Shanes Park, the alignment of one of the unnamed drainage channels (this entering the subject site in the central portion of the southern boundary) has been realigned and significantly modified, this creek being present within a concrete channel. Associated with this drainage line are a number of concrete structures, including gross pollutant traps. Areas adjacent to this channel are dominated by cleared and regularly maintained lawns.

Neither of the drainage lines present within the subject site are mapped as Key Fish Habitat (DPI – Fisheries 2021).

No developed wetlands are present within Shanes Park, though sites of impounded water have been vegetated by a high-density layer of aquatic plants. No open expanses of water were observed in association with these at the time of inspection.

### 8.1.4 Areas of outstanding biodiversity value or critical habitat

Through reference to the listings provided under the EPBC and FM Acts, it is noted that no gazetted areas of critical habitat for any flora or fauna species, populations or communities occur within, or in the vicinity of, the study area. Similarly, none of the Areas of Outstanding Biodiversity Value (AOBVs) listed under Part 3 of the Biodiversity Conservation Regulation 2017 occur within, or in the vicinity of, the study area (DPIE 2021).

### 8.1.5 Threatened ecological communities

Site inspections undertaken within, and in proximity to, the proposal area identified the presence of a number of State and Federally listed Threatened Ecological Communities (Table 1) (Lesryk 2021 – Appendix D). Based on a consideration of the scope of works proposed and extent of likely disturbance, estimates of the area affected within each have been determined (Table 1).

These communities can be described as per the following:

**Shale Plains Woodland:** A small area of this community occurs in the south of the reserve east of the main creek. It is characterised by a canopy of forest red gum and grey box with a moderate to dense shrub layer of blackthorn. The groundcover is composed of the native species kangaroo grass, *Paspalidium distans*, weeping meadow grass and hedgehog grass (*Echinopogon caespitosus*), with the introduced African lovegrass often dominating near the boundary.

**Shale-Gravel Transition Forest:** This is the most widespread community in the reserve. It has a canopy to 25 m of broad-leaved ironbark, forest red gum (*Eucalyptus tereticornis*) and grey box (*E. moluccana*) with an understorey that often includes black she-oak (*Allocasuarina littoralis*) and sickle wattle (*Acacia falcata*). Melaleucas are less common and the shrub layer includes blackthorn, *Dillwynia sieberi*, *D. tenuifolia* and *Grevillea juniperina* subsp *juniperina*. African lovegrass is common near the reserve's boundaries and Rhodes grass (*Chloris gayana*) is common in the south. The native groundcover component is similar to the Castlereagh Ironbark Forest though species such as kangaroo grass (*Themeda triandra*) can be more common.

**Alluvial Woodland:** This community occurs along and beside drainage lines and includes areas mapped as Castlereagh Swamp Woodland by the department (OEH 2011). The canopy is composed of rough-barked apple (*Angophora floribunda*), forest red gum and cabbage gum (*E. amplifolia*). Intact areas have an understorey of *Melaleuca styphelioides* and/or swamp oak (*Casuarina glauca*) and a groundcover of both weeping meadow grass (*Microlaena stipoides*) and kangaroo grass. However, those part of the community impacted by the fence alignment tend to be weed-infested with an understorey of privet (*Ligustrum* spp) and introduced herbs and grasses forming a dense groundcover where there is sufficient light.

**Freshwater Wetlands:** This community occurs along the two drainage lines in the north of the reserve where impeded drainage has resulted in pondages allowing colonisation by the native species cumbungi (*Typha orientalis*), common rush (*Juncus usitatus*), *Bolboschoenus caldwellii*, knotweed (*Persicaria* sp) and *Schoenoplectus validus*. Weeds are interspersed amongst stands of these species and are dominant in much of the larger western wetland. Common species are the herbs buttercup (*Ranunculus* spp), curled dock (*Rumex crispus*), plantain (*Plantago lanceolata*) and the shrub Peruvian primrose (*Ludwigia peruviana*). It is unclear whether these wetlands were formed by artificial means, which would disqualify

them as the BC Act Endangered Ecological Community (EEC) known as Freshwater Wetlands on Coastal Floodplains. Until this matter is resolved, a precautionary approach is taken and they are assumed to be part of this EEC.

**Castlereagh Ironbark Forest:** This community is widespread in the west of the reserve and is characterised by a canopy of broad-leaved ironbark (*Eucalyptus fibrosa*) to 20 m above a dense understorey of 10 m high *Melaleuca decora* and ball honeymyrtle (*M.nodosa*) to 3 m. Shrub cover is sparse to moderately dense and includes *Grevillea juniperina subsp juniperina*, *Daviesia ulicifolia* and *Dillwynia tenuifolia*. Common ground cover species are sword sedge (*Lepidosperma laterale*), *Dianella revoluta*, Mulga fern (*Cheilanthes sieberi*), mat-rushes (*Lomandra filiformis* and *L. multiflora*), three-awn spear grass (*Aristida vagans*) and, at and near disturbance margins, the introduced plant African lovegrass (*Eragrostis curvula*).

**Castlereagh Scribbly Gum Woodland:** A small area of this community is traversed by the proposed fence alignment in the south of the reserve. It has a canopy of scribbly gum (*Eucalyptus racemosa*) and narrow-leaved apple (*Angophora bakeri*) and a variety of shrub and groundcover species.

No aquatic Threatened Ecological Communities are present within, or in proximity to, Shanes Park.



**Table 1** Extent of vegetation predicted to be cleared to achieve the objectives of the proposal.

–	Plant Community Type (PCT)	BC Act status	EPBC Act Status	Current Extent (ha)	Total area in reserve (ha)	Area affected (ha)	Area affected as % of current extent	Area affected as % of reserve total
Shale Plains Woodland	849 – Cumberland Shale Plains Woodland	CEEC Cumberland Plain Woodland	CEEC Cumberland Shale Plains Woodland and Shale-Gravel Transition Forest	6800	25.38	0.22	0.003	0.87
Shale-Gravel Transition Forest	724 – Shale-Gravel Transition Forest	EEC Shale-Gravel Transition Forest	CEEC River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	1700	251.38	3.87	0.23	1.54
Alluvial Woodland <sup>1</sup>	835 – Cumberland riverflat forest	EEC River-flat Eucalypt Forest on Coastal Floodplains	–	4729	39.19	0.17	0.004	0.43
Freshwater Wetlands	1071 – <i>Phragmites australis</i> and <i>Typha orientalis</i> coastal freshwater wetlands of the Sydney	EEC – Freshwater Wetlands on Coastal Floodplains	–	unknown	2.85	0.08	unknown	2.81

1. <sup>1</sup> Areas mapped by OEH (OEH 2011) as Castlereagh Swamp Woodland within the reserve were interpreted to be Alluvial Woodland and added to the totals for that community.

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	Plant Community Type (PCT)	BC Act status	EPBC Act Status	Current Extent (ha)	Total area in reserve (ha)	Area affected (ha)	Area affected as % of current extent	Area affected as % of reserve total
	Basin Bioregion							
Castlereagh Ironbark Forest	725 – Castlereagh Ironbark Forest	CEEC Cooks River-Castlereagh Ironbark Forest	CEEC Cooks River-Castlereagh Ironbark Forest	1100	120.91	0.42	0.04	0.35
Castlereagh Scribbly Gum Woodland	883 – Castlereagh Scribbly Gum Woodland	VEC Castlereagh Scribbly Gum Woodland	EEC Castlereagh Scribbly Gum and Agnes Banks Woodlands	3100	12.49	0.03	0.001	0.24
<b>Totals</b>					<b>452.21</b>	<b>4.79</b>		<b>1.06</b>

Key:

EEC – Endangered Ecological Community

VEC – Vulnerable Ecological Community

CEEC – Critically Endangered ecological community

## 8.1.6 Threatened species and populations

To target the presence of threatened species a series of surveys that drew upon standard survey methods, were undertaken along, and in proximity to, the proposal area (Lesryk 2021).

At the completion of these surveys, the following state and federally listed threatened species were recorded within, or in proximity to, the proposal area:

- *Hibbertia puberula* – listed as endangered on the BC Act
- *Pultenaea parviflora* – listed as endangered on the BC Act and vulnerable on the EPBC Act
- *Grevillea juniperina* subsp. *juniperina* – listed as vulnerable on the BC Act
- *Dillwynia tenuifolia* – listed as vulnerable on the BC Act
- little lorikeet (*Glossopsitta pusilla*) – listed as vulnerable under the BC Act
- Cumberland plain land snail (*Meridolum corneovirens*) – listed as endangered under the BC Act.

In addition, considering the habitat types present and based on the adoption of a precautionary approach, it was considered that 12 animals listed under the EPBC or BC Acts could be present within proximity to the project area (Table 2).

In addition to these, records with no formal data exist for a number of listed bird species likely to use the reserve intermittently such as the scarlet robin (*Petroica boodang* – listed as vulnerable on the BC Act), swift parrot (*Lathamus discolor* – listed as endangered on the BC Act and critically endangered on the EPBC Act), little eagle (*Hieraaetus morphnoides* – listed as vulnerable on the BC Act) and the square-tailed kite (*Lophoictinia isura* – listed as vulnerable on the BC Act) (Vella 2011).

A number of these species and communities have programs under the *Saving our Species* (SoS) program including, *Grevillea juniperina* subsp. *juniperina*, masked owl, eastern coastal freetail bat, Cumberland plain land snail, little lorikeet and Cumberland Plain Woodland in the Sydney Basin Bioregion. The proposed activity will not have any adverse impacts on any management actions identified in any SoS programs.

**Table 2 Species considered highly likely to be resident within/adjacent to the reserve.**

Species	EPBC Act	BC Act	Habitat within reserve
Squirrel glider <i>Petaurus norfolcensis</i>	–	Vulnerable	Hollow-bearing trees, flowering plants
Yellow-bellied sheath-tail-bat <i>Saccolaimus flaviventris</i>	–	Vulnerable	Hollow-bearing trees, insect-attracting plants
Eastern false pipistrelle <i>Falsistrellus tasmaniensis</i>	–	Vulnerable	Hollow-bearing trees, insect-attracting plants
Southern myotis <i>Myotis macropus</i>	–	Vulnerable	Hollow-bearing trees, drainage lines in which exotic fish were observed
Greater broad-nosed bat <i>Scoteanax rueppellii</i>	–	Vulnerable	Hollow-bearing trees, insect-attracting plants
Eastern coastal free-tailed bat <i>Micronomus norfolkensis</i>	–	Vulnerable	Hollow-bearing trees, insect-attracting plants

Species	EPBC Act	BC Act	Habitat within reserve
Australian painted snipe <i>Rostratula australis</i>	Endangered	Endangered	Suitable water bodies present
Curlew sandpiper <i>Calidris ferruginea</i>	Critically Endangered, Migratory	Endangered	Suitable water bodies present
Latham's snipe <i>Gallinago hardwickii</i>	Migratory	–	Suitable water bodies present
Speckled warbler <i>Chthonicola Sagittata</i>	–	Vulnerable	Suitable woodlands present
Varied sittella <i>Daphoenositta chrysoptera</i>	–	Vulnerable	Suitable woodlands present
Dusky woodswallow <i>Artamus cyanopterus cyanopterus</i>	–	Vulnerable	Suitable woodlands present

The proposed fence does not present a barrier to movement in and out of the reserve for any of these threatened fauna as all can either fly or glide over the fence.

There are a number of additional threatened species recorded within proximity to the Shanes Park reserve, in which examples or suitable habitat were not observed within the reserve. These are considered to have a low to moderate likelihood of occurring within the reserve. This *Likelihood of Occurrence Table* can be found in *Appendix D*.

No species listed under the FM Act were considered to be present within, or in proximity to, Shanes Park.

## 8.2 Cultural values

### 8.2.1 Aboriginal cultural heritage

A stand-alone *Aboriginal Cultural Heritage Assessment Report* is being undertaken in conjunction to this REF in order to assess the impacts of the proposed activity on Aboriginal heritage. The park contains evidence of past use by the Darug people with multiple records available. Based on the landscape and knowledge of neighbouring reserves there is a high probability of unrecorded Aboriginal sites within the reserve. The assessment report involves extensive consultation with the Aboriginal community.

### 8.2.2 Historic heritage values

A stand-alone heritage assessment is being undertaken in conjunction to this REF in order to assess the impacts of the proposal on heritage values at the reserve. However, as the proposed activity will have no impact on any extant heritage fabric, it is expected that no further investigation will be required. Further investigation into the extant buildings will be necessary for future management.

## 8.3 Social values

### 8.3.1 Recreation values

Under its previous tenure, the Shanes Park reserve has no history of public use. It remains closed to the public and, as such, does not represent an area with lawful recreational values. Despite this, the reserve is widely used for recreational activities that are not permitted under NPWS management, such as dirt bike riding, 4-wheel driving, trail building and camping. These unauthorised activities are causing significant damage to the natural and cultural values of the site.

Passive recreation does take place mainly in the form of bushwalking and bird watching.

### 8.3.2 Scenic and visually significant areas

Given the site's relatively flat topography, there is a lack of lookouts or high points. It, however, is a valuable area of open green space when viewed from certain lookouts from the lower Blue Mountains. Sections of the fence will be visible from public roads running parallel with the boundary. Remnants of a former boundary fence exist in certain locations along the boundary.

### 8.3.3 Education and scientific values

It is believed there are no current educational uses or scientific research occurring in the Shanes Park reserve. A couple of licences exist for water quality monitoring and seed collection, and some monitoring of threatened plant species abundance/condition is proposed in *Saving our Species* strategies, e.g. *Grevillea juniperina* subsp. *juniperina*, these will be able to continue following the construction of the predator proof fence. The proposed activity will, however, provide an opportunity for unique visitor opportunities, to enhance the community's awareness and understanding of our threatened species, the factors impacting on them and the benefits of healthy native ecosystems; and an opportunity for groundbreaking research in reintroduction biology and landscape/ecosystem management.

### 8.3.4 Interests of external stakeholders

There are a number of local conservation groups with a significant interest in the future of the reserve, many of which would like continued access to the reserve following construction of the predator proof fence. The reserve represents one of the few large remaining examples of threatened vegetation communities across western Sydney. In 2015, these conservation groups put forward a proposal to establish a rewilding program at the Shanes Park reserve.

## 8.4 Matters of National Environmental Significance

Based on the outcomes of the site inspections undertaken within Shanes Park, the following Matters of National Environmental Significance were recorded:

- *Pultenaea parviflora* - listed as vulnerable on the EPBC Act
- Shale Plains Woodland and Shale-Gravel Transition Forest – both components of the Critically Endangered Ecological Community listed under the EPBC Act as Cumberland Shale Plains Woodland and Shale-Gravel Transition Forest
- Alluvial woodland – a Critically Endangered Ecological Community listed under the EPBC Act as River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Victoria

- Castlereagh Ironbark Forest – a Critically Endangered Ecological Community listed under the EPBC Act as Cooks River-Castlereagh Ironbark Forest
- Castlereagh Scribbly Gum Woodland – an Endangered Ecological Community listed under the EPBC Act as Castlereagh Scribbly Gum and Agnes Banks Woodlands.

No fauna listed under the EPBC Act were recorded during the course of the field surveys (Lesryk 2021).

Considering the habitat types present and based on the adoption of a precautionary approach, it was considered that the Australian painted snipe (*Rostratula australis*), curlew sandpiper (*Calidris ferruginea*) and Latham's snipe (*Gallinago hardwickii*) would be present within Shanes Park during the summer migratory period.

In regard to these birds, the:

- Australian painted snipe is listed as endangered under the EPBC Act
- curlew sandpiper is listed as critically endangered and migratory
- Latham's snipe is listed as migratory.

A similar precautionary approach was adopted with birds anticipated to be winter migrants, including the swift parrot (*Lathamus discolor*), which is listed as critically endangered under the EPBC Act

The Protected Matters Search Tool (EPBC Act) was utilised to provide a summary of Matters of National Environmental Significance at Shanes Park. The following matters were searched:

- Ramsar Wetlands
- Nationally Important Wetlands
- Commonwealth Heritage Places
- World Heritage Properties
- National Heritage Places
- Regional Forest Agreements
- Australian Marine Parks
- Commonwealth Marine Areas
- Marine Regions
- Key Ecological Features

None of these Matters of National Environmental Significance are present within Shanes Park.

## 9. Impact assessment

### 9.1 Physical and chemical impacts during construction and operation

Is the proposed activity likely to...	Applicable?*	Impact level (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of impact, taking into account the receiving environment & proposed safeguards which will limit the impact)	Safeguards/mitigation measures
1. Impact on soil quality or land stability?	<input checked="" type="checkbox"/>	Low, negative	<p>The highest potential for impact on soil quality or land stability is likely to be during the vegetation removal phase. Temporary negative impacts could be observed where vegetation is removed to bare earth.</p> <p>The installation of posts into the ground has a lower potential for adverse impacts. Posts will be either air driven or installed with concrete footings.</p> <p>There may be some small localised temporary impacts where feral animal traps are set.</p>	<p>An Erosion and Sediment Control Plan (ESCP) will be prepared concurrently and will outline detailed mitigation techniques to be implemented. This is likely to include:</p> <ul style="list-style-type: none"> <li>• erosion mitigation structures consistent with the NPWS field guide for erosion and sediment control on unsealed roads</li> <li>• works should not take place during or within 3 days after a heavy rain event. Works to minimise erosion in this time can be permitted</li> <li>• sediment controls to be left in situ until surfaces have stabilised</li> <li>• vehicles, machinery and foot traffic are limited to existing trails or areas cleared as part of establishing the fence line</li> <li>• the placement of feral animal traps and control methods will be selected in order to ensure minimal soil disturbance</li> <li>• site-wide soil erosion will significantly benefit from the control of feral herbivores, and restoration of ecological processes.</li> </ul>

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Is the proposed activity likely to...	Applicable?*	Impact level (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of impact, taking into account the receiving environment & proposed safeguards which will limit the impact)	Safeguards/mitigation measures
2. Affect a waterbody, watercourse, wetland or natural drainage system – either physically or chemically (e.g. due to run-off or pollution)?	<input checked="" type="checkbox"/>	Medium, negative	<p>Two creek crossings will be constructed as part of the proposed activity. The affected creeks are unnamed first and second order streams flowing into South Creek and eventually the Hawkesbury River.</p> <p>The predator proof fence will run across these drainage lines. The fence and trails will be designed to allow water to flow at a natural rate during times of heavy rainfall.</p>	<p>No artificial release of water into drainage lines, creeks or wetlands will occur.</p> <p>Ongoing visual monitoring of drainage lines and watercourses (e.g. for turbidity) will take place throughout the activity to ensure construction activities are not resulting in sediment laden water.</p> <p>Temporary sediment fences will be installed either side of creek crossings to prevent sediment run-off.</p> <p>No fuels and chemicals will be stored within 100m, or uphill of any drainage lines or watercourses</p> <p>The fence and trails will be designed to allow water to flow at a natural rate during times of heavy rainfall.</p> <p>Feral animal traps will not be set in watercourses, wetlands or drainage systems.</p> <p>An Authorised Control Officer Risk Assessment will be prepared to prevent harm to water courses from chemical feral animal control techniques and ensure poisons are used in accordance with product labels and permits.</p>
3. Change flood or tidal regimes, or be affected by flooding?	<input type="checkbox"/>	N/A		Not applicable
4. Affect coastal processes and coastal hazards, including those under climate	<input type="checkbox"/>	N/A		Not applicable



Is the proposed activity likely to...	Applicable?*	Impact level (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of impact, taking into account the receiving environment & proposed safeguards which will limit the impact)	Safeguards/mitigation measures
change projections (e.g. sea level rise)?				
5. Involve the use, storage or transport of hazardous substances, or use or generate chemicals which may build up residues in the environment?	<input checked="" type="checkbox"/>	Low, negative	Risk of chemical or oil spills from machinery.	<p>All machinery will be inspected to ensure it is in working order prior to mobilisation to the site.</p> <p>An Authorised Control Officer Risk Assessment will be prepared to prevent environmental harm from chemical feral animal control techniques, including that untaken poison baits are removed and disposed in accordance with product labels and permits.</p> <p>A hazardous chemical spill kit will be onsite during construction activities in case there are any incidents involving fuel or oil spills</p>
6. Involve the generation or disposal of gaseous, liquid or solid wastes or emissions?	<input checked="" type="checkbox"/>	Low, negative	Minor negative impacts to air quality may result by the generation of exhaust fumes from machinery during the clearing of vegetation, construction of roads and construction of the predator proof fence.	All machinery is to be maintained to ensure minimum levels of emissions are created. Engines to be switched off when machinery not in use as opposed to being left idling.
7. Involve the emission of dust, odours, noise, vibration or radiation?	<input checked="" type="checkbox"/>	Low, negative	Some dust is likely to be generated throughout the vegetation removal and construction of fire trails. Noise and vibration as a result of operating machinery could have impacts on neighbouring properties,	<p>Where construction is near residential properties, dust levels will be managed by wetting down fire trails when appropriate.</p> <p>Management vehicle speed will be restricted to 40 km hr when driving past urban interface areas to minimise dust generation</p> <p>Hours of operation during construction will be restricted to Monday to Friday 0700 to 1700hrs. Neighbours will be notified of works prior.</p>

Is the proposed activity likely to...	Applicable?*	Impact level (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of impact, taking into account the receiving environment & proposed safeguards which will limit the impact)	Safeguards/mitigation measures
				Shooting operations plans will dictate measures to minimise noise and disturbance to neighbours from feral animal control programs involving use of firearms.

## 9.2 Biodiversity impacts during construction and operation

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
1. Result in the clearing or modification of vegetation, including ecological communities and plant community types of conservation significance?^	☒	Medium, negative	<p>The fencing proposal would affect about 5.308 ha of vegetation, with 4.79 ha of this being mapped as native vegetation. The vegetation that would be cleared is listed as either critically endangered, or endangered, ecological communities under the EPBC and/or BC Acts.</p> <p>The proposal will require the removal of 100 <i>Dillwynia tenuifolia</i>, 50 <i>Grevillea juniperina</i> subsp. <i>juniperina</i>, 2 <i>Hibbertia puberula</i> and 50 <i>Pultenaea parviflora</i>.</p> <p>56 hollow-bearing trees are likely to require removal for fence construction. Within other portions of Shanes Park, hollow-bearing plants would be retained.</p>	<p>Clearing of native vegetation would not be more than that required to permit the scope of work.</p> <p>Ensure onsite inductions occur with contractors and supporting information such as maps / differential GPS files provided to ensure vegetation clearing does not occur outside the cleared corridor.</p> <p>Clearly identify the limits of vegetation clearing on ground by through erection of temporary fencing or marking using stakes, bunting or other clear marking technique.</p> <p>Areas beyond the proposal footprint that are to be retained would be clearly identifiable as being outside the marked clearing corridor. These areas will be communicated as 'no-go zones'.</p>

Is the proposed activity likely to...	Likely impact (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
	<p>Applicable?*</p>		<p>NPWS will seek to reduce the number of turnarounds shown in consultation with the RFS through the lodgement of a 'Performance Solution' under the RFS Fire Trail Standards and relevant FAFT plan.</p> <p>Turnaround locations will be identified on-ground and on project maps and use existing trail junctions and turn around bays, to avoid off-track mechanical disturbance to vegetation.</p> <p>Up to 10 ha of disturbed areas within the fenced area will be actively regenerated by way of <b>assisted</b> natural regeneration over the course of the project.</p> <p>Over 500 ha of the site will be restored through the removal of feral herbivores and the reintroduction of locally extinct animals by way of <b>passive</b> regeneration.</p> <p>Approximately 7 km of trails (generally 2-3 m in width) will be closed and natural regeneration will be encouraged.</p> <p>The removal of hollow-bearing trees (HBT) will be avoided altogether where possible but is expected that 56 HBTs will need to be removed. A clearing protocol will be developed in consultation with the project ecologist</p> <p>The project ecologist will be present on-site during the felling of HBT's to ensure the hollow-bearing tree guideline is followed.</p> <p>The guideline will include:</p>

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
2. Endanger, displace or disturb terrestrial or aquatic fauna, including fauna of conservation significance, or create a barrier to their movement?^	<input checked="" type="checkbox"/>	Low, negative	<p>The fencing proposal would affect habitat available for use by the State listed Cumberland Plain Land Snail. This species was recorded at a number of additional sites within Shanes Park.</p> <p>56 hollow-bearing trees are likely to require removal to achieve the objectives of the works. These could be occupied by a number of</p>	<ul style="list-style-type: none"> <li>• when removing hollow-bearing trees, surrounding areas should be cleared, then hollow-bearing trees left for one night prior to felling</li> <li>• trees should be shaken by being tapped by an excavator or similar prior to felling in an attempt to scare fauna from hollows</li> <li>• following felling, hollows and the surrounding area are to be checked again to ensure no trapped or injured fauna are present</li> <li>• if the tree is being removed in stages, the hollow-bearing branch should be the last to be removed</li> <li>• trees should be felled in a manner that avoids disturbance to surrounding vegetation</li> <li>• HBT's trees cleared to achieve the objectives of the proposal that have a DBH of 200 mm or greater will be repurposed as habitat such as coarse woody debris on the ground and / or suitable hollow limbs suspended in vegetation that is retained to provide habitat.</li> </ul> <p>Vegetation that is not suitable to be used as coarse woody habitat will be mulched.</p> <p>In addition to the safeguard provided for HBT's above, the loss of the hollow-bearing trees will be offset through the erection of suitably designed habitat boxes or hollow limbs. These boxes will:</p> <ul style="list-style-type: none"> <li>• cater for the sheltering/breeding needs of those resident fauna species</li> <li>• be regularly monitored, with any damaged boxes being repaired or replaced.</li> </ul>

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
			<p>threatened hollow-associated/dependent species.</p> <p>The fencing proposal would erect a barrier to the movement of those medium to large ground traversing resident animals currently present in Shanes Park.</p>	<ul style="list-style-type: none"> <li>habitat boxes occupied by exotic species will be removed and replaced.</li> </ul> <p>The Ecological Health Monitoring Framework will monitor the responses of extant species to the proposed activity, including medium to large terrestrial species that the fence may pose a barrier to movement. Given the isolation of the reserve it is anticipated that the resident fauna are likely to remain within the reserve following the construction of the predator proof fence. The reserve does have permanent water through the two creeks. Any species requiring further intervention will have a specific management plan developed.</p> <p>During the vegetation management phase, any coarse woody debris within the vegetation removal footprint will be inspected for presence of the Cumberland Plain Land Snail, with any living individuals identified relocated to outside the works footprint. Coarse woody debris should be removed from the footprint with the snail where possible.</p>
<p>3. Result in the removal of protected flora or plants or fungi of conservation significance?</p>	<p><input checked="" type="checkbox"/></p>	<p>Medium, negative</p>	<p>The vegetation removal will require the removal of approximately 100 <i>Dillwynia tenuifolia</i>, 50 <i>Grevillea juniperina</i> subsp. <i>juniperina</i>, 2 <i>Hibbertia puberula</i> and 50 <i>Pultenaea parviflora</i>.</p> <p>There may be some small localised clearing of shrubs and ground covers where feral animal traps are set.</p>	<p>Clearing of native vegetation is no more than is required to permit the scope of work.</p> <p>Limits of clearing will be clearly identified.</p> <p>Threatened species within 1m of the impact corridor will be marked to ensure no unintentional impacts.</p> <p>These species thrive in disturbed landscapes and are likely to proliferate on the edges of the disturbed corridor.</p>

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
				Persons involved in feral animal control will be briefed and provided with information to enable them to identify and avoid clearing or other harm to known threatened plants i.e. <i>Dillwynia tenuifolia</i> , <i>Grevillea juniperina</i> subsp. <i>juniperina</i> , <i>Hibbertia puberula</i> and <i>Pultenaea parviflora</i> .
4. Contribute to a key threatening process to biodiversity or ecological integrity?	<input checked="" type="checkbox"/>	High, positive	<p>The proposed activity will result in the removal of feral predators, such as cats and foxes. Predation by the feral cat and Predation by the European Fox are listed KTPs under the BC Act. By controlling other feral animals, the proposed activity will also mitigate negative impacts of KTPs: Predation, habitat degradation, competition and disease transmission by feral pigs, Environmental degradation caused by feral deer and Competition and grazing by the feral European rabbit.</p> <p>The fencing of the reserve will prevent further illegal activity against KTP Removal of dead wood and dead trees.</p> <p>The loss of hollow-bearing trees is a listed KTP, the proposed activity will include the felling of some hollow-bearing trees. The number of hollow-bearing trees is limited by the type and age of the vegetation (40 year old regrowth)</p>	Hollow-bearing trees to be felled will be repurposed as coarse woody debris throughout the reserve as described in section 6.2 and 9.2.
5. Introduce weeds, pathogens, pest animals or	<input checked="" type="checkbox"/>	Low, negative	Machinery used for the vegetation removal has the possibility to introduce weeds or pathogens to the reserve.	All machinery on site will be thoroughly cleaned and washed down before mobilisation to site.

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
genetically modified organisms into an area?				NPWS will undertake targeted, site-based weed control using physical and chemical methods to maintain weeds at low densities.

## 9.3 Community impacts during construction and operation

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or N/A)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
1. Affect community services or infrastructure?	<input type="checkbox"/>	Medium, positive	There is currently no public access to the reserve. The program will allow some level of public access to the reserve by 2023.	Public access will be designed in a way that minimises adverse impacts to the natural values of the reserve. The design and addition of any visitor infrastructure is beyond the scope of this REF.
2. Affect sites important to the local or broader community for their recreational or other values or access to these sites?	<input checked="" type="checkbox"/>	Medium, positive and negative	<p>During construction, pest control and establishment phases the park will be closed to the public. This will limit recreational opportunities for the regular park users.</p> <p>There is a commitment that following establishment, the park will be open to the public in some capacity.</p> <p>Conservation groups in Western Sydney feel strongly that a rewilding program should be undertaken on the Cumberland Plain.</p>	<p>During construction, signage around the park will indicate why it is closed, a brief summary of the program, and that future access will be possible in some form.</p> <p>Ongoing community consultation will be undertaken to ensure neighbours, park users and conservation groups are aware of and involved in the decision making processes.</p>
3. Affect economic factors, including employment, industry and property value?	<input checked="" type="checkbox"/>	Medium, positive	<p>The feral predator-free areas program includes the creation of four roles within NPWS Cumberland Area.</p> <p>Following the opening of the reserve to public visitation, guided tours are likely to be operated through the reserve. This will not only create job opportunities for the local community, but the potential to increase visitation to the area is likely to bring economic benefits.</p>	Not applicable
4. Have an impact on the safety of the community?	<input checked="" type="checkbox"/>	Medium, positive	The program will involve the creation of a reserve fire management strategy for the Shanes Park reserve.	The implementation of an appropriate fire regime will result in an increased level of bushfire safety for properties neighbouring the reserve.



Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or N/A)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
5. Cause a bushfire risk?	<input checked="" type="checkbox"/>	High, positive	The program will include a strategic approach to fire management and a reserve fire management strategy will be prepared, as well as an updated and maintained fire trail network.  Fire will be managed in the reserve with regular hazard reduction burning, with small sized mosaic ecological and cultural burns, to allow movement of fauna within the reserve.	Not applicable
6. Affect the visual or scenic landscape?^	<input checked="" type="checkbox"/>	Medium, negative	The predator proof fence will be visible around the feral predator free area.	Signage to communicate the purpose of the fence, that details why the design is necessary and the benefits it brings.

## 9.4 Natural resource impacts during construction and operation

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or N/A)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
1. Result in the degradation of the park or any other area reserved for conservation purposes?	<input type="checkbox"/>	Not applicable	Vegetation management is addressed in section 9.2.  There will be no other use or degradation of natural resources (water, air or extractive materials) as part of the activity	Large trees removed during construction will be redistributed to increase coarse woody debris and improve habitat for ground active/nesting species throughout the feral-free area.

## 9.5 Aboriginal cultural heritage impacts during construction and operation

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or N/A)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
1. Disturb the ground surface or any culturally modified trees?	<input checked="" type="checkbox"/>	TBC	Impacts on Aboriginal Cultural Heritage will be assessed in a stand-alone <i>Aboriginal Cultural Heritage Assessment Report</i> (ACHAR).	Disturbance to any culturally modified trees or significant objects will be avoided. The ACHAR will provide recommended actions to be taken before, during and after the activity to manage and protect any Aboriginal objects and declared Aboriginal Places that have been identified. It will inform an Aboriginal Heritage Impact Permit if it is found that harm cannot be avoided.
2. Affect or occur in close proximity to known Aboriginal objects or Aboriginal Places? If so, can impacts be avoided? How?	<input checked="" type="checkbox"/>	TBC	Impacts on Aboriginal Cultural Heritage will be assessed in a stand-alone <i>Aboriginal Cultural Heritage Assessment Report</i> (ACHAR).	The ACHAR will provide recommended actions to be taken before, during and after the activity to manage and protect any Aboriginal objects and declared Aboriginal Places that have been identified. It will inform an Aboriginal Heritage Impact Permit if it is found that harm cannot be avoided.
3. Affect areas: a. within 200m of waters b. within a sand dune system c. on a ridge top, ridge line or headland d. within 200m below or above a cliff face	<input checked="" type="checkbox"/>	TBC	Impacts on Aboriginal Cultural Heritage will be assessed in a stand-alone <i>Aboriginal Cultural Heritage Assessment Report</i> (ACHAR).	The ACHAR will provide recommended actions to be taken before, during and after the activity to manage and protect any Aboriginal objects and declared Aboriginal Places that have been identified. It will inform an Aboriginal Heritage Impact Permit if it is found that harm cannot be avoided.

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, low, medium or high; negative or positive; or N/A)	Reasons (describe the type, nature and extent of the impact, the nature of the receiving environment and any proposed safeguards which will limit the impact)	Safeguards/mitigation measures
<p>e. within 20m of or in a cave, rock shelter or a cave mouth?</p> <p>f. If so, can impacts be avoided? How?</p>				
<p>4. Affect wild resources which are used or valued by the Aboriginal community or affect access to these resources?</p>	<input checked="" type="checkbox"/>	<p>TBC</p>	<p>Impacts on Aboriginal Cultural Heritage will be assessed in a stand-alone <i>Aboriginal Cultural Heritage Assessment Report (ACHAR)</i>.</p>	<p>The ACHAR will provide recommended actions to be taken before, during and after the activity to manage and protect any Aboriginal objects and declared Aboriginal Places that have been identified. It will inform an Aboriginal Heritage Impact Permit if it is found that harm cannot be avoided.</p>
<p>5. Affect access to culturally important locations?</p>	<input checked="" type="checkbox"/>		<p>Impacts on Aboriginal Cultural Heritage will be assessed in a stand-alone <i>Aboriginal Cultural Heritage Assessment Report (ACHAR)</i>.</p>	<p>The ACHAR will provide recommended actions to be taken before, during and after the activity to manage and protect any Aboriginal objects and declared Aboriginal Places that have been identified. It will inform an Aboriginal Heritage Impact Permit if it is found that harm cannot be avoided.</p>

## 9.6 Other cultural heritage impacts during construction or operation

Is the proposed activity likely to...	Applicable?*	Likely impact (negligible, maintenance, minor, major, contentious; or NA)	Reasons (describe the type, nature and extent of impact, taking into account the receiving environment & proposed safeguards which will limit the impact)	Safeguards/mitigation measures
1. Impact on places, buildings, landscapes or moveable heritage items?^	<input checked="" type="checkbox"/>	TBC	Impacts on historical heritage will be assessed in a stand-alone heritage assessment.	The heritage assessment will provide recommended actions to be taken before, during and after the activity to manage and protect any historic heritage that may be impacted by the activity.
2. Impact on vegetation of cultural landscape value (e.g. gardens and settings, introduced exotic species, or evidence of broader remnant land uses)?	<input checked="" type="checkbox"/>	TBC	Impacts on historical heritage will be assessed in a stand-alone heritage assessment.	The heritage assessment will provide recommended actions to be taken before, during and after the activity to manage and protect any historic heritage that may be impacted by the activity.

## 9.7 Matters of National Environmental Significance under the EPBC Act

Is the proposal likely to impact on Matters of National Environmental Significance, including:	Applicable?*	Impact level (negligible, low, medium or high; negative or positive; or NA)	Reasons (describe the type, nature and extent of impact, taking into account the receiving environment & proposed safeguards which will limit the impact)	Safeguards/mitigation measures
1. Listed threatened species or ecological communities?	<input checked="" type="checkbox"/>	Medium, negative	<p>The proposal will clear portions of several Critically Endangered and Endangered Ecological Communities listed under the EPBC Act, totalling 4.71 ha.</p> <p>The proposal will require the removal of 50 <i>Pultenaea parviflora</i>.</p>	<p>Beyond those mentioned previously in Section 9.2 no specific safeguards or mitigation measures required.</p> <p>Persons involved in feral animal control will be briefed and provided with information to enable them to identify and avoid clearing or other harm to known threatened plants, including <i>Pultenaea parviflora</i>.</p>
2. Listed migratory species?	<input checked="" type="checkbox"/>	Low, negative	<p>Curlew Sandpiper (<i>Calidris ferruginea</i>), Australian Painted Snipe (<i>Rostratula australis</i>) and Latham's Snipe (<i>Gallinago hardwickii</i>) predicted to occur. Extent of disturbance to those habitats likely to be occupied by these birds considered to be negligible. Reduction of feral pests within Shanes Park considered to benefit these migratory birds.</p>	<p>No additional specific safeguards or mitigation measures required other than those identified in section 9.1 with respect to soil erosion and run-off.</p>

## 10. Proposals requiring additional information

Under the Guidelines for Preparing a Review of Environmental Factors, no additional information is required.

## 11. Summary of impacts and conclusions

Category of impact	Significance of impacts		
	Extent of impact	Nature of impact	Environmentally sensitive features
Physical and chemical	Possibility of air pollution, dust and potential chemical and oil spills as a result of heavy machinery being operated on site.	Short-term, mitigation measures will minimise the impact of this machinery and prevent any potential chemical/oil spills.	Two first order creeks run through the reserve. Mitigation methods will prevent adverse impacts to the health of these creeks.
Biological	A number of threatened or endangered species or ecological communities will be impacted by the construction of the predator proof fence.	Impacts will be managed through mitigating measures such as the repurposing of coarse woody debris and improved habitat throughout the reserve. The long-term benefits of the proposed activity will result in an overall improvement in habitat and ecological processes, which far outweigh the short-medium term impacts.	A number of threatened species will be impacted during the construction phase. Every effort to minimise this impact has been made.
Natural resources	Preventing illegal activity within the reserve will mitigate effects of illegal vegetation clearing and firewood collection currently taking place.	Long-term, positive impacts. As well as serving an ecological purpose, the predator proof fence will help prevent illegal activity including trail construction and firewood collection which is currently impacting the reserve.	Coarse woody debris is an important habitat feature in this landscape.
Community	The proposed activity will enhance	The reserve is currently not open to	The reserve, once established, will play a

Category of impact	Significance of impacts		
	Extent of impact	Nature of impact	Environmentally sensitive features
	community understanding and appreciation of threatened species and biodiversity in western Sydney.	the public and. The proposal will result in a long-term positive impact on the community through increased access and opportunities for visitor experience and environmental education.	crucial role from an educational and recreational perspective in the community.
Cultural heritage	To be assessed in stand-alone reports.		

This REF has examined and taken into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration of impacts on cultural values (including Aboriginal and non-Aboriginal heritage), socio-economic values (including potential impacts on the community resulting from construction works) and threatened species, populations and ecological communities and their habitats. It has also considered potential impacts to threatened species and Matters of National Environmental Significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposal have been identified and amended during the design development and options assessment. The proposal as described in the REF best meets the project objectives and will result in some impacts on the biological values. These will be short-term in nature. Safeguards and management measures as detailed in this REF will ameliorate or minimise these expected impacts. The proposal will also provide positive environmental, social, cultural and economic benefits. On balance the proposal is considered justified and the following conclusions are made. Despite environmental impacts associated with the construction of the predator proof fence, the proposed activity will result in a net ecological gain due to the prevention of illegal activity, improved habitat, and restored ecological function within the reserve.

The proposal is not likely to have a significant impact on threatened species, populations or communities within the meaning of the NSW *Biodiversity Conservation Act 2016*.

The proposal is not likely to have a significant impact on Matters of National Environmental Significance or the environment of Commonwealth land within the meaning of the Environment Protection and *Biodiversity Conservation Act 1999*. A referral to the Australian Government's Department of Agriculture, Water and the Environment is not required.

The proposal is not likely to have a significant impact on threatened species, populations or ecological communities or migratory species, within the meaning of the Environment Protection and *Biodiversity Conservation Act 1999*. A referral to the Australian Government's Department of Agriculture, Water and the Environment is not required. Threatened species tests of significance for species listed under the BC Act and EPBC Act can be seen in Appendix A.

## 12. Supporting documentation

In addition to the below Appendixes, a number of documents relevant to the proposal are yet to be completed, these include:

- Erosion and Sediment Control Plan
- Aboriginal Cultural Heritage Assessment Report
- Feral Animal Management Plan
- Translocation Plans
- Heritage Assessment
- Reserve Fire Management Strategy
- Environmental Health Monitoring Framework

Document title	Author	Date
Appendix A – Threatened Species Tests of Significance	NPWS	30/10/2021
Appendix B – Maps and figures	NPWS	29/10/2021
Appendix C – Design drawings	Pritchard & Francis – Civil and Structural Engineering Consultants	20/10/2021
Appendix D – Flora and Fauna Biodiversity Assessment	Lesryk Environmental	29/10/2021
Appendix E – References	NPWS	27/10/2021

## 13. Signature of proponent

By signing the REF, the proponent confirms that the information in the REF is accurate and adequate to ensure that all potential impacts of the activity can be identified.

Signature		Signature	
Name (printed)	Luke Mitchell	Name (printed)	Katie Littlejohn
Position	Acting, Senior Project Officer	Position	Manager, Cumberland Area
Date		Date	

## More information

- [12 Powers and functions of Service](#)
- [151F Public consultation regarding grant of leases and licences](#)
- [2A Objects of Act](#)
- [8 Miscellaneous functions of Chief Executive](#)
- [Biodiversity Conservation Act 2016](#)
- [Clause 65\(1\)\(a\) of State Environmental Planning Policy \(Infrastructure\) 2007](#)



- Division 2 Management principles
- Environment Protection and Biodiversity Conservation Act 1999
- Environmental Planning and Assessment Act 1979
- Fisheries Management Act 1994 No 38
- Infrastructure SEPP
- Local Council (clauses 13, 14, 15 and 15A)
- National Parks and Wildlife Act 1974
- Part 12 Leases, licences, easements etc.
- Rural Fires Act 1997
- Schedule 3 of the Environmental Planning and Assessment Regulation 2000
- Schedule 3(7) of the State Environmental Planning Policy (State and Regional Development) 2011
- SEPP (Coastal Management) 2018
- Significant Impact Guidelines 1.1 - Matters of National Environmental Significance
- Traffic-generating development

## **Appendix A: Threatened species tests of significance**

### **Species and communities listed under the *Biodiversity Conservation Act 2016***

A Threatened Species Test of Significance has been undertaken in accordance with Part 7 of the *Biodiversity Conservation Act 2016* and has concluded that that the activity will not have any significant effect on threatened species or ecological communities.

### **Species and communities listed under the Fisheries Management Act**

Not applicable.

### **Species and communities listed under the *Environmental Protection and Biodiversity Conservation Act 1999***

On 28 February 2012, the Commonwealth Government approved all actions associated with the development of the Western Sydney Growth Centres as described in the Sydney Growth Centres Strategic Assessment Program Report. The proposed action is associated with the development of the Western Sydney Growth Centres and is consistent with the report. As such, separate referral is not required under the *Environmental Protection and Biodiversity Conservation Act 1999*.

All threatened species tests of significance for species listed under the BC Act and the EPBC Act can be found in Appendix A.