NSW NATIONAL PARKS & WILDLIFE SERVICE

Ngambaa Nature Reserve

Review of environmental factors for proposed feral predator–free area

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Cover photo: Stockyard Creek, Ngambaa Nature Reserve. Biodiversity Australia

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Contents

List of tables

List of figures

Summary

Introduction

On 18 December 2020 the former Minister for Energy and Environment, the Honourable Matt Kean MP, announced a plan to establish 4 new feral predator–free areas across New South Wales (NSW), including a site in Ngambaa Nature Reserve (NR) on the North Coast. The program will enable the reintroduction of locally extinct species, improved protection of extant species, and restoration of ecosystem health and functioning. In October 2021 an amendment to the plan of management for Ngambaa NR was also adopted by the former Minister for Energy and Environment.

This review of environmental factors (REF) and supporting documents have been prepared by or on behalf of the NSW National Parks and Wildlife Service (NPWS) to assess and mitigate potential impacts associated with establishing a feral predator–free area in Ngambaa NR (also referred to as 'the site' or 'the reserve').

The proposal

The proposal is for the construction and operation of a 2,503 hectare (ha) feral predator–free area.

The feral predator–free area involves the construction of approximately 33 km of conservation fencing including:

- fencing to enclose the 2,503 ha feral predator–free area
- fencing to enclose an internal 288 ha first release area.

Vegetation will be managed in a 20 m corridor along the fence line. This will consist of a cleared corridor up to a maximum of 15 m wide, and the remainder will be under-scrubbed where practical. Hazardous trees and trees/branches that are overhanging the fence line will be removed or trimmed within the 20 m vegetation management corridor.

The calculated construction footprint (i.e. the maximum area impacted by the proposal) is 73 ha, as follows:

- conservation fence line footprint of ~50 ha, including the clearing of 40 ha of vegetation
- under-scrubbed area of up to 16 ha
- field operations base on a 7 ha site.

The proposal also involves:

- the establishment of ancillary facilities to support the feral predator–free area, including a field operations base
- minor realignment of management trails as required to enable access for the construction and maintenance of conservation fencing
- removal of feral animals
- reintroduction of locally extinct species.

Proposal objectives

The objectives of the proposal are to:

- create and maintain a large feral predator–free area by constructing fencing and eradicating feral animals within the fenced enclosure
- establish and maintain viable populations of reintroduced species in the new feral predator–free area
- maintain or improve the trajectory for extant resident animals (including threatened species) within the new feral predator–free area
- improve the environmental health and ecosystem function within the feral predator–free area.

In addition, the Ngambaa NR site has an important role in increasing the awareness and understanding of threatened species, ecological communities, threatening processes and their management.

Options considered

At a statewide scale, the Mid North Coast region has been identified as a priority for the establishment of a feral predator–free area by the Department of Planning and Environment (the department), to protect and restore extinct and extant populations of threatened fauna.

Consideration has been given to a number of alternative sites within the Mid North Coast region, alternative fence designs and fence alignments.

Five sites across the region were assessed using multi-criteria spatial prioritisation tools, on-ground feasibility assessments and engagement with key stakeholders (NPWS 2020).

The south-east section of Ngambaa NR was selected as the preferred feral predator–free area for the NSW Mid North Coast for ecological, topographical and operational elements following the assessment process. Consideration has been given to alternate fence designs and alignments including 2,500 ha and 3,000 ha options. On balance, the 2,500 ha option assessed within this REF is the preferred alignment considering the ecological, cultural, social, operational and economic factors.

Statutory and planning framework

This REF and supporting documents have been prepared in accordance with the requirements of section (s) 111 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and clause 228 of the Environmental Planning and Assessment Regulation 2000 specifying a ‘duty to consider environmental impact’.

The assessment has also taken into account the provisions of the NSW *Biodiversity Conservation Act 2016* (BC Act), the Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act), and other relevant legislation.

Accordingly, this REF will:

- provide 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

Consultation has been undertaken with technical and conservation fencing specialists, Aboriginal community and the broader community. Formal community consultation occurred as part of the process to amend the plan of management. Issues raised in submissions to the *Ngambaa Nature Reserve amendment to the plan of management: return of threatened and declining species and improving ecosystem health* ('the PoM amendment') (DPIE 2021b) have been considered and addressed in this REF.

This REF will be placed on public exhibition for a period of 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	When considering the footprint of the disturbance against the benefits of proposed activity to the biophysical values, the overall impact is positive. The proposed activity affects an area of 2,503 ha within Ngambaa NR. Approximately 40 ha of extant vegetation will be cleared in the construction of the feral predator–free area. This represents 0.3% of the reserve's vegetation, the majority being in the most represented vegetation classes. It is proportionally even less if habitats in the broader landscape are considered (e.g. surrounding state forests, national parks and private forests). The removal of feral predators, reintroduction of locally extinct species and the associated fire and weed management will have a positive affect for up to 20 animal species within the proposed 2,503 ha feral predator–free area.	The proposal will result in short-term impacts including vegetation removal. 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, including feral animals, weeds and fire. 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.	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. 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.

Category of impact	Significance of impacts		
	Extent of impact	**Nature of impact**	**Environmentally sensitive features**
Socio-economic	Visitation is not a primary objective for Ngambaa NR and visitation is considered low. Unauthorised public access will not be permitted within the proposed feral predator–free area of 2,503 ha. This will limit recreational opportunities for some existing reserve users in the area, however, access to Cedar Park Picnic Area and walking track remain open to public. Adjacent sections of Ngambaa NR and state forest also remain available for public use.	The proposal is expected to have a small positive effect for the Nambucca Valley community and economy. Four new positions within NPWS have been created to support the development and operation of the feral predator–free area, including Aboriginal identified and targeted positions. Construction of the feral predator–free area will be undertaken by contract. Local suppliers and vendors will have the opportunity the tender for projects and benefit from the investment. The feral predator–free area and reintroduction of threatened and locally extinct animals will attract ongoing scientific research in the area, contributing to further knowledge in threatened species conservation.	Access to Cedar Park Picnic Area and walking track remain open to public. Flood access along Greenhills Road and Taylors Arm Road will remain open.
Cultural	The *NPWS Ngambaa rewilding, Ngambaa NR NSW: Aboriginal cultural heritage assessment report* (Everick Heritage [2021a] at Appendix C) found there is limited potential for large Aboriginal sites, with more than 100 artefacts in the project area.	The activity will disturb the topsoil during mulching and excavation of holes for gate and corner post. The ameliorative measure recommended in the *Aboriginal cultural heritage assessment report* will reduce the impacts to the Aboriginal cultural landscape. The proposal involves ongoing engagement and involvement of Aboriginal people in the management of cultural heritage and conservation threatened species.	Aboriginal objects were identified along Briggs Tower Road during a previous Aboriginal cultural heritage survey. Of these artefacts, Briggs Tower Road Core 1 was positively identified as a stone core / unifacial chopper at the intersection of Briggs Tower Road and Buds Crossing Road. This site has been registered on the NPWS Aboriginal Heritage Information Management System (AHIMS).

Justification and conclusion

This REF has been prepared to assess and mitigate potential impacts associated with establishing a feral predator–free area in Ngambaa NR. The proposal involves the construction of 33 km of conservation fencing and associated infrastructure such as a field operations base, gates and waterway crossings.

The construction of the feral predator–proof fence requires the clearing of approximately 40 ha of native vegetation that includes hollow-bearing trees and koala habitat. This represents 0.3% of the habitat within the reserve and is proportionally much less when considering the broader landscape (i.e. surrounding national parks, state forests and private forests). An additional 10 ha of already cleared land (i.e. management trails and old logging tracks) will become part of the cleared fence line.

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 2018; Legge et al. 2018).

The Ngambaa feral predator–free area 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 and will result in:

- viable, self-sustaining populations of reintroduced species established in the feral predator–free area
- improved trajectory of extant threatened species threated by feral cat (*Felis catus*) and red fox (*Vulpes vulpes*) predation within the feral-free area.

Impacts will be managed through mitigating measures such as minimising vegetation clearing wherever possible, 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 project will deliver a measurable conservation benefit for at least 20 threatened animal species, including fire-affected species such as rufous bettong (*Aepyprymnus rufescens*), parma wallaby (*Macropus parma*), common planigale (*Planigale maculata*), long-nosed potoroo (*Potorous tridactylus tridactylus*), eastern chestnut mouse (*Pseudomys gracilicaudatus*), koala (*Phascolarctos cinereus*), red-legged pademelon (*Thylogale stigmatica*), eastern pygmy-possum (*Cercartetus nanus*).

The project will also raise awareness and understanding of our threatened species, the factors impacting on them, and appreciation of the value of native wildlife and healthy native ecosystems. The proposal will provide research opportunities for threatened species on the North Coast, and allow a platform for engagement with local communities, environmental groups and Aboriginal communities. The overall benefits of the project outweigh the impacts of construction.

1. Background

Australia has the worst rate of mammal extinction in the world. At least 34 Australian mammal species have been driven to extinction since European settlement, with feral cats and foxes the main drivers of at least two-thirds of these losses (Legge et al. 2018, Woinarski et al. 2015; Radford et al. 2018). 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. 2017a), reptile (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 NSW, cats are thought to impact 117 threatened species, more than any other feral animal species (Coutts-Smith et al. 2007).

A network of predator-free areas is an essential part of the NPWS strategy to protect and restore our most vulnerable native fauna species. This proposal will build on other feral predator–free areas constructed on national park estate in NSW, including 3 under the Reintroduction of Locally Extinct Mammals Project and 3 under the NSW feral predator–free areas project.

The NSW feral predator–free areas project represents one of the most significant threatened fauna restoration projects in NSW's history. The establishment of 4 large feral cat and fox-free areas at various locations across NSW, including a site in western Sydney, will deliver a measurable conservation benefit for at least 50 threatened animal species including:

- the re-establishment of 9 mammal species currently listed as extinct in NSW, including iconic species such as the greater bilby (*Macrotis lagotis*), western quoll (*Dasyurus geoffroii*) and eastern bettong (*Bettongia gaimardi*)
- the establishment of new populations of at least 14 threatened species (and 5 protected species) which are locally extinct – priority species will include the critically endangered long-footed potoroo (*Potorous longipes*), eastern quoll (*Dasyurus viverrinus*) and bushfire-affected species such as smoky mouse (*Pseudomys fumeus*)
- an improvement in the trajectory, or reduction in extinction risk, of another 21 threatened extant animal species including bushfire-affected species such as red-legged pademelon, and iconic species such as koala and malleefowl (*Leipoa ocellata*)
- a significant conservation benefit for an additional 10 or more extant threatened animal species.

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

The program is partly funded by the NSW Environmental Trust for $20.3 million with most of these funds allocated to establishment in the first 4 years. NPWS will cover other costs, including ongoing costs. The program will be independently evaluated in its 10th year.

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

Ngambaa Nature Reserve site

Site selection process

At a statewide scale, the Mid North Coast region has been identified as a priority for the establishment of a feral predator–free area by the department, to protect and restore extinct and extant populations of threatened fauna.

Consideration has been given to a range of factors including land tenure, permissibility, degree to which the site meets the project's objectives, restoration benefits and impacts of the proposal on environmental, cultural and social values, and practical management factors. Ngambaa NR was identified as providing, on balance, the best site for establishing a feral predator–free area and meeting the ecological objectives with minimal adverse impacts to the existing environment.

NPWS has developed a spatial tool which utilises information on the past and present distribution of target species and allows strategic prioritisation of areas where there is overlap.

A wide range of factors were considered when selecting priority sites for conservation fencing projects. The essential elements of a framework to guide selection or rejection of sites include:

- Stage 1 – Broad-scale (desk-top) assessments to ensure the selection of priority sites contributes to a strategic network of conservation fencing areas across NSW, and that 'at risk' taxa are represented across areas, and thus the extinction risk is minimised. Stage 1 includes consideration of historical and extant species' distributions, habitat suitability and climate change considerations.
- Stage 2 – Detailed (desk-top) assessments including planning, ecological, cultural, social and operational economic, resourcing and stakeholder considerations.
- Stage 3 – On-ground feasibility assessments.
- Stage 4 – Communication and engagement with key stakeholders (while listed as a stage, this is best undertaken throughout the process).

Five sites within the NPWS North Coast Branch were assessed using the framework and special tools noted above (NPWS 2020). These include Ngambaa NR, Chaelundi National Park (NP), Banyabba NR, Nymboi-Binderay NP and Guy Fawkes River NP. The south-east section of Ngambaa NR was selected as the preferred feral predator–free area for ecological, topographical and operational elements. Key factors for selecting Ngambaa NR as a feral predator–free area on the NSW North Coast are:

- habitat is suitable for a number of candidate threatened species for reintroduction
- mix of vegetation types (eucalypt forests, grassy understory, wet gullies with subtropical rainforest
- suitable topography and size within national park estate
- geographic location between escarpment and sea – an area that has seen high species decline
- it is a recovering state forest post-logging – fence alignment along old logging trails and previously logged ridges minimises the clearing impact of the fence line; and selecting a previously disturbed landscape also increases the restoration benefits
- proximity to an established works depot, but outside urban or peri-urban environment.

Predicted outcomes of the activity

Asset construction and maintenance outcomes:

- infrastructure to support a significant conservation project is established on national park estate and regularly maintained to ensure its ongoing integrity.

Elimination of key threatening processes:

- feral cats and foxes are eradicated from inside the fenced enclosure, and other pest species are either eradicated or controlled, to create a feral predator–free safe haven on national park estate.

Species outcomes:

- viable, self-sustaining populations of reintroduced species are established in the feral predator–free area
- improved trajectory of extant resident animals threatened by feral cat and fox predation within the feral predator–free area.

Ecological processes and function outcomes:

- improved ecosystem function over time within feral predator–free area through the restoration of ecological processes such as seed and spore dispersal, soil engineering and native predator–prey relationships.

The project will deliver a measurable conservation benefit for at least 20 threatened animal species including:

- the re-establishment of one mammal species currently listed as extinct in NSW (eastern bettong)
- the establishment of new populations of at least 5 threatened species which are locally extinct – priority species will include eastern bettong, eastern quoll, rufous bettong, bush stone-curlew (*Burhinus grallarius*) and eastern bristlebird (*Dasyornis brachypterus*)
- a significant conservation benefit for an additional 20 or more threatened animal species, including fire-affected species such as parma wallaby, common planigale, long-nosed potoroo, eastern chestnut mouse, koala, red-legged pademelon and eastern pygmy-possum.

The project will also result in an improvement in the ecological health and functioning of ecological communities within the feral predator–free area. The proposal will provide an opportunity to raise public awareness, foster support for conservation of native animals and provide educational opportunities through public visitation services such as tours and partnerships with education institutions.

2. The proposed activity

2.1 Brief description

Proposal overview	The proposal involves 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 in Ngambaa Nature Reserve
Name of NPWS park or reserve	Ngambaa Nature Reserve ('Ngambaa NR', also referred to as 'the reserve' or 'the site')
Other lands and tenure	Nil
NPWS Area	Coffs Coast Area, North Coast Branch
Location of activity	Southern part of Ngambaa NR as identified in **Figure 1**
Council	Nambucca Shire Council
NSW State electorate	Oxley
Proposed commencement date	May 2022
Proposed completion date	December 2023 (establishment) reintroductions and management will be ongoing
Estimated capital investment value	$4M

2.2 Proponent's details

Contact name	Scott Filmer
Position	Senior Project Officer, Coffs Coast Area
Street address	4/32 Edgar Street, Coffs Harbour 2450
Postal address	As above
Contact numbers	02 6652 0900

2.3 National Parks and Wildlife Service/Department of Planning and Environment proponents

Area Manager or Section Manager	Glenn Storrie npws.coffscoast@environment.nsw.gov.au

3. Permissibility and assessment pathway

3.1 Permissibility under NSW legislation

3.1.1 National Parks and Wildlife Act 1974

Objects of the National Parks and Wildlife 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 reintroduction of locally extinct species, and restoration of threatened 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 incorporation of scientific research and application of traditional knowledge.

Adverse effects to the values for which the land has been reserved 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)
- the project's desired outcome is to maintain or enhance the health, diversity and productivity of part of the Ngambaa NR environment for the benefit of future generations (inter-generational equity)
- the fundamental goal of the project is the enhancement of native biodiversity and ecological integrity (conservation of biological diversity).

Reserve management principles (s 30J)

The activity is consistent with the following management principles for nature reserves under s 30J of the NPW Act, particularly:

- the conservation of biodiversity and the maintenance of ecosystem function (s 30J(2)(a))
    - through removal of feral predators and herbivores, reintroduction of locally extinct species and improved ecosystem health, including seed and spore dispersal and soil engineering

- provision for appropriate research and monitoring (s 30J(2)(d))
    - through the development and implementation of a comprehensive monitoring, evaluation and reporting plan and research strategy.

Plan of management

The *Ngambaa Nature Reserve plan of management* (DEC 2004) was adopted in 2004. To facilitate the establishment of a feral predator–free area, an amendment to the plan was prepared. The *Ngambaa Nature Reserve draft amendment to the plan of management: return of threatened and declining species and improving ecosystem health* ('the PoM amendment) (DPIE 2021b) was adopted by the Hon Minister Kean in October 2021. The plan of management, as amended in 2021, allows for the establishment of a feral predator–free area within the reserve, the reintroduction of locally extinct species, and the recovery of extant fauna as a direction for the reserve's management.

National Parks and Wildlife Service 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)(b) 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 activity is consistent with the biodiversity conservation objectives of the *Biodiversity Conservation Act 2016* (BC Act).

The activity will:

- contribute to conservation of biodiversity and ecological integrity
- facilitate ecologically 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 has been undertaken. The *Ecological assessment for Ngambaa rewilding project* (Biological Australia [2021] at Appendix A, referred to as the 'ecological assessment' from here on). The proposal is unlikely to have a significant impact on 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 activity is consistent with the objectives of protecting life and property and protection of the environment under the *Rural Fires Act 1997* (RF Act).

The bush fire risk management plan will be updated to include an asset protection zone (APZ) for the conservation fence and strategic fire advantage zones (SFAZ). Management of these zones will mitigate the risk to the conservation fence by incorporating strategic prescribed burns as required.

The reserve fire management strategy will be reviewed and amended to consider the built and natural assets of the activity.

3.2 Environmental Planning and Assessment Act 1979

3.2.1 Assessment pathway

The activity may be undertaken without development consent under the provisions of s 2.73(1)(a) of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP) because:

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

The activity is not designated development under Schedule 3 of the Environmental Planning and Assessment Regulation 2021.

The activity is not 'state significant infrastructure' under Schedule 3(7) of the *SEPP (Planning Systems) 2021* and is not of a similar kind to such an activity.

The activity is not designated development under the *SEPP (Resilience and Hazards) 2021* because 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 by a public authority may be considered exempt development in some situations, the height of the proposed fencing and the scale of the associated ground disturbance and clearing mean it does not meet the standards of exempt development (under Schedule 1 of the Transport and Infrastructure SEPP) and the definition of 'minor impact' (under s 1.6 of the EP&A Act).

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 EP&A Act, requiring a consideration, to the fullest extent possible, of the environmental impacts of the proposal.

3.2.2 Consistency with strategic plans

The relevant strategic plans prepared under Division 3.1 of the EP&A Act are:

- *North Coast Regional Plan 2036* (approved in 2017), and the exhibited draft of the *North Coast Regional Plan 2041* (exhibited in 2022)
- Nambucca Valley Council's Local Strategic Planning Statement (2020).

This proposal aims to restore and enhance high biodiversity habitat, and to support the future development of tourism and recreation opportunities. As such, it is consistent with these plans and planning statements. In particular, it supports achievement of 2 key goals of the regional plan 2036 – the most stunning environment in NSW and a thriving, interconnected economy. It also aims to protect and improve this important natural area and the potential future development of nature-based tourism if found to be appropriate.

3.3 Other NSW legislation

3.3.1 Coal Mine Subsidence Compensation Act 2017

Not applicable. The activity does not occur in a mine subsidence district.

3.3.2 Fisheries Management Act 1994

The activity may affect fish, including threatened species, and will affect fish habitat. It will also involve the excavation of or deposition in 'water land' including land that is only intermittently submerged by water.

The *Fisheries Management Act 1994* (FM Act) sets out to conserve fish stocks and key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation, and aquatic biological diversity. Further, it aims to promote viable commercial fishing, aquaculture industries and recreational fishing opportunities.

As a public authority, NPWS is exempt from the requirement for a permit for dredging and reclamation works within 'water land' under s 200(1) of the FM Act. However, under s 199, a public authority must give the Fisheries Minister written notice of any proposed dredging or reclamation work in 'water land'.

The proposal includes 7 water crossings: 2 at Allgomera Creek in the north, 2 at Stockyard Creek in the central area of the proposal and 3 at Eungai Creek in the southern part of the proposal. All these waterways consist of catchment areas from within the reserve (DEC 2004) and are proposed to be traversed by the construction of the predator-proof fence.

As per the *Policy and guidelines and fish habitat conservation and management* (DPI 2013), the classification of the waterways or fish passage and the stream order as per the Strahler system, in relation to the habitats located within the reserve are described below:

- Allgomera Creek – a class 3 waterway or fish passage, classified as a second order stream
- Stockyard Creek – a class 3 waterway or fish passage, classified as a third order stream
- Eungai Creek – a class 3 waterway or fish passage, classified as a third order stream.

Class 3 minimal key fish habitat is defined as (DPI 2013):

> Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other class 1–3 fish habitats.

This proposal was provided to Fisheries NSW for comment in March 2021, before preparation of this REF. A formal s 199 referral has more recently occurred, and any conditions required have been integrated into the conditions of determination of this REF and will be delivered by the project's construction environmental management plan.

3.3.3 Heritage Act 1977

The activity is on land that contains a place, building, landscape feature or moveable heritage item older than 25 years, and which may have local heritage significance.

The *Historic cultural heritage assessment* (Everick Heritage [2021b] at Appendix B) identified one heritage item as being potentially impacted by the proposal: Buds Crossing Road Bridge. This item is not in the State Heritage Register or in Schedule 5 of the *Nambucca Local Environmental Plan 2010*.

The assessment states that the proposed feral predator–free area within Ngambaa NR will not impact on the value or significance of Buds Crossing Bridge as the alignment of the fence will not be in proximity to the heritage item. However, use of Buds Crossing Road as a haul road for materials for the project may exacerbate existing structural faults with the bridge and as such the physical state of the bridge should be monitored during the course of the civil works.

3.3.4 Marine Estate Management Act 2014

Not applicable. The activity will not affect and does not directly adjoin a marine park or aquatic reserve.

3.4 Commonwealth legislation

3.4.1 Environment Protection and Biodiversity Conservation Act 1999

A protected matters search was undertaken using a 10-kilometre radius to identify relevant matters of national environmental significance (MNES) under the EPBC Act. The search results can be found in Appendix A-6 of the ecological assessment (Appendix A). The search results are also summarised below.

Protected matter	Matter located within 10-km search radius	Comments	Potential impact
World Heritage values of a listed property	None	–	Nil
National Heritage values of listed place	None	–	Nil
Wetlands of international importance	None	–	Nil
Commonwealth marine area	None	–	Nil
Listed threatened species, ecological communities, and migratory species	No threatened ecological communities listed under the EPBC Act occur within the study area. 41 listed threatened species or species habitat are known / likely / may occur within the study area. 15 listed migratory species or species habitat are known / likely / may occur within the study area.	The ecological assessment includes an MNES assessment, which determined that the impact of the proposal on MNES is unlikely to be significant.	No significant impact likely

Other matters protected by the EPBC Act	Matter located within 10-km search radius	Potential impact
Commonwealth land	None	Nil
Commonwealth heritage places	None	Nil
Listed marine species	None	Nil
Whales and other cetaceans	None	Nil
Critical habitats	None	Nil
Commonwealth reserves – terrestrial	None	Nil
Commonwealth reserves – marine	None	Nil

The MNES assessment determined that the impact of the proposal on MNES was unlikely to be significant.

The ecological assessment includes recommended safeguards, which have been incorporated into Section 9 of this REF.

3.5 Consistency with National Parks and Wildlife Service policy

The REF is consistent with NPWS policy, as outlined below.

Policy name	How proposal is consistent
Translocation operational policy	Single species and multi-species translocation plans will be prepared for each proposed reintroduced species in accordance with the NPW Act, BC Act and the *Translocation operational policy* (DPIE 2019). 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 2 scientists, including one departmental scientist and one external independent scientist. Relevant animal ethics committee (AEC) approvals will be required under the *Animal Research Act 1985*. 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 the fence will be aligned on common boundary. The proposal is consistent with the policy in the level of clearing (up to 6 m from the fence line – see paragraph 14) and environmental assessment (see paragraphs 16–18). Due to the special needs of the project, the proposal is not consistent with the requirement for boundary fencing to be 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.
Regional pest management strategy	In the draft North Coast Branch pest management strategy, priority pest control programs identified for Ngambaa NR are weed control (mainly lantana). Wild dog control has occurred in the reserve in 2020 and 2021, as part of the Nambucca Valley Pest Predator Plan post-fire aerial fox and wild dog baiting.
NPWS Firearms management manual	Control of feral animals will be conducted in line with the feral animal control plans and will use a range of conventional techniques including trapping, shooting and baiting, in accordance with relevant codes of practice (including animal welfare requirements) and the Environment Protection Authority (EPA) / Australian Pesticides and Veterinary Medicines Authority (APVMA) permits. Use of firearms will be consistent with the NPWS Firearms management manual and individual shoot plans.

3.6 Summary of licences and approvals

3.6.1 Approval under the National Parks and Wildlife Act

Internal NPWS approval or authorisation, including expenditure, is required for the proposed activity.

An Aboriginal Cultural Heritage Assessment was prepared by Everick Heritage (2021a) – Appendix C – and concludes that a permit under s 90 of the NPW Act is not required.

3.6.2 Other approvals

A permit will be required under the FM Act to block fish passage. No other permits are required.

3.6.3 Publication triggers

The REF's publication is triggered if the activity requires an approval or permit identified in section 171(4) of the EP&A Regulation before it may be carried out. These triggers are summarised below in relation to the proposed activity.

Permit or approval	Applicable?
Fisheries Management Act, sections 144, 201, 205 or 219	Yes (s 219 only)
Heritage Act, section 57 (commonly known as a section 60)	No
National Parks and Wildlife Act, section 90 (AHIP)	No
Protection of the Environment Operations Act 1997, sections 47–49 or 122	No

The REF will therefore require publication following determination.

4. Consultation – general

A communication and engagement plan has been developed to guide community engagement and consultation throughout the project. This involved initial consultation with direct neighbours of the reserve and key government and external stakeholders, the exhibition of the draft PoM amendment, exhibition of the draft REF and finalisation of the proposal. The communication plan provides for continued consultation at identified stages of the project.

4.1 Consultation required under the Transport and Infrastructure SEPP

4.1.1 Local council (ss 2.10, 2.11, 2.12 and 2.14)

Development with impacts on council-related infrastructure or services, local heritage, flood liable land or in a coastal vulnerability area

Not applicable.

4.1.2 National park or other C1-zoned land (s 2.15(2)(a) and (b))

Development on land zoned C1 or adjacent to land reserved or acquired under the NPW Act

The activity is supported by the NSW Minister for Environment and Heritage, the NPWS executive and local NPWS Coffs Coast Area.

4.1.3 Transport for NSW (s 2.15(2)(c) or s 2.122/ Schedule 3)

Development on navigable waters or traffic-generating development

Not applicable.

4.1.4 Siding Spring Observatory (s 2.15(2)(d))

Development increasing artificial light in the night sky within 200 km of the Siding Spring Observatory

Not applicable.

4.1.5 Defence communications facility buffer (s 2.15(e))

Development within the buffer area surrounding the facility near Morundah

Not applicable.

4.1.6 Mine subsidence area (s 2.15(2)(f))

Development within a mine subsidence district

Not applicable.

4.2 Consultation required under other NSW legislation

4.2.1 Consultation requirements under National Parks and Wildlife Act for leases and licences

Not applicable – the proposal does not require a lease or licence.

4.2.2 Fisheries Management Act

As identified in section 3.3.2, NPWS has notification requirements under s 199 of the FM Act and has been consulting with Department of Primary Industries (DPI) Fisheries.

4.3 Other targeted consultation

4.3.1 Adjacent landowners

Adjacent landowners were advised of the project via phone and/or email and sent a project fact sheet. An invitation to comment on the PoM amendment was sent to all adjacent landowners.

Forestry Corporation of NSW

Forestry Corporation of NSW (FCNSW) is recognised as an important adjacent land manager. This agency has been consulted throughout the development of the Ngambaa feral predator–free area with regard to fence alignment adjacent to boundaries, use of public roads and transfer of a section of Buds Crossing and Stockyards Part 11 roads.

4.3.2 Wider community consultation and/or notification of works

Consultation with the wider community and special interest groups has been and will be made throughout the proposed activity, including the provision of invitations to provide feedback on the PoM amendment and this REF. NPWS has also briefed Lower Mid North Coast Rural Fire Service and Nambucca Shire Council on the proposal during and following the exhibition of the draft PoM amendment.

The PoM amendment, which facilitates the permissibility of the proposed feral predator–free area, was publicly exhibited as a draft proposal between 16 April and 7 June 2021 for more than the 45 days then required under the NPW Act. A total of 5 public submissions were received, reviewed and considered by the NPWS North Coast Branch Regional Advisory Committee and the NPWS Advisory Council. Based on the recommendation of these advisory bodies, the PoM amendment was adopted by the Minister on 1 October 2021.

NPWS provided further opportunities for local council, community groups and members of the broader community to have their input during the exhibition of the draft of this REF between 15 July and 16 August 2022. No comments on the draft REF were received.

Notification signage will be installed at primary access points within the proposed feral predator–free fenced area and construction timeframes once the REF is finalised.

5. Consultation – Aboriginal communities

5.1 Native title consultation requirements

The land is not subject to an Indigenous land use agreement. There has not been a determination of native title applicable to the land nor is there a native title claim pending.

It is unclear if native title has been extinguished and so it is assumed that it may persist in the site of the proposal.

It is recognised that the activity may have the potential to adversely affect the exercise of native title rights through restricting access to the site.

As such, in the absence of any active claim in the area, NPWS provided formal written notification to NTSCorp, as required under subsection 24JB(7) of the Commonwealth *Native Title Act 1993* in April 2021. No response from NTSCorp has been received.

5.2 Other parks

The local Aboriginal community has been consulted through a variety of means, including:

- meetings with the Gaagal Wanggaan NP Board which includes Gumbaynggirr representatives from Nambucca and Unkay local Aboriginal land councils (LALC)
- sites visits with Gumbaynggirr Elders
- notifications of 48 registered Aboriginal parties, including Gumbaynggirr and Dunghutti peoples, as part of the *Aboriginal cultural heritage assessment report* (Everick Heritage [2021a] at Appendix C).

6. Proposed activity (or activities)

6.1 Location of activity

Park name	Ngambaa Nature Reserve
Description of location	The proposed activity is located in the southern part of Ngambaa NR bound by Sergeants Road, Briggs Tower Road, Taylors Arm Road, Greenhills Road, Mcleods Trail and Jacks Road. The proposal encompasses all or sections of Stockyard Creek Road, Seams Road, Wittiggs Road and the upper catchments of Allgomera Creek, Stockyard Creek and Eungai Creek (see Figure 1).
Site commonly known as	N/A
Lot/DP	N/A
Street address	N/A
Site reference	Easting: 478413 Northing: 6581815 MGA zone: 56

6.2 Description of the proposed activity

The proposal will involve the following key elements:

- The construction of 33.2 km of conservation fencing (see Figure 1, Figure 3 and Appendix D), including:
  - fencing to enclose the 2,503 ha feral predator–free area in Ngambaa NR
  - fencing to enclose the stage 1 initial release area of approximately 288 ha, to facilitate the effective release of particular species to be specified in the approved translocation proposal.
- Vegetation will be managed in a 20 m corridor along the fence line. This will consist of a cleared corridor up to a maximum of 15 m wide, and the remainder will be under-scrubbed where practical. Hazardous trees and trees/branches that are overhanging the fence line will be removed or trimmed within the 20 m vegetation management corridor.
- The conservation fence will require a maximum 15 m wide fence line corridor to be cleared (minimum of 4 m wide on outside and 3 m on inside of the fence) as illustrated in Figure 3.
- The calculated construction activity footprint (i.e. the maximum area impacted by the proposal) is 73 ha, as follows:
  - 50 ha for the conservation fence line, including 40 ha to be cleared (0.3% of the reserve's vegetation) and 10 ha of already cleared land
  - 16 ha under-scrubbed area adjacent to fence line clearing
  - 7 ha field operations base site, including a 0.16 ha infrastructure footprint.
- The fence will follow existing trails and dormant forestry trails that have existing cleared corridors of between 3 and 8 m. This accounts for approximately 10 ha of already cleared vegetation along the proposed fence line corridor. Table 1 summarises vegetation disturbance for the proposed feral predator–free area.
- The establishment of ancillary facilities to support construction and operation of the feral predator–free area, including a field operations base (on a 7 ha site) containing site office, composting toilet, shower, hard-roofed shelter, camping area and storage shed,

solar and communication services, installation of surveillance, monitoring equipment with an infrastructure footprint of about 0.16 ha.

- Removal of feral predators and herbivores (to the extent reasonably practicable) and other interventions such as dedicated fire management, habitat restoration and weed control.
- The reintroduction of up to 5 locally extinct animal species, with identified priorities being eastern bettong, eastern quoll, rufous bettong, bush stone-curlew and eastern bristlebird (see Section 6.2.8).
- The construction and operation of visitor facilities are **out of scope** for this REF.

6.2.1 The proposed activity: pre-construction, construction and post-construction

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

Pre-construction:

- on-ground assessment of the fence alignment to minimise impacts to threatened flora and fauna
- completion of *Aboriginal cultural heritage assessment report* (Appendix C) and *Historic cultural heritage assessment* (Appendix B) to accurately assess and address impacts on cultural heritage values
- detailed marking of the proposed fence line including proposed centreline, boundaries of the cleared corridor and under-scrubbed zone, where hollow-bearing trees are to be retained, and erosion mitigations
- hollow-bearing trees in the cleared footprint are to be felled and retained on site as coarse woody debris habitat
- installation of works and road closure signs to inform neighbours and stakeholders of planned works and closures
- collection of baseline ecological health and monitoring data as per the ecological health and monitoring framework
- establish operational base, including toilet facilities.

Construction:

- vegetation management, including the removal of vegetation, re-purposing of coarse woody debris, and mulching of removed vegetation
- construction of predator-proof fence, connection to solar array, vehicle and pedestrian gates
- construction of a field operations base, including lock-up storage for tools and equipment, a site office and an under-cover multipurpose area, composting toilet, shower and camping platforms to facilitate ongoing research and education within the area (see Figure 2 and Fisher Design and Architecture [2021] at Appendix E).

Post-construction:

- eradication of feral predators and (to the greatest extent practicable) feral herbivores
- reintroduction of locally extinct and declining animal species
- ongoing tree risk assessment and treatment
- monitoring and treatment of erosion
- monitoring, evaluation and reporting on species, threats and ecosystem health
- ongoing maintenance and park management activities including weed and fire management.

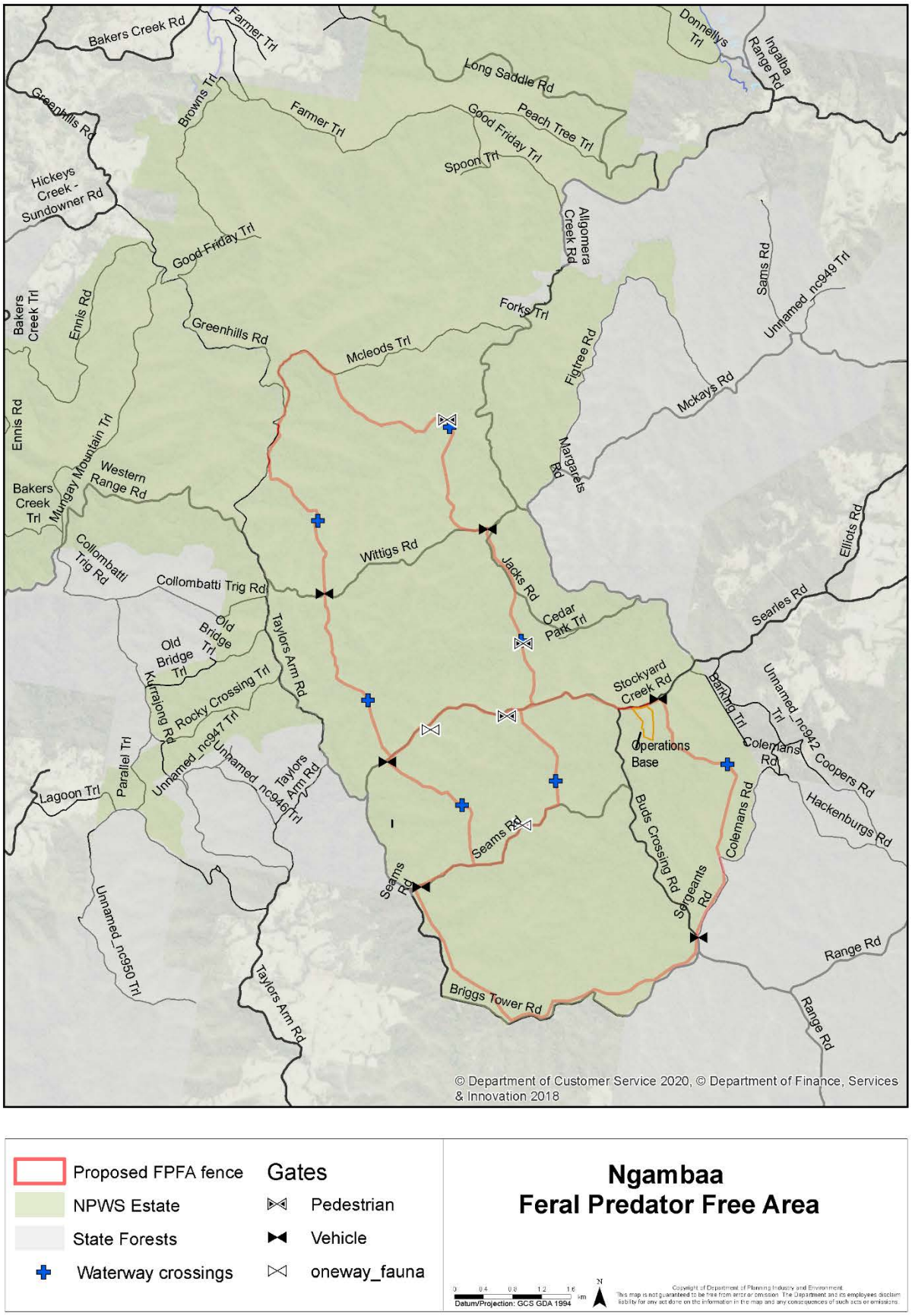


Figure 1 Ngambaa feral predator–free area showing proposed fence, gates, waterway crossings

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

The calculated construction activity footprint (CCAF) is defined as the area of land directly affected by the proposed development and refers to the area which is calculated from the activity footprint plus the applied construction buffers. The CCAF is based on worst case scenario with the intent to allow for micro-siting of the final activity footprint while constructing.

This proposal encompasses a CCAF disturbance area of **73 ha** comprising (see Table 1):

- a cleared fence line corridor of **50 ha** including 40 ha to be cleared to establish the fence and 10 ha of existing cleared land along roads and trails
- a **16 ha** area adjacent to the cleared fence line where under-scrubbing and/or hazardous tree removal will occur
- a **7 ha** area where the field operations base will be located.

The total CCAF is 0.7% of the of the reserve.

The intensity of disturbance varies along the length of the fence. The fence alignment follows 9.2 km of formed roads and trails and 11.6 km of dormant forestry tracks. These sections of the fence alignment have existing cleared corridors of between 3 and 8 m and the ridge line sections are largely regrowth eucalypts and acacias. When considering the existing clearing associated with roads and the development area of the field operations base, the actual clearing is likely to be around **40 ha**. Table 1 summarises the vegetation disturbance associated with the proposal.

Table 1 Summary of calculated construction activity footprint

Type	Area (ha)
15 m wide cleared fence line corridor:	
• vegetation to be cleared as part of this proposal	40
• already cleared fence line corridors	10
5 m wide management zone (under-scrubbing and/or hazardous tree removal)	16
Field operations base	7
Total calculated construction activity footprint (CCAF)	**73**
Estimated vegetation clearing for this proposal:	
• fence line corridor	40
• field operations base infrastructure footprint	0.16

The operations base is sited in a disturbed area on an old log dump dominated by regrowth eucalypts. The design of the field operations base is modular and is designed to fit in with existing larger trees. Of the 7 ha identified for the field operations base, the total area for the operations base infrastructure is 0.16 ha when considering the infrastructure footprint as shown in Table 2 and the areas that link them. The intensity of vegetation disturbance for the operations base is considered low to moderate.

The CCAF for vegetation classes within the Ngambaa feral predator–free area is shown in Table 3. The size ranges (i.e. cm diameter at breast height [DBH]) of species of hollow-bearing trees within the vegetation disturbance zone are shown in Table 4.

Table 2 Field operations base infrastructure footprint

Operations base feature	Size (m^2)
Storage container	15
Office/lab container	15
Multi-purpose area	60
(2) Large tent platform	60
(3) Small tent platform	54
Toilet	9
Shower	9
Parking	300
Total	**522**

Table 3 Calculated construction activity footprint (CCAF) for vegetation classes within the Ngambaa feral predator–free area

Vegetation class	Total area in reserve (ha)	Total area in FPFA (ha)	Area affected (ha)	CCAF as % of reserve total (nearest whole %)
Blackbutt	987	630	23	2
Grey gum – grey ironbark – mahogany complex	1,831	34	3	0
Grey gum – grey ironbark – mahogany complex – spotted gum complex	4,937	1,266	45	1
Moist coastal complex	2,658	570	2	0
Moist coastal complex – grey gum – grey ironbark – mahogany complex	2	0	0	0
Rainforest	31	0	0	0
Rainforest – brush box emergent – lantana	3	0	0	0
Rainforest – eucalypt emergents	7	0	0	0
Rainforest – eucalypt emergent – lantana	35	0	0	0
Rainforest – lantana	35	0	0	0
Rainforest – mixed emergent – lantana	2	3	0	0
Unknown	2	0	0	0
Exclusions	4	0	0	0
Total	**10,535**	**2,503**	**73**	**0.70**

FPFA = feral predator–free area

Source of vegetation classes: CRAFTI – DPE spatial database

Table 4 Size ranges (cm diameter at breast height, dbh) of species of hollow-bearing tree within the vegetation disturbance zone

Species	<80 cm dbh	>80 cm dbh	Total
Blackbutt	31	7	38
Grey gum	14	17	31
Grey ironbark	1	7	8
Pink bloodwood	3	1	4
Spotted gum	31	28	59
Stag	51	11	62
Stringybark	3	0	3
Tallowood	7	2	9
Turpentine	2	2	4
White mahogany	23	9	32
Total	**166**	**84**	**250**

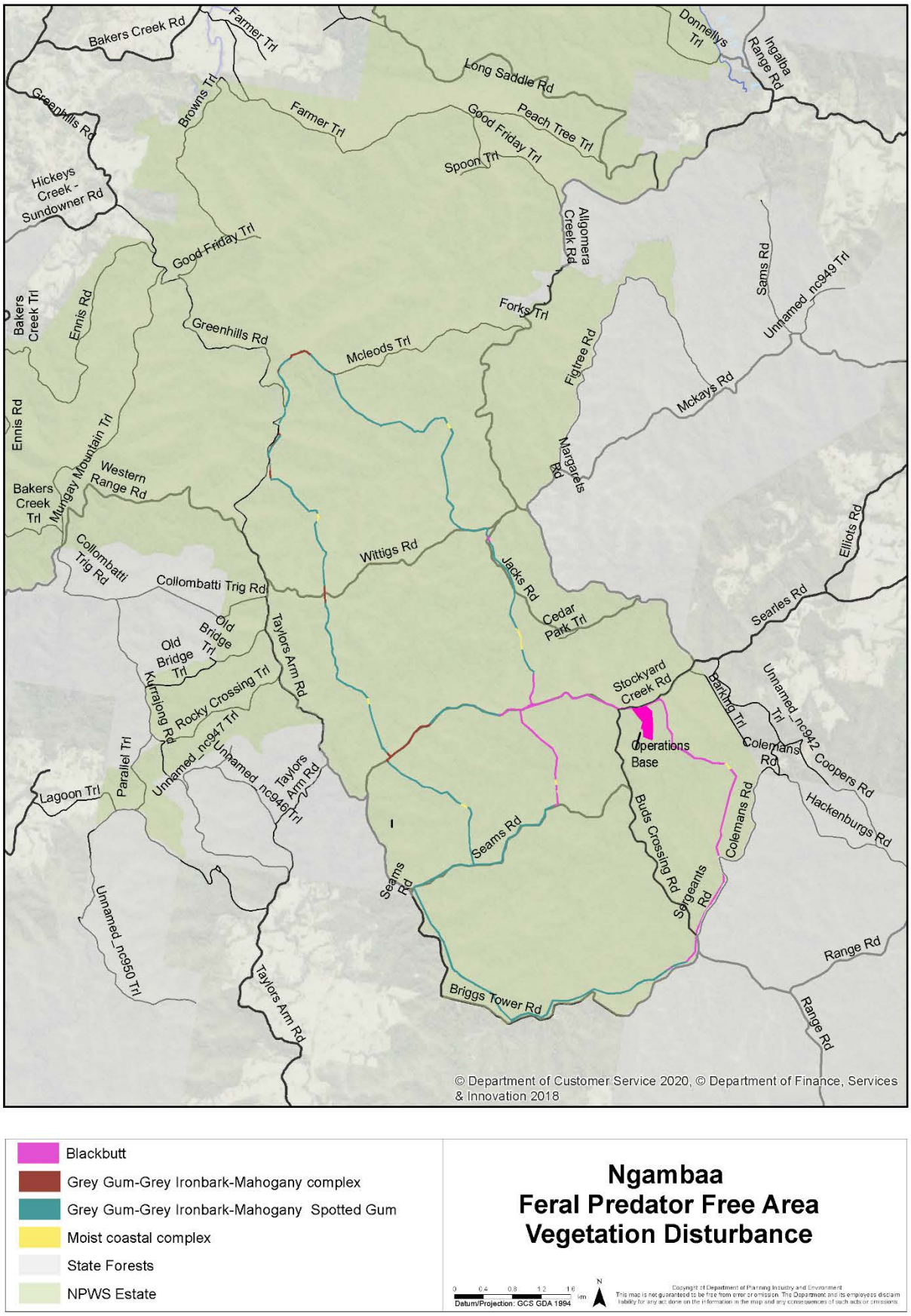


Figure 2 Ngambaa feral predator–free area vegetation disturbance map

6.2.3 Proposed construction methods, materials and equipment

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.

Vegetation management

Vegetation will be managed in a 20 m corridor along the fence line. This will consist of a cleared corridor up to a maximum of 15 m wide, and the remainder will be under-scrubbed where practical. Dangerous/hazardous trees and trees/branches overhanging the fence line will be removed or trimmed within the 20 m vegetation management corridor (see Figure 3).

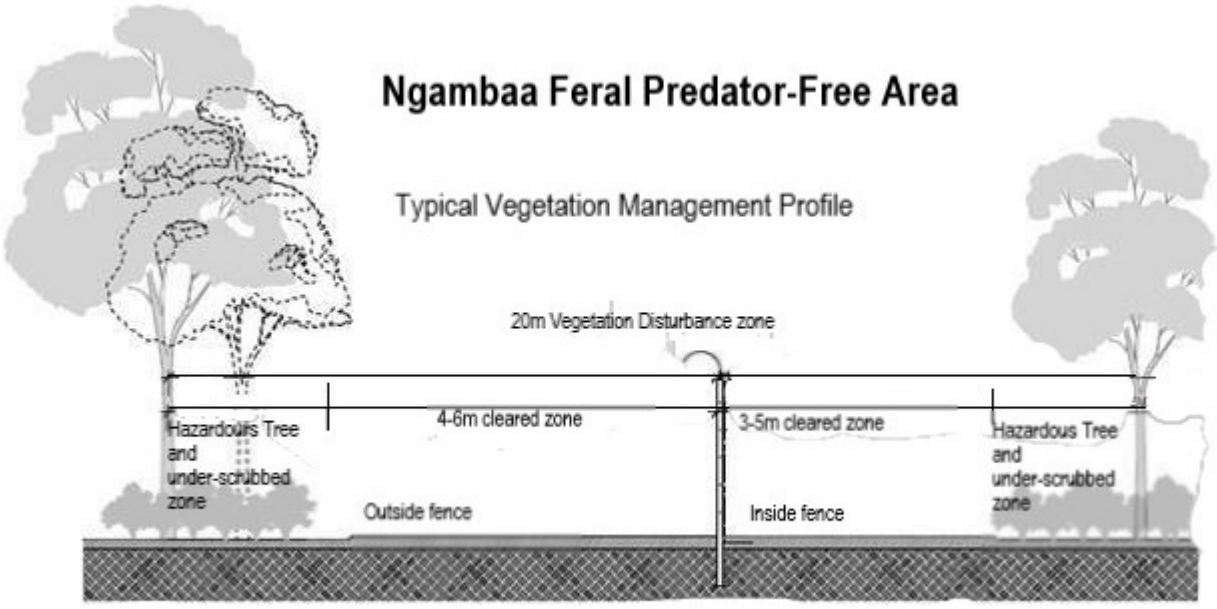


Figure 3 Typical fence line clearing profile

Vegetation will be cleared using a forestry harvester, mulcher and manually using chainsaw. Cleared vegetation will be salvaged for re-use, retained in the reserve as coarse woody debris habitat or mulched. Stumps will be mulched to ground level rather than being ripped and removed, and there will be no windrows left along the cleared corridor.

Where the fence line alignment allows, and the risk of trees or branches falling on the fence is low, large and hollow-bearing trees will be retained. Salvaged trees will be stockpiled within the proposed corridor or on existing trails and intersections for collection and transportation on existing roads.

Vegetation will be managed in accordance with the following procedure:

- A check for fauna in the zone of disturbance before clearing and scare or remove them before beginning operations. Implement protocols for hollow-bearing tree removal guidelines (Appendix F).
- Remove high-value salvageable trees for re-use first using a forestry harvester followed by removal of hollow-bearing trees and mulching the cleared corridor.
- Hollow-bearing trees to remain on site to be placed whole or in segments in areas adjacent to their original location to reduce further disturbance and damage to surrounding vegetation by relocating longer distances.
- Install sediment and erosion control measures as clearing works progress.

- Roading to improve access for construction and maintenance and associated drainage, erosion and sediment control.
- Trim or remove dangerous or high-risk trees in the under-scrubbed zones.
- Mulch remaining vegetation including stumps in the cleared zone and under-scrubbed zone where required up to a total of 20 m width.

Predator-proof fence

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 Prichard Francis Civil [2022] at Appendix D). 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 D). There would be a second overlapping section extending up from the base (the area most subject to macropod impact).

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 1,000 mm and 1,300 mm above ground level. Insulators will be fitted later in the construction process. Netting will then be installed.

Three rolls of netting are used:

- 1,800 mm wide roll for the upper vertical section, including the 600 mm floppy top (40 mm aperture)
- 1,200 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 2 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 D). 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 D 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 D.

All fencing materials will be stored along the cleared fencing corridor.

Crossings

The proposal includes crossings of drainage lines to construct the predator-proof fence over 7 drainage lines: 2 at Allgomera Creek to the north, 2 at Stockyard Creek in the centre of the proposal area and 3 at Eungai Creek in the southern area (see Table 5 and Figure 1). All these waterways consist of catchment areas from within the reserve (DEC 2004) and are proposed to be traversed by the construction of the predator-proof fence.

The fence will cross first and second order waterways (dry gullies) with no additional drainage infrastructure such as pipes or culverts. Where the fence crosses third, fourth or fifth order streams, box culverts or low-level bridges as per DPI Fisheries (DPE 2013) with a predator-proof outlet consisting of a hinged grate with 50 mm steel mesh and upstream coarse debris traps will be used (see Nambucca Engineering [2022] at Appendix G).

Crossings will be constructed in accordance with the following procedure:

- Prior to construction of crossings and clearing riparian vegetation, establish an exclusion zone and pre-clearing of fauna from exclusion zone.
- All in-stream work will occur during periods of low flow, generally in winter and early spring.
- Establish temporary stream flow diversion. A coffer dam will be constructed, and PVC pipe diversion installed to divert water downstream of the proposed crossing during construction. The dam will be removed after completion of the culvert installation prior to packing out the pipes and reshaping the road (pipe will remain in-situ to fill up with sediment naturally.
- Install precast box culverts as follows:
    - the exposed creek will allow for the lead project officer to determine the natural flow regime and determine the most appropriate location of the culvert
    - test the streambed to determine the proximity to bedrock and the amount and size of sterile imported quarry rock necessary to sit the culvert piping on
    - excavate the stream bed (minimal required to achieve 10% submersion of culvert pipes below streambed) to make space for the fill in which the culvert will sit
    - excavation should follow the existing stream bed gradient to ensure that excess build-up of sediment and debris do not occur inside of the culvert
    - spread crushed rock over the bottom of the stream bed and compact
    - place culvert pipe with 10% of diameter below stream bed (to allow for any potential fish movement)
    - install pre-cast concrete headwalls in stream bed to protect the upstream and downstream fill batters surrounding the culvert pipe

- backfill and compact around the culvert with ~20 mm crushed rock
- pipe outlets should discharge onto stable surfaces – scouring at the pipe outlet should not undermine the crossing structure or initiate gully erosion
- install rock ~500 mm and geotextile at inlet and outlet of culvert for scour protection
- install ~500 mm rock or aggregate where necessary to armour unstable area and mitigate for potential batter collapse
- remove coffer dam and install temporary sedimentation and erosion control measures.

Table 5 Waterway crossing summary Ngambaa feral predator–free area

SId	Catchment	Stream order	Catchment size (ha)	Discharge m^3/sec (@10 yr)	Design
1	Eungai Creek	5	1,733	36.20	Low-level bridge
2	Eungai	2	171	8.61	Box culvert
3	Eungai	2	26	0.00	Box culvert
4	Stockyard	3	215	6.85	Box culvert
5	Allgomera	3	135	6.85	Box culvert
6	Allgomera	4	629	19.35	Low-level bridge
7	Stockyard	4	828	21.36	Low-level bridge

6.2.4 Ancillary facilities to support construction and operation

The proposal involves the establishment of ancillary facilities to support construction and operation of the feral predator–free area, both in the nature reserve and outside the feral-free area. These facilities include temporary on-site storage of materials used in construction and maintenance, connection to electrical and communication services, installation of surveillance, monitoring equipment, and have a combined footprint of about 0.16 ha.

A field operations base to support the establishment and ongoing operation of the feral-free area will be constructed. It will provide parking, lock-up storage for tools and equipment, a site office and an undercover multi-purpose area, composting toilet, shower and camping platforms to facilitate ongoing research and education within the area. See Figure 1 and Appendix E. The siting of the operations base is along an east–west aligned ridge that was previously used as a log dump. The operations base is designed to be modular, fire-aware, sympathetic to the surrounding environment and positioned to minimise tree removal and ground disturbance. The field operations base may be constructed in stages including:

- Stage 1 – Parking area, storage container and site office, involving:
  - clearing regrowth vegetation as per vegetation management guidelines from old log dump and preparing level surface for parking area and store
  - covering parking area with 50 mm gravel
  - placing container store on precast concrete footings
  - levelling site for site office and placing container on precast footings
  - installing erosion and sediment control measures.

- Stage 2 – Multi-purpose work building, composting toilet/shower and camping platforms, involving:
  - clearing regrowth vegetation as per vegetation management guidelines from old log dump and preparing level surface for multi-purpose work building
  - constructing multi-purpose work building, composting toilet/shower and camping platforms
  - constructing paths to link facilities
  - installing erosion and sediment control measures.

A design and specification including materials for the operations base is provided in Appendix E.

Any structures will be constructed in accordance with the NPWS *Parks facilities manual* (NPWS 2016) and associated policies, and be a colour which is sympathetic to the natural setting.

6.2.5 Management trails

Management trails within the proposed feral predator–free fenced area are shown in Figure 1. These trails are maintained to the standard required by the Rural Fire Service (RFS) to support response to fires. In addition to the existing trail network, dormant tracks may be slashed for temporary access to facilitate the construction and maintenance of the conservation fencing, land management (particularly feral animal eradication and ongoing control), fire management and science activities within the fenced area.

6.2.6 Eradication of feral predators and herbivores from proposed feral predator–free fenced area

The eradication of feral predators and (to the greatest extent practicable) herbivores within the proposed fenced area will be delivered through intensive feral animal control programs informed by a comprehensive monitoring program (DPE 2022). The feral animals known to be in the area are cats, foxes and wild dogs. These works will be documented in a future feral animal management plan. All feral animal control will be conducted in accordance with standard operating procedures developed by the Invasive Animal Cooperative Research Centre (CRC); with the NSW *Codes of practice and standard operating procedures for the effective and humane management of pest animals* (DPI 2022) and with NPWS standard operating procedures. Feral animal control plans will use a range of conventional techniques including trapping, shooting and baiting, in accordance with relevant codes of practice (including animal welfare requirements) and the EPA / APVMA permits. Experimental and emerging techniques will be considered and deployed if appropriate.

A monitoring program will be implemented, consisting of remote camera traps deployed in an array throughout the proposed fenced area, 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.

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:

- 1080 baiting (ground and aerial)
- ongoing regular spotlighting patrols – these patrols will be used for opportunistic shooting of feral herbivores and predators
- deployment of soft-jaw traps for feral cats, foxes and wild dogs

- deployment of cage traps, using a variety of attractants to bring feral animals into the traps
- deployment of canid pest ejectors throughout the fenced area, using a variety of attractants
- traps – using 1080 treated grains or manufactured baits – will be deployed for feral pigs, pending numbers recorded through the activity monitoring
- use of cat-detection dogs
- use of cat trackers
- deployment of Eradicat (subject to permit approval).

Shooting (opportunistic or planned) will be conducted under shoot plans approved by NPWS and carried out by authorised personnel. Feral animal control programs will be consistent with the NSW *Codes of practice and standard operating procedures for the effective and humane management of pest animals* (DPI 2022), Invasive Animal CRC standard operating procedures and NPWS standard operating procedures.

Verification of feral predator–free status

The proposed fenced area will be monitored using remote camera arrays, sand plots, scat sampling 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 2–3 months, an 'interim feral-free status' will be declared. To ensure all feral predators have been removed, intensive monitoring will continue for a further 2–3 months post 'interim feral-free status', after which the area will be declared 'feral predator–free'.

Subject to the results of the monitoring, initial reintroductions may be conducted (possibly within holding pens) before the conclusion of the 4–6 month monitoring period, with released animals monitored intensively for survival. Once declared feral predator–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.

6.2.7 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 NPWS.

Relevant bushfire risk management plans and reserve fire management strategies will be reviewed in order to ensure they adequately identify built and natural assets and prioritise strategies for their protection.

Reduction of fuels within the APZs and SFAZs will be achieved using both prescribed burning and mechanical removal of ground debris, shrubs and sub-canopy trees.

A program of ecological and cultural burns will be carried out within the feral predator–free area. 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 overarching principles to ensure that a diversity of age classes / life stages of vegetation communities are present across the reserve. Specific standalone environmental impact assessment will be undertaken for fire management activities in accordance with the Rural Fires Act and NPWS *Fire management manual* (DPIE 2021a).

6.2.8 Reintroduction of locally extinct species

A list of species that were considered potential candidates for reintroduction in the Ngambaa feral predator–free area was compiled by Beranbek and Hayward (2021) of the University of Newcastle (see Appendix H). The list of species is based on specimen records, sightings, distribution modelling, reports or other accounts, knowledge of their habitat requirements, historic ranges and species expert review.

Eleven species will be considered for reintroduction, including:

- eastern bettong
- eastern quoll
- bush stone-curlew
- eastern bristlebird
- rufous bettong
- eastern pygmy possum
- parma wallaby
- northern long-nosed potoroo
- eastern chestnut mouse
- New Holland mouse (*Pseudomys novaehollandiae*)
- red-legged pademelon.

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 Monitoring, evaluation and reporting

NPWS has developed a detailed draft ecological health monitoring framework for this site (DPE 2022). The framework will be used to guide how NPWS will monitor, evaluate and report performance against the project's objectives, outputs and outcomes identified for the Ngambaa feral predator–free area, over the short, medium and long term. The ecological health monitoring framework 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:

- biodiversity indicators (including reintroduced species, extant species and habitat use)
- threat indicators (including feral predator and herbivore activity and abundance, macropods and rabbits)
- indicators related to ecological function and processes.

7. Reasons for the activity and consideration of alternatives

7.1 Objectives and reasons for the proposal

The primary objectives of the NSW feral predator–free areas project are common to all of the 4 sites, including the Ngambaa NR site. These are as follows:

- establish and maintain viable new populations of locally extinct species 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 Ngambaa NR 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 the development of visitor experiences, but this aspect is outside the scope of this REF.

The feral predator–free areas will operate as anchors (foundations) supporting 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.
- enabling targeted interventions beyond feral animal control, as required
- through research and innovation, generating knowledge which 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 effective landscape control of cats and foxes is developed
- providing source populations for the restoration of species, when feasible, across the landscape
- promoting public awareness of, and appreciation for, the value of native wildlife.

7.1.1 Reasons for the feral predator–free program

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. 2015; Legge et al. 2018).
- In NSW, 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 and feral cat 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 species (Garnett et al. 2011;

Woinarski et al. 2017a), 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 (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 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 (Radford et al. 2018).
- A number of species with a high to extreme susceptibility to predation are dependent on permanent and intensive predator control, and in some cases entirely dependent on 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 so-called ‘exclosures’ 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).

Australian small to medium-sized terrestrial mammals have been in significant decline since European settlement some 200 years ago (Woinarski et al. 2015), and the Mid North Coast 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 on studies of 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 is a critical outcome of this proposal.

7.2 Consideration of alternatives

The purpose of this section is to describe the options considered for the proposal and to demonstrate why the preferred option was chosen. Consideration has been given to reasonably feasible alternative sites, designs, construction and management options that may also achieve the proposal objectives.

7.2.2 Alternative sites

Consideration has been given to a number of alternative sites within the North Coast that meet the program objectives (NPWS 2020).

The detailed assessment of each potential area has taken into account a range of factors including:

- land tenure, permissibility and 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
- level of support from adjacent landholders and the broader community.

Reserves considered and assessed under these criteria included: Ngambaa NR, Chaelundi NP, Banyabba NR, Nymboi-Binderay NP and Guy Fawkes River NP.

7.2.3 Alternative designs

Consideration has been given to alternative designs within the preferred sites to avoid and minimise potential environmental, cultural and social impacts.

7.2.4 Alternative 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.

7.2.5 Alternative fence alignment

Consideration has been given to multiple alternative fence alignments within the preferred sites to avoid and minimise potential environmental, cultural and social impacts. Consideration was given to the following factors:

- considering terrain and topography to minimise incursion risk of feral predators, soil erosion potential and impacts on threatened species
- ensuring all infrastructure is located on national park estate
- potential impacts from wildfire
- minimising the impact on Aboriginal cultural heritage
- maximising the potential population size of candidate reintroduction species.

Two fence alignments within the Ngambaa feral predator–free area project area have been considered. An alignment with an area of 2,916 ha and a perimeter of 23 km that included 8.4 km of shared boundary with FCNSW and extensive side-cuts (7.8 km) was considered. In comparison, the proposed final area is smaller, at 2,503 ha, with a perimeter of 30 km but containing no side-cuts, and 2.3 km of FCNSW boundary.

Technical advice has been sought from departmental and external specialists including project managers, fencing contractors and fence manufacturers regarding the predator-proof fence construction for Ngambaa NR. This advice recommended realigning the fence to ridges and spurs rather than large areas of side-cuts or side slopes to reduce feral predator incursion risk and maintenance liabilities due to soil erosion, supporting the preferred 2,503 ha proposal assessed in the REF.

Fire prediction modelling indicates the western boundary is the most vulnerable to fire. Fire spread was modelled using Pheonix Rapidfire (a bushfire simulator and risk assessment decision-support tool) for a typical extreme fire weather event for 11 single point ignitions. A fire originating from the Collombatti Valley, west of the feral predator–free area, poses the most risk to the area. Under this scenario fire would rapidly run east uphill to towards Briggs Tower Road towards the feral predator–free area. The proposed final fence area (2,503 ha option) has a reduced spread potential due to downhill fire spread and moister vegetation and allows for a fuel reduced zone between the fence and Briggs Tower Road and Taylors Arm Road that can be managed on-park.

The preferred 2,503 ha alignment has no significant effect on potential population estimates of candidate species identified for reintroduction. Species with a population estimate of less than 50 include parma wallaby, red-legged pademelon, rufous scrub-bird (*Atrichornis rufescens*) and spotted-tailed quoll (*Dasyurus maculatus*). These species prefer habitat associated with rainforest and wet sclerophyll forest. The proposed feral predator–free area (2,503 ha) encompasses 116 ha less rainforest and wet sclerophyll forest than the other (2,916 ha) option that was considered.

Based on Beranek and Hayward (see Appendix H) density of candidate species, this 116 ha of rainforest and wet sclerophyll forest does not increase these populations above 50 animals.

7.2.6 Justification for preferred option

Ngambaa NR has been selected as the preferred site for the establishment of a feral predator–free area on the North Coast of NSW. Distribution models of threatened species and their former range have confirmed that the reserve has the potential to support the reintroduction of many species that were formerly widespread across the North Coast Bioregion. Vegetation types incorporating grassy understoreys, wet gullies, eucalypt forests and rainforest associations provide large areas of intact habitat that will facilitate:

- the re-establishment of the eastern bettong which is currently listed as extinct in NSW
- the establishment of new populations of locally extinct species such as the eastern quoll, rufous bettong, parma wallaby, common planigale and long-nosed potoroo
- conservation benefits for existing (extant) threatened animal species, including the koala, red-legged pademelon, eastern pygmy-possum and yellow-bellied glider (*Petaurus australis*).

The Ngambaa NR feral predator–free area will also deliver major benefits including:

- improvement in ecological health through:
  - removal of feral predators and herbivores (to the greatest extent practicable)
  - restoration of ecosystem processes such as digging and predation
- 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 strengthen 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.

The topography within Ngambaa NR is suitable for the construction of a feral predator–proof fence, and the reserve contains previously logged areas and a network of old logging trails which will enable the construction of a feral predator–proof fence with minimum vegetation disturbance.

The reserve is also relatively close to existing park management infrastructure and has relatively low levels of recreation.

The alignment of the proposed feral predator–free area fence addresses topographical and administrative constraints, minimises environmental impacts and maximises the likelihood of successful reintroductions of candidate species within the feral predator–free area.

8. Description of the existing environment

8.1 Natural values

The *Ngambaa Nature Reserve plan of management* (DEC 2004) states that the natural values of the reserve include:

- a large number of rare and threatened flora and fauna species as well as regionally significant species and communities
- high-quality habitat, including old-growth habitat for several threatened fauna species
- a large area of dry forest communities close to the coast
- an important component of a continuum of forest along the coastal range and link through to the escarpment of New England
- a high diversity of *Eucalyptus* species, including 4 different ironbark species of which 2 are rare
- protection of part of the catchment of the Nambucca and Macleay rivers.

8.1.1 Geology, geomorphology and topography

The mix of landscapes in the reserve is characterised by the underlying geology and geological form. The reserve has a number of very distinct and prominent ridgelines and mountains. Mungay Mountain (450 m), in the south-west, dominates the reserve and its surrounding area and is believed to be significant to both Aboriginal and non-Aboriginal communities.

Mungay Mountain forms part of a steep ridgeline, which runs north-east along most of the western boundary of the reserve and also includes Good Friday and Scotsman mountains. This ridgeline is the watershed for streams flowing north and west to Taylors Arm and east to Eungai and Allgomera creeks. A steep ridge also runs east–west along the southern boundary of the reserve.

The reserve is split between 3 main physiographic regions known as the Nambucca – Bellingen Hills, Horseshoe Ranges and Kempsey Hills and contains a mix of gentle and very steep slopes exceeding 30 degrees. The Nambucca – Bellingen Hills extend northwards from Eungai and Stockyard creeks (both within the reserve) and adjoin the Kempsey Hills which extend south and the Horseshoe Ranges which extend west.

The Nambucca – Bellingen Hills lie on the Permian metasediments of the Nambucca Beds, the Kempsey Hills on the permo-carboniferous Kempsey Beds and the Horseshoe Ranges on both the Kempsey and Nambucca beds. The Horseshoe Ranges are dominated by strongly erosional and colluvial processes (Eddie 2000).

The Kempsey and the Nambucca beds comprise what is commonly referred to as the Nambucca Block or Nambucca Slate Belt (lithological units). The Nambucca Block is the eastern part of the New England Fold Belt, faulted against the Coffs Harbour Block to the north and the Hastings Block to the south. Interbedded permo-carboniferous lithic sandstone, mudstone, pebbly sandstone, and minor conglomerate comprise the geology of the Kempsey Beds. The Kempsey Beds and the associated rock material are moderately resistant and less erodible than those of the Nambucca Beds. Water erosion problems are often typical as the acidic clay soils can be dispersive when wet and sometimes sodic. The upper reaches of the Nambucca Beds are dominated by Permian metasediments, fine-grained sediments with conspicuous soft micaceous sandstones and siltstones and the lower reaches consist of diamictite (Eddie 2000).

The deeply incised valleys of the upper catchments of the Nambucca and Bellingen rivers is due to the soft and highly erodible nature of the rocks of the Nambucca Beds and the predisposition for landslides on steep slopes.

The construction footprint sits between 83 m above sea level (ASL) at the eastern boundary towards Tamban with higher points at the ridge near the centre of the site being at 200–230 m ASL. At the northern boundary of the construction footprint, the high point is at 311 m ASL.

The proposed fence would be predominantly confined to flat areas or ridgelines/saddles that have been subject to quarrying and cut-and-fill construction methods to provide for the adjacent forestry trails.

8.1.2 Soil types

The construction footprint falls within the Aldavilla, Tamban, Tamban Variant B, Thumb Creek and Roses Knob soil landscapes (Eddie 2000). See Table 6. The geological makeup of the landscape generally comprises kudosols and kandosols on sandstone ridges and escarpments support tall, open eucalypt forest and pockets of wet sclerophyll forest.

Table 6 Soil landscapes and vegetation modelling of the construction footprint

Landscape	Description	Vegetation
Aldavilla (Eddie 2000*:144)	Landscape: Level elevated terraces to the Macleay River and valley flats to streams draining theKempsey Beds (CPkx) on late Pleistocene alluvium. Slopes <5%; elevation 30–80 m; relief up to 10 m on the Macleay River and upto 5 m on smaller valleys. Open forests and woodlands, mostly cleared. Soils: 100–180 cm imperfectly drained brown or red kurosols (yellow or red podzolic soils and soloths) and brown, red or yellow kandosols (red or yellow earths).	Much of the original vegetation was cleared several decades ago for agriculture. Tall open forests of the *Eucalyptus tereticornis* alliance are widespread. *E. ancophila*, *E. eugenioides*, *Angophora floribunda* and *Corymbia intermedia* also occur. *Acacia maidenii* and *Acacia floribunda* are common in the understorey, with *Themeda triandra* and *Imperata cylindrica* at ground level. *Themeda triandra*, *Imperata cylindrica* and *Pteridium esculentum* may replace understoreys when repeatedly burned. Exotic species include *Cinnamomum camphora* and *Lantana camara*. Pasture weeds include fireweed (*Senecio lautus*), Scotch thistle (*Cirsium vulgare*) and purple-top (*Verbena bonariensis*). Along smaller valleys streams, the *Eucalyptus grandis* and *E. tereticornis* alliances predominate, with *Tristaniopsis laurina*, *Commersonia fraseri* and *Guioa semiglauca*.
Roses Knob (Eddie 2000:117)	Landscape: Steep to very steep hills as upper slopes and escarpments with narrow crests, steep slopes and occasional colluvial foot slopes on the Kempsey Beds (CPkx). Relief 90– 300 m; elevation 100–300 m; slopes 33–65%. Tall open dry sclerophyll forests, uncleared. Soils: <70 cm leptic rudosols with 80 cm imperfectly	Uncleared open forests (dry sclerophyll forests) of the *Eucalyptus pilularis – Corymbia intermedia – E. siderophloia* sub-alliance, *E. acmenoides – E. propinqua* alliance and *C. maculata* alliance are widespread. *E. placita* and *E. carnea* also occur. *Allocasuarina torulosa*, *Acacia falcata*, *Xanthorrhoea johnsonii* and *Jacksonia scoparia* are typically found in the understoreys, which may be partly replaced by *Imperata cylindrica*, *Themeda triandra* and *Pteridium esculentum* when repeatedly burned.

Landscape	Description	Vegetation
	drained yellow kandosols and yellow kurosols on steep ridges and slopes, and 120 cm moderately well drained brown kandosols on mudstones.	Sheltered sites support wet sclerophyll forests of the *Eucalyptus pilularis – E. microcorys* sub-alliance with *Syncarpia glomulifera*, or *Backhousia myrtifolia – Lophostemon confertus – Tristaniopsis* dry rainforests (sub-alliance 29, Floyd 1990, in Eddie 2000).
Thumb Creek (Eddie 2000:160)	Landscape: Narrow, discontinuous valley flats below steep hills and mountains. Elevation 100–200 m; gradients 5–10%. Partly cleared riverine rainforests. Soils: Shallow to moderately deep (20–100 cm), stony brown kandosols (prairie soils) with shallow (10–20 cm) clastic	Much has been cleared for agriculture in accessible areas. Riverine or gully rainforests, commonly *Ceratopetalum apetalum* / *Schizomeria ovata – Argyrodendron actinophyllum* / *Sloanea woollsii* (sub-alliance 33). *Eucalyptus grandis* has regrown in areas of prior clearing. Canopy associates include *Diploglottis australis*, *Melia azedarach*, *Cryptocarya obovata* and *Archontophoenix cunninghamii*. Common small trees include *Callicoma serratifolia*, *Aphananthe philippinensis*, *Glochidion ferdinandi* and *Ficus coronata*, with *Lomandra hystrix*, *Oplismenus aemulus* and *Culcita dubia* sparsely distributed at ground level. Riparian vegetation is reported in more detail in Raine (1994 a, b, in Eddie 2000).
Tamban and Tamban Variant B (Eddie 2000:102)	Landscape: Rolling to steep hills. Low dissected plateaux with broad crests and occasional steep side slopes on lithic sandstones with interbedded mudstones of the Kempsey Beds (CPkx). Slopes 20–33% (up to 50% on side slopes); relief 50–100 m; elevation 50–200 m. Open forests, partly cleared. Landscape Variant tbb: Mappable areas that have steep lower side slopes with gradients 33–50%. Soils: 50–100 cm moderately well-drained brown kurosols (red podzolic soils) and kandosols (yellow earths), with 70 cm leptic tenosols and leptic rudosols (lithosols) on steeper slopes and ridges.	Partly cleared open forests of the *Eucalyptus pilularis – Corymbia intermedia – E. siderophloia* sub-alliance, *E. acmenoides – E. propinqua* alliance and *Corymbia maculata* alliance are widespread. *C. maculata* is associated with sandstone substrates (Boland et al. 1984, in Eddie 2000), and its presence distinguishes this soil landscape from the Euroka (eu) soil landscape. *E. placita* and *Lophostemon confertus* also occur. *E. carnea* occurs on exposed, less favourable sites. West of Temagog in a rainshadow (tba landscape variant), a woodland of the *Eucalyptus tereticornis – Angophora floribunda* sub-alliance occurs, with *E. acmenoides* and *E. siderophloia*. *Allocasuarina torulosa*, *Acacia falcata*, *Notelaea ovata* and *Jacksonia scoparia* typically comprise the understoreys, which may be replaced by *Dodonaea triquetra*, *Imperata cylindrica* and *Pteridium esculentum* when repeatedly burned. Sheltered valleys (tbb landscape variant) support tall open forests of *Eucalyptus pilularis – E. microcorys* sub-alliance grading to the *Eucalyptus grandis* sub-alliance, or *Backhousia myrtifolia – Lophostemon confertus – Tristaniopsis* dry rainforest (sub-alliance 29). Understoreys include *Alphitonia excelsa*, *Rhodamnia rubescens*, *Acacia irrorata* and *Commersonia fraseri*.

* refer to Eddie (2000) landscape numbers.

8.1.3 Soil erosion risk

The underlying geologies of the reserve, namely the Nambucca and Kempsey beds, differ in their erosive qualities. The Kempsey Beds are moderately resistant and less erodible than those of the Nambucca Beds and the soils are acidic clays, dispersive when wet and sometimes sodic, giving rise to strong contrasts and water erosion problems. The rocks of the Nambucca Beds are soft and highly erodible, giving rise to the deep, incised valleys of the upper catchments of the Nambucca and Bellingen rivers, intensified by the susceptibility for landslides on steep slopes (Eddie 2000).

The majority of soil types found within the reserve have been classified as being highly erodible.

The erosive qualities of soils and their parent materials have important implications for management, particularly for roads, track and trail maintenance. Erosion is recognised as a natural process, however, a number of events can accelerate the rate of erosion within the reserve. Soils are particularly vulnerable to erosion after large fire events, especially when post-fire periods coincide with months of rainfall.

There is a minor area of erosion at Cedar Park along the existing walking track, which is associated with the grade of the walk and the lack of appropriate footing to minimise water runoff. Some of the tracks and trails within the reserve are also subject to erosion where they traverse a steep gradient.

8.1.4 Existing ground disturbance

The ground surface is considered to be significantly disturbed from the following:

- historic forest clearing in Ngambaa NR, particularly on the ridgetops and ridgelines
- construction and maintenance of forestry roads through the reserve historically and to provide access for tourist purposes
- use of flat ridges and spurs along Stockyard Creek Road as historic forestry log dumps.

8.1.5 Contamination risk

The NSW EPA's Contaminated Land Register was searched on 12 September 2021. No sites are registered in the Nambucca Valley Local Government Area. Other than minor spills of fuels and oils during logging operations, the plan of management for the reserve does not contain any indication that potentially contaminating land uses have ever occurred at the site.

8.1.6 Watercourses, waterbodies and wetlands (including their catchment values)

The reserve falls into 2 major catchments, the Nambucca River and the Macleay River catchments, with the majority of the reserve lying within the Nambucca River catchment.

Eight aquatic habitats intersect the subject site as creek lines. These include Allgomera Creek to the north, Stockyard Creek in the centre and Eungai Creek to the south.

Allgomera, Stockyard and Eungai creeks all flow into Warrell Creek, which flows into the Nambucca River at Nambucca Heads. Warrell Creek forms part of the Nambucca River catchment and is identified to have 'potential high conservation value' due to the extent of undisturbed waterways within the catchment (DEC 2004). The aquatic sites are located approximately 10–18 km from the mouth of Warrell Creek.

The location of the 7 creek crossings required to construct the feral predator–proof fence and their respective stream order are shown in Figure 1 and Table 5.

8.1.7 Coasts and estuaries

The reserve is approximately 21 km west of the ocean. There are no coast or estuarine values in the vicinity of the proposal.

8.1.8 Areas of outstanding biodiversity value or critical habitat

Ngambaa NR protects many rare and threatened flora and fauna species as well as regionally significant species and communities.

Biodiversity Australia prepared an ecological assessment for the proposal (see Appendix A), which included flora and fauna surveys. This assessment determined the proposed development will not directly or indirectly affect an area of outstanding biodiversity value identified in the BC Act. At the time the assessment was made, there were 4 declared areas of outstanding biodiversity value in NSW, none of which are within the reserve: Gould's petrel (*Pterodroma leucoptera leucoptera*) critical habitat, little penguin (*Eudyptula minor*) population in Sydney's north harbour, Mitchell's rainforest snail (*Thersites mitchellae*) in Stotts Island NR, and the Wollemi pine (*Wollemia nobilis*) critical habitat.

8.1.9 Threatened ecological communities

Biodiversity Australia prepared an ecological assessment for the proposal, which included flora and fauna surveys (see Appendix A).

The vegetation assessment identified approximately 0.22 ha of plant community type (PCT) 670 Black Booyong – Rosewood – Yellow Carabeen Subtropical Rainforest of the NSW North Coast Bioregion. PCT 670 is referable to sub-alliance 10, *Argyrodendron actinophyllum – Dendrocnide excelsa* – sub-alliance 33: *Ceratopetalum / Schizomeria-Heritiera / Sloanea*. Sub-alliance 33 is listed as Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion Endangered Ecological Community, however this classification has limitations. The patches of this sub-alliance are very small (less than 0.1 ha); the soils are not basalt-derived; and brush box (*Lophostemon confertus*), turpentine (*Syncarpia glomulifera*) or blackbutt (*Eucalyptus pilularis*), form part of the canopy in or adjacent to these sub-alliances making it difficult to determine classification as part of Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion.

No vegetation communities listed as threatened ecological communities under the EPBC Act were recorded within the subject site. The Lowland Rainforest of Subtropical Australia listing advice indicates that the vegetation community PCT 670 falls within Condition Classes 2 and/or 3. However because of its small extent, it does not meet the minimum requirements at which patches are to be considered under the EPBC Act.

8.1.10 Threatened species and populations

Biodiversity Australia prepared an ecological assessment for the proposal (see Appendix A). Desktop searches and flora and fauna surveys were undertaken.

Threatened flora

Desktop searches and survey by Biodiversity Australia showed that a total of 3 threatened flora species were identified as known or likely to occur within the subject site. Of these, 2 were recorded during the survey. An additional species, slender marsdenia (*Marsdenia longiloba*), was considered to potentially occur due to the suitable quality habitats occurring within the study area and the proximity of local records. Twelve threated plants are recorded in BioNet Wildlife Atlas within 10 km of the proposed feral predator–free area (shown in Table 7). Appendix A details threatened flora locations, survey and assessment of impacts. Figure 4 shows the location of BioNet Atas threatened flora records within the proposal area.

Table 7 Threatened flora records within 10 km of proposed feral predator–free area

Common name	Scientific name	BC Act	EPBC Act	No. of records	Source
Floyd's grass	*Alexfloydia repens*	E	–	2	BioNet Atlas
White-flowered wax plant	*Cynanchum elegans*	E	E	1	BioNet Atlas
Spider orchid	*Dendrobium melaleucaphilum*	E	–	27	BioNet Atlas
Willawarrin doubletail	*Diuris disposita*	E	–	59	BioNet Atlas
Slender marsdenia	*Marsdenia longiloba*	E	V	101	BioNet Atlas, Graham (undated)
n/a	*Maundia triglochinoides*	V	–	94	BioNet Atlas
Rusty plum, plum boxwood	*Niemeyera whitei*	V	–	30	BioNet Atlas
Milky silkpod	*Parsonsia dorrigoensis*	V	E	653	BioNet Atlas, Graham (undated)
Scant pomaderris	*Pomaderris queenslandica*	E	–	1	BioNet Atlas, Graham (undated)
Scrub turpentine	*Rhodamnia rubescens*	E	–	68	BioNet Atlas
Native guava	*Rhodomyrtus psidioides*	E	–	7	BioNet Atlas
Rainforest cassia	*Senna acclinis*	E	–	10	BioNet Atlas

BC Act = Biodiversity Conservation Act, EPBC Act = Environment Protection and Biodiversity Conservation Act; E = endangered, V = vulnerable.

– = not listed; n/a = no common name.

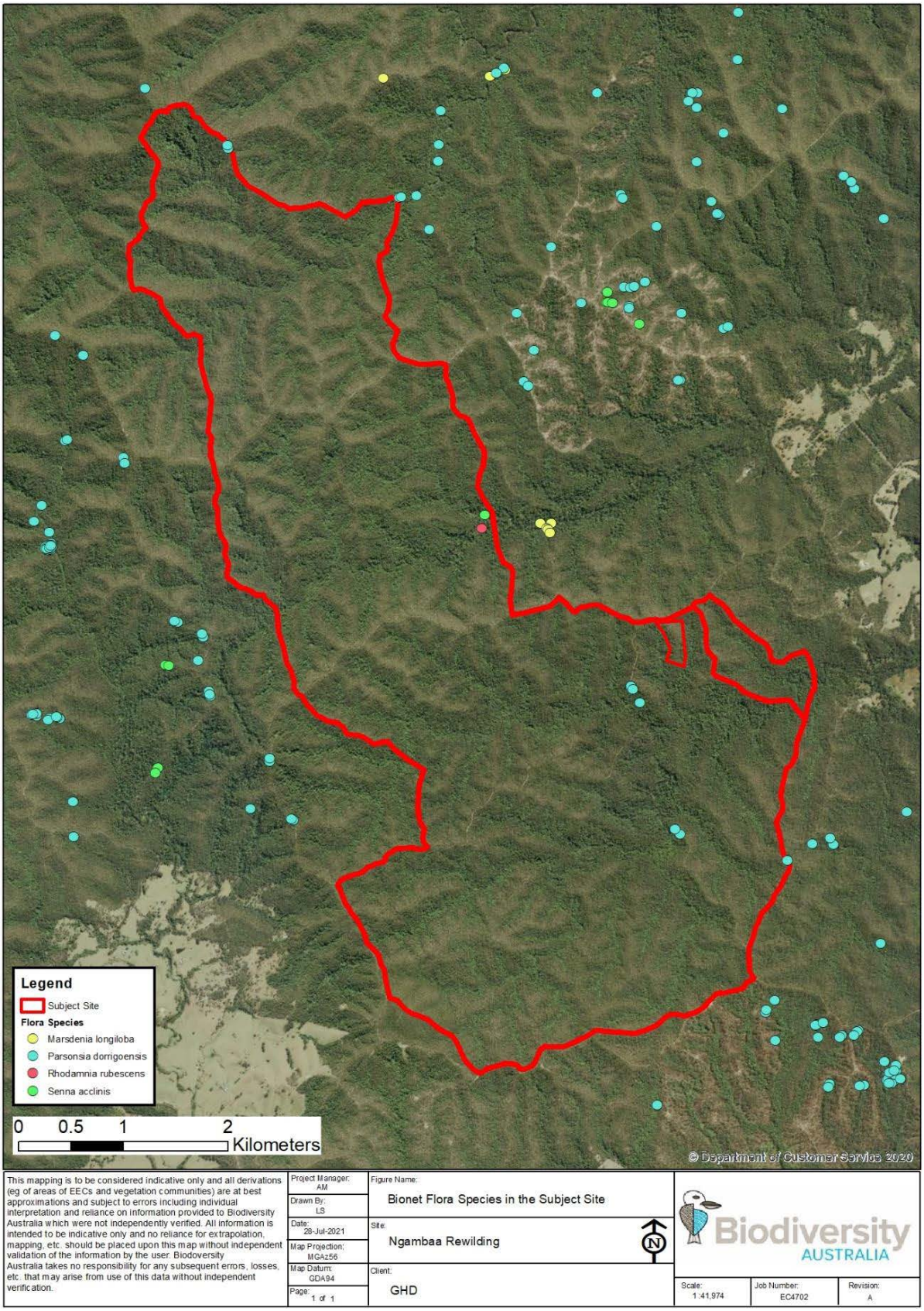


Figure 4 Map of threated flora (source Biodiversity Australia)

Threatened fauna

The ecological assessment included evaluations of terrestrial fauna habitat and aquatic fauna habitat:

- The terrestrial habitats present within the construction footprint were assessed for their potential to support terrestrial fauna and threatened terrestrial species.
  - The construction footprint contains potential habitat for several threatened fauna species.
  - There are numerous threatened species recorded in BioNet within 10 km of the proposed feral predator–free area (shown in Table 8).
  - A fauna survey found a total of 7 threatened fauna species within the construction footprint (Appendix A).
- The 7 creek crossings present within the construction footprint were assessed for their potential to support aquatic fauna and threatened aquatic species.
  - None of the creek crossings were considered suitable habitat for the purple-spotted gudgeon (*Mogurnda adspersa*) or platypus (*Ornithorhynchus anatinus*).

Appendix A details threatened fauna locations, survey, and assessment of impacts. Figure 5 shows the location of BioNet Atas threatened fauna within the proposal area.

Table 8 Threatened fauna records within 10 km of proposed feral predator–free area

Common name	Scientific name	BC Act	EPBC Act	No. of records	Source
Birds					
Regent honeyeater	*Anthochaera phrygia*	E	CE	3	BioNet Atlas
Dusky woodswallow	*Artamus cyanopterus cyanopterus*	V	–	3	BioNet Atlas
Bush Stone-curlew	*Burhinus grallarius*	E	–	4	BioNet Atlas
Glossy black-cockatoo	*Calyptorhynchus lathami*	V	–	556	BioNet Atlas, DEC (2004)
Spotted harrier	*Circus assimilis*	V	–	1	BioNet Atlas
Brown treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	–	1	BioNet Atlas
Barred cuckoo-shrike	*Coracina lineata*	V	–	1	BioNet Atlas
Varied sittella	*Daphoenositta chrysoptera*	V	–	21	BioNet Atlas
Black-necked stork	*Ephippiorhynchus asiaticus*	E	–	26	BioNet Atlas
Little lorikeet	*Glossopsitta pusilla*	V	–	29	BioNet Atlas
Little eagle	*Hieraaetus morphnoides*	V	–	1	BioNet Atlas
White-throated needletail	*Hirundapus caudacutus*	–	V, M	22	BioNet Atlas
Comb-crested jacana	*Irediparra gallinacea*	V	–	4	BioNet Atlas
Black bittern	*Ixobrychus flavicollis*	V	–	1	BioNet Atlas, DEC (2004)
Square-tailed kite	*Lophoictinia isura*	V	–	12	BioNet Atlas

Common name	Scientific name	BC Act	EPBC Act	No. of records	Source
Barking owl	*Ninox connivens*	V	–	6	BioNet Atlas
Powerful owl	*Ninox strenua*	V	–	59	BioNet Atlas
Wompoo fruit-dove	*Ptilinopus magnificus*	V	–	27	DEC (2004)
Rose-crowned fruit dove	*Ptilinopus regina*	V	–	unknown	DEC (2004)
Diamond firetail	*Stagonopleura guttata*	V	–	1	BioNet Atlas
Eastern grass owl	*Tyto longimembris*	V	–	2	BioNet Atlas
Masked owl	*Tyto novaehollandiae*	V	–	27	BioNet Atlas
Sooty owl	*Tyto tenebricosa*	V	–	39	DEC (2004)
Mammals					
Rufous bettong	*Aepyprymnus rufescens*	V	–	2	BioNet Atlas
Hoary wattled bat	*Chalinolobus nigrogriseus*	V	–	3	BioNet Atlas
Spotted-tailed quoll	*Dasyurus maculatus*	V	E	32	BioNet Atlas, DEC (2004)
Eastern false pipistrelle	*Falsistrellus tasmaniensis*	V	–	2	BioNet Atlas
Parma wallaby	*Macropus parma*	V	–	1	BioNet Atlas
Eastern coastal free-tailed bat	*Micronomus norfolkensis*	V	–	12	BioNet Atlas
Little bent-winged bat	*Miniopterus australis*	V	–	78	BioNet Atlas, DEC (2004)
Large bent-winged bat	*Miniopterus orianae oceanensis*	V	–	24	BioNet Atlas
Southern myotis	*Myotis macropus*	V	–	6	BioNet Atlas
Greater glider	*Petauroides volans*	–	V	60	BioNet Atlas
Yellow-bellied glider	*Petaurus australis*	V	–	115	BioNet Atlas, DEC (2004)
Squirrel glider	*Petaurus norfolcensis*	V	–	27	BioNet Atlas
Brush-tailed phascogale	*Phascogale tapoatafa*	V	–	26	BioNet Atlas
Koala	*Phascolarctos cinereus*	E	E	334	DEC (2004)
Golden-tipped bat	*Phoniscus papuensis*	V	–	18	BioNet Atlas
Common planigale	*Planigale maculata*	V	–	1	BioNet Atlas
Long-nosed potoroo	*Potorous tridactylus*	V	V	1	BioNet Atlas
Grey-headed flying-fox	*Pteropus poliocephalus*	V	V	153	BioNet Atlas

Common name	Scientific name	BC Act	EPBC Act	No. of records	Source
Greater broad-nosed bat	*Scoteanax rueppellii*	V	–	12	DEC (2004)
Eastern cave bat	*Vespadelus troughtoni*	V	–	1	BioNet Atlas
Frogs					
Green and golden bell frog	*Litoria aurea*	E	V	3	BioNet Atlas
Green-thighed frog	*Litoria brevipalmata*	V	–	10	BioNet Atlas
Stuttering frog	*Mixophyes balbus*	E	V	3	BioNet Atlas
Giant Barred frog	*Mixophyes iteratus*	E	E	55	BioNet Atlas, DEC (2004)
Reptiles					
Stephens' banded snake	*Hoplocephalus stephensii*	V	–	3	BioNet Atlas, DEC (2004)

BC Act = Biodiversity Conservation Act, EPBC Act = Environment Protection and Biodiversity Conservation Act; CE = critically endangered, E = endangered, V = vulnerable, M = migratory.

– = not listed.

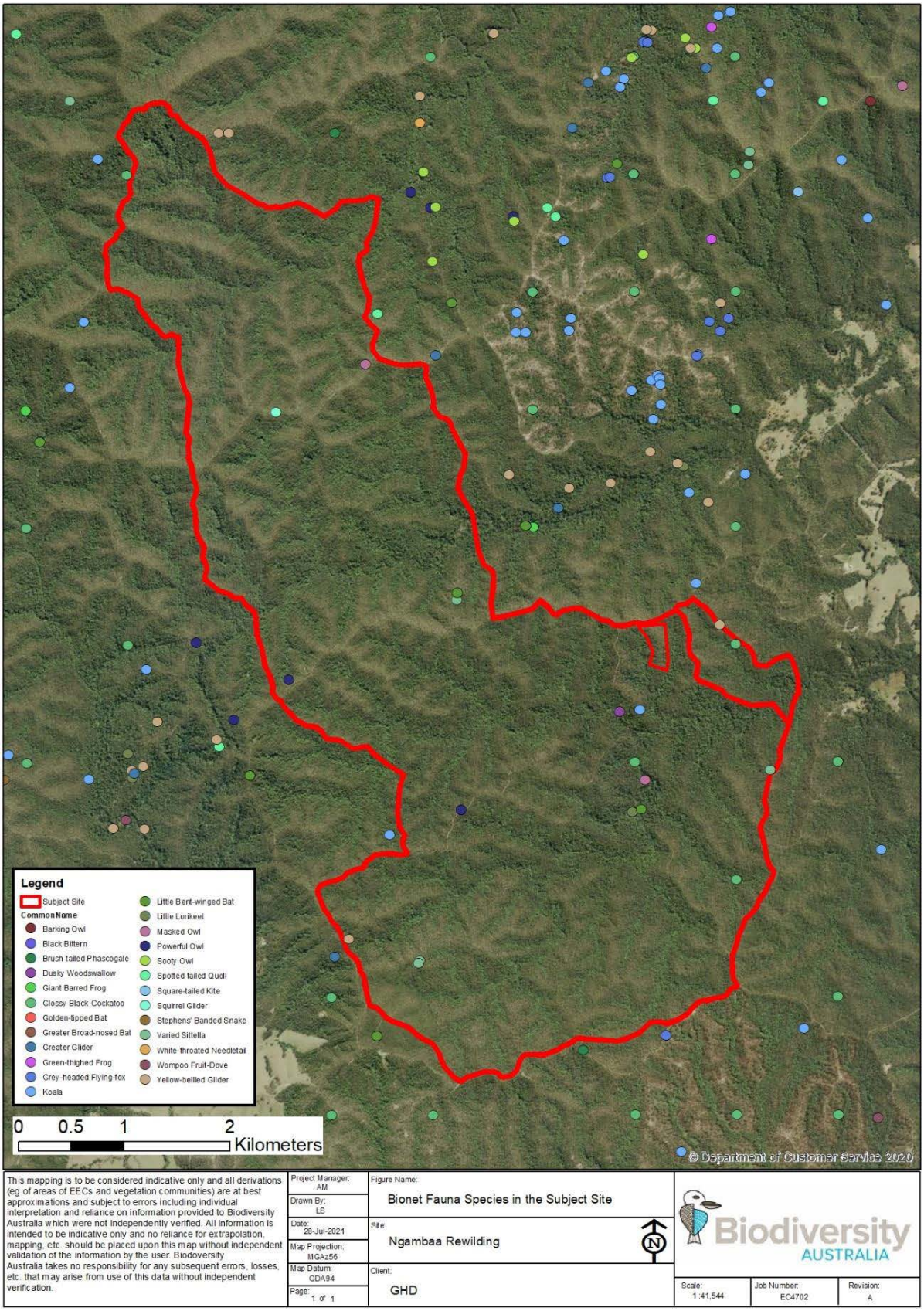


Figure 5 Map of threated fauna (source Biodiversity Australia)

8.2 Cultural values

8.2.1 Aboriginal cultural heritage

Background

Ngambaa is the Gumbaynggirr word for ‘Tribe that lived between Nations’ and the name of the local Warrell Creek Tribe, reflecting the reserve’s location on the boundary of the Gumbaynggirr and Dungutti language groups.

The Gumbaynggirr tribal group is reported to cover an area from Grafton in the north to the Nambucca River in the south, and westward from the coast to the headwaters of the Nymboida River.

Clement Hodgkinson, the Colonial Surveyor in 1841, identified a number of tribes in and around Nambucca and Kempsey, including Yarrahapinni and the Tanban (Townsend 1993).

A number of areas and sites within the reserve are understood to be significant to the local Aboriginal community. These range from sites of individual significance, such as modified trees, to areas that hold specific spiritual significance within the landscape.

The history of Aboriginal occupation of the area is evident not only in the relics and sites that hold considerable significance but also in the names of many of the towns, rivers and other features in the area. It can be extrapolated that Mungay Mountain, which is within the reserve, derives its name from the Munga Tribe, described by Clement Hodgkinson in 1841. The word Nambucca is believed to be derived from the Aboriginal word, Ngambugka, and is said to mean ‘winding or crooked river’ or ‘entrance to the waters’ (Townsend 1993). Tanban, which later became Tamban, means ‘spiky grass’ or ‘kurrajong tree’ (Townsend 1993). Other locations include Collombatti, which means ‘knobby tree’; and Unkya, which means ‘long river’ (Bradley 1994).

The reserve is split between 3 local Aboriginal land council (LALC) areas: Thunggutti, Kempsey, and Unkya. The majority of the reserve is within the Unkya LALC area. There may also be other Aboriginal community organisations and individuals with an interest in use and management of the reserve.

Some of the native plants within Ngambaa NR are significant to local Aboriginal people for medicinal usage, bush tucker and cultural purposes.

Aboriginal sites within Ngambaa NR form part of a connected cultural landscape which includes isolated finds and small-scale artefact scatters which are primarily located on ridges and spurs. The sites represent the use of forest environments by Aboriginal groups who primarily camped close to rivers and waterways on the coast and in the valleys. The artefacts are not considered to be regionally rare, however the sites have an elevated potential for Aboriginal community–driven research as they are so accessible to the public.

Further detail is provided in the *Aboriginal cultural heritage assessment report* (Everick Heritage 2021a) which can be found in Appendix C.

8.2.2 Historic heritage values

Background

The Nambucca Valley was one of the last eastern valleys in NSW to be fully explored and settled by Europeans. The difficult entrance to the Nambucca River and dense rainforest on the valley floor delayed European settlement in the valley. The first Europeans to permanently settle and work in the area were the cedar-getters in the 1830s.

James Taylor, one of the first pastoralists in the area, took up a run called TRY station between Warrell Creek and Taylors Arm in 1841. It is suggested that the name Taylors Arm was named after him (Townsend 1993).

In 1841, Colonial Surveyor Clement Hodgkinson embarked on a major exploratory journey through the upper Nambucca catchment from his base on the Macleay River. His trip was notable for the good relations he enjoyed with local Aboriginal people. There is some debate about the precise route taken by Hodgkinson. The journal kept by Hodgkinson described the vegetation and topography of the area and it is believed that his route included the reserve.

The reserve contains a number of sites of historic interest such as a marked tree on Good Friday Mountain, dry-stone retaining walls along Taylors Arm / Greenhills Road, the remains of an old stone cairn along Seargents Road which is believed to mark a grave site, and the Cedar Park Picnic Area. The reserve is also believed to contain several old sawmill sites, although no relics have been found.

The marked tree on Good Friday Mountain was carved by Jim Wright on Good Friday in 1926 with the inscription 'Good Friday 1926 JW'. The Wright family has a long history in the region and held a grazing lease in the former Ingalba State Forest, now Ngambaa NR, which was passed down the family. A member of the Wright family has visited the tree, an old New England box (*Eucalyptus andrewsii*), every Good Friday since. Toby Wright, the grandson of Jim, erected a sign on top of Good Friday Mountain to identify the site (pers. comm. T Wright, 2001).

The reserve comprises land that was previously part of Ingalba, Collombatti and Tamban state forests. Many of the reserve roads have been named after early timber-getters in the area, such as Buds Crossing Road named after Bud Miles.

The Cedar Park Picnic Area was established in the 1960s by the former State Forests of NSW (SFNSW). A number of introduced non-native species were planted by SFNSW when the picnic area was established. These include 2 fully grown Arizona cypress trees (*Cupressus arizonica*) and a number of silky oaks (*Grevillea robusta*) and poplar trees (*Populus nigra*). The picnic area also contains a grove of spectacular red cedars (*Toona ciliata*) planted in 1969. Just off Jacks Road there are the remains of an old hut used by Fred Chapman, who planted the trees in Cedar Park.

Prior to gazettal of the reserve, forest protests were held in the 1990s over the proposal to release a number of compartments for wood chipping. This brought the conservation significance of the area into the public spotlight. In 1998, local conservation groups formally submitted a proposal to the NPWS for the creation of the reserve.

Fire and human disturbance are the biggest threat to sites of historic heritage within the reserve.

Searches were made of relevant Commonwealth, state and local heritage registers on 1 June 2021 by Everick Heritage (see Appendix B), with the following results:

- NSW State Heritage Register – no results were returned
- NSW Heritage Inventory – no results were returned
- *Nambucca Valley Local Environment Plan 2010* – no results were returned
- Commonwealth Heritage List – no results were returned
- National Trust Heritage list – no results were returned
- s 170 Heritage Register – one result, being Buds Crossing Road Bridge.

Everick Heritage (2021b) noted that Buds Crossing Road Bridge is not located on the mapped alignment of the feral predator–free area fence, but is within an area likely to be used for transport of materials by civil contractors.

A site inspection by Everick Heritage (2021b) revealed the bridge is a simple log-beam bridge with timber abutments cut into the creek banks (see Figure 6 and Figure 7). The bridge has been modified substantially and while the original log beams and girders of the bridge have been retained, the timber deck has been replaced with pre-formed concrete slabs bolted into the original girders. Further, the northern abutment has been replaced with a modern rock gabion wall while the southern timber abutment wall has been retained. One of the original log beams has also collapsed partially into the creekbank on the southern side of the bridge. Segments of the concrete slab side railings on the western side of the bridge have also collapsed and some are notably loosened, likely due to consistent use of the bridge. Buds Crossing Road Bridge is very low-set and at the time of the inspection the creek was nearly at the bottom of the gabion abutment wall. Although the bridge is a simple construction, it is expected that bridges of this age are becoming more rare in the landscape due to changing modern road haulage requirements.

No items that would be classified as archaeological ‘relics’ under the *Heritage Act 1977* were identified in the vicinity of the bridge during the course of the survey.

Figure 6 Buds Crossing Road Bridge (Everick 2021b)

Figure 7 Buds Crossing Road Bridge deck girders and underside of the concrete deck, facing north (Everick 2021b)

Further detail is provided in the *NPWS Ngambaa rewilding, Ngambaa NR*: *Historic cultural heritage assessment report*, which can be found at Appendix B.

8.3 Social values

8.3.1 Recreation values

The only formal visitor facilities within the reserve are those provided at the existing Cedar Park Picnic Area. Cedar Park pre-dates the dedication of the reserve and was established by SFNSW. Cedar Park takes its name from the large stands of red cedar trees at the picnic area which were planted in 1969 (DEC 2004). The picnic area is located on Jacks Road, on the banks of Stockyard Creek and consists of 2 clearings either side of Stockyard Creek and is outside the proposed feral predator–free area. On the eastern side of the creek are 2 picnic tables, a cement barbecue and a toilet. A track leads across the creek to another picnic table and cement barbecue. A short loop walking track leads from the picnic area through the surrounding forest.

Self-reliant bushwalking, cycling, birdwatching and 4-wheel drive (4WD) touring occurs in the reserve at low numbers.

8.3.2 Scenic and visually significant areas

The reserve and surrounding state forests provide a vegetative backdrop to the surrounding towns and communities such as South West Rocks, Eungai, Bowraville, Macksville and Kempsey; and geological landscapes referred to as the Horseshoe Ranges, Bellingen – Nambucca Hills and Kempsey Hills. Due to the height of the vegetation and distance from towns and communities, the proposed feral predator–free area will not be visible from surrounding areas.

8.3.3 Education and scientific values

Diverse and significant plant and animal communities, cultural features and a variety of management issues provide numerous opportunities for research. The reserve contains a number of ongoing yellow-belly glider monitoring sites as part of the Pacific Highway upgrade. There are currently no educational uses occurring in the reserve.

8.3.4 Interests of external stakeholders

Prior to the reservation of the reserve there were a number of occupational permits issued by SFNSW for apiary sites. The 1998 NSW Government Regional Forest Agreement allowed for the issuing of a consent under clause 16(2) of the National Parks and Wildlife (Land Management) Regulation 1995 for existing apiary sites that pre-date reservation of the reserve. The NPWS *Beekeeping policy* allows existing sites to continue but does not allow any new or additional sites. Under the policy, any existing sites that seriously compromise the environmental or recreational values of an area may be relocated within the reserve. The European honeybee (*Apis mellifera*) is an exotic species that can have adverse impacts on some native biota. Impacts on native plants and animals depend on the type and abundance of native species present, the climate or season, the number of hives in an area and the frequency with which the sites are used. There are a number of short, dead-end tracks that lead to apiarist sites within the reserve. These tracks run off existing management trails and public roads and are not needed for management by NPWS, but are used by apiarists for access to their bee sites both in and outside of the proposed feral predator–free area.

8.4 Matters of national environmental significance

A matters of national environmental significance (MNES) assessment under the EPBC Act was undertaken to assess the impact of the proposal on MNES. The assessment found:

- no threatened ecological communities listed under the EPBC Act occur within the study area
- 41 listed threatened species or species habitat are known / likely / may occur within the study area
- 15 listed migratory wetland, terrestrial and marine species or species habitat are known / likely / may occur within the study area.

MNES assessments of significance under the EPBC Act determined the proposal was unlikely to have significant impact on MNES.

Details of MNES assessments of significance are in Appendix A.

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?	☒	Low, negative	The majority of soil types found within Ngambaa NR have been classified as being highly erodible. The erosive qualities of soils and their parent materials have important implications for management, particularly for roads, track and trail maintenance. Earthworks required as part of the proposal would include: • fence construction • vegetation clearing • maintenance road construction. The above impacts have the potential to cause environmental harm. However, with the implementation of the management measures and safeguards detailed, the risk associated with such impacts is considered low.	Fence line vegetation will be cleared using a forestry mulcher. This will minimise soil disturbance and leave a cover of mulch over the soil that will reduce erosion potential within the proposed work area. Standard soil and sedimentation control measures will be required throughout the earthworks phase to minimise erosion. Controls will be established prior to works commencing and would remain in place until the site is stable. Erosion and sediment controls will be implemented in accordance with Landcom (2004) *Managing urban stormwater: soils and construction* (also known as the 'blue book'). Regular inspection of erosion and sediment control measures, particularly following rainfall events, will be carried out to ensure their functionality. Stockpiles will be managed appropriately to minimise potential erosion and surface water runoff. This may include implementing silt fences to capture and isolate surface runoff. Following completion of construction works, cleared areas within the proposal footprint would be rehabilitated.

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 runoff or pollution)?	☒	Low, negative short-term, negligible long-term	The proposed fence line includes 7 waterway crossings (two class 2, two class 3, two class 4 and one class 5 streams) as per Table 5. Waterways effected include Allgomera Creek to the north, Stockyard Creek in the centre of the proposal area and Eungai Creek in the south. Class 4 and 5 streams are considered key fish habitat. To maintain key fish habitat, crossings installed comply with NSW Fisheries *Policy and guidelines for fish habitat conservation and management* (DPI 2013). During construction the proposal has potential negative impacts to water quality, hydrology and aquatic animals such as frogs. Potential impacts which include: • erosion and sedimentation of local aquatic habitats and waterways • pollution of local water quality from machinery and construction materials and spills and dewatering • a variety of dispersible liquid materials would be used which pose a potential pollutant threat to local water quality. These liquids include but are not limited to diesel, unleaded petrol, machinery oils and lubricants. The nature of these liquids and their ability to disperse away from the study area means that they could have a negative impact on ground or surface water on or adjacent to the study area, especially during rain.	Waterway crossings are designed to maintain key fish habitat as guided by NSW Fisheries *Policy and guidelines for fish habitat conservation and management* (DPI 2013) including: • installing low-level bridges on class 4 and 5 streams and box culverts for class 2 and 3 streams • feral-free barriers will be at least 30 mm in aperture • feral-free barriers will rise with water levels • feral-free fences across the top of crossings will have a failure point and upstream debris catchers to reduce the likelihood of log jams and dam effects that may cause erosion and change stream geomorphology. A frog hygiene protocol should be implemented for areas within 40 m of waterways to reduce the risk of spread of chytrid fungus. This would involve the removal of soil from plant/equipment via washing down or brushing with a wire brush and disinfection with cleaning products containing benzalkonium chloride, in accordance with the *Hygiene protocol for the control of disease in frogs* (DECC 2008). Direct impact on riparian and aquatic fauna during construction of crossings will be mitigated by constructing an exclusion fence around the worksite and surveying and removing animals from the worksite during construction. Animals removed will be relocated in suitable habitat upstream to the worksite. The storage and handling of fuels and chemicals would comply with Australian Standard (AS1940).

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
			• introduction of aquatic pathogens. Overall, with the safeguards and mitigation measures described, significant water quality, negative impacts to waterways from the proposal are not expected.	All chemicals must be kept in clearly marked bunded areas. Vehicle wash downs and/or concrete truck washouts would be undertaken within a designated bunded area on an impervious surface or off site. Regularly inspect vehicles and mechanical plant for leakage of fuel or oil. Do not re-fuel, wash, or maintain vehicles or plant within 20 m of a waterway. Refuelling, fuel decanting and vehicle maintenance work, if required, would take place in a designated sealed and bunded area within the construction compounds. At least 2 ‘spill kits’ would be kept on site at all times for potential chemical or fuel spills, one at each end of the proposal site. Construction contractors would be trained in the correct use of a spill kit. A toilet would be provided for site workers, which would be appropriately managed by a licensed contractor. No works would be undertaken in periods of heavy rain or flooding. Weather forecasts would be monitored daily. A facility for collecting, treating and disposing of any concrete wastes generated during construction would be installed on site. Stockpiles would be established at least 50 m from waterways where possible. Materials/equipment laydown and compound areas would be located in cleared or degraded areas to prevent any damage to the surrounding plants or habitat.

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
3. Change flood or tidal regimes, or be affected by flooding?	☐	NA	Not applicable	
4. Affect coastal processes and coastal hazards, including those under climate change projections (e.g. sea level rise)?	☐	NA	Not applicable	
5. Involve the use, storage or transport of hazardous substances, or use or generate chemicals which may build up residues in the environment?	☐	NA	Not applicable	
6. Involve the generation or disposal of gaseous, liquid or solid wastes or emissions?	☒	Low, negative	Waste materials, fuel spills and sediment have the potential to cause pollution to the environment. However, given the proposed safeguards listed, pollution to the environment is unlikely to occur.	Recycle and divert from landfill surplus soil, rock and other excavated or construction materials, wherever this is practical. Dispose of waste at a facility that can lawfully accept that type of waste. Should contaminated water or other harmful substances escape from the sites, immediately take steps to contain any discharge, minimise environmental damage, clean-up the contamination and make good any damage.

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
				A contingency plan will be implemented in the event that contaminated soils are encountered during the works. Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed. Rubbish and food scraps would be removed from the subject site so as not to encourage fauna into the work area during construction.
7. Involve the emission of dust, odours, noise, vibration or radiation?	☒	Negligible, negative	Air quality may be affected by dust generation from earthworks associated with the construction of the proposal. Fumes, odours and other air pollution may occur from vehicles, equipment, machinery or other activities. The construction of the proposal has potential to generate noise and vibration from machinery. No sensitive receivers are located within 500 m of the construction footprint, and no negative impacts are expected on neighbouring properties. Local fauna may be negatively impacted by dust, fumes, odours, noise and vibration during construction of the proposal. However, no negative impacts are expected if the described safeguards are implemented.	Restrict construction vehicle movements to daylight hours only, when fauna movements are low. Works should be limited to standard working hours for construction activities. Implement and enforce appropriate speed limits within the proposal boundary for all construction contractors' vehicles to minimise dust generation. Use a water cart or similar to spray unpaved access tracks during the construction phase where required. Apply dust suppressants or covers to soil stockpiles. Plant and machinery would be turned off when not in use as much as possible and would be fitted with emission control devices complying with Australian Standards.

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. Affect any declared area of outstanding biodiversity value or critical habitat?	☐	NA	The ecological assessment (Appendix A) determined the site does not contain any declared area of outstanding biodiversity value.	Not applicable
2. Result in the clearing or modification of vegetation, including ecological communities and plant community types of conservation significance?	☒	Short-term; medium, negative Long-term; low, negative	Construction footprint is estimated to be up to 73 ha (0.7% of the reserve). This comprises: • 40 ha fence line corridor clearing (0.3% of reserve vegetation) • 10 ha already cleared fence line corridor • 16 ha management zone (under-scrubbed / hazardous tree removal area) • 7 ha for the field operations base (including 0.16 ha clearing for infrastructure). In some places the fence follows existing trails and dormant forestry trails that have existing cleared corridors of between 3 and 8 m. This accounts for approximately 10 ha of already cleared vegetation along the proposed fence. The overall impact to vegetation is expected to be less than the maximums indicated. Surveys of the fence line corridor recorded a hollow-bearing tree density of approximately 8.6 hollow-bearing trees per hectare, with hollows ranging in size from less than 5 cm to more than 15 cm. Approximately 250 hollow-bearing trees will be affected by the fence line clearing. At the density of 8.6 hollow-bearing trees per hectare, the proposal will only affect approximately 0.3% of the	**General clearing** Clearing of native vegetation would not be more than required to permit the scope of works. The extent of the construction footprint to be clearly marked (e.g. via pegging/fencing/flagging) before clearing in order to prevent any inadvertent clearance beyond what is required and has been assessed and to avoid damage or encroachment into the root zone of retained trees. This fencing/marking is to remain until all clearing and construction is completed. Site induction is to specify that no clearing is to occur beyond the marked area. All vehicles are only to be parked in designated areas. Clearing should begin in the most distant and disturbed vegetation and work progressively towards areas of secure habitat and/or retained vegetation to encourage any fauna within the clearing footprint to disperse into these areas. Clearing and earthworks is to avoid damage to root zones of the retained trees. The clearing of hollow-bearing trees will be avoided where possible with micro-siting adjustments of fence alignment.

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
			hollow-bearing trees likely to be in Ngambaa NR. The loss of hollow-bearing trees key threatening process listing indicated larger trees with hollows are of higher value for wildlife. The fence line clearing is likely to affect approximately 84 hollow-bearing trees with a DBH greater than 80 cm. As the fence line is primarily on ridges and spurs that have previously been logged, it is expected that there is a higher density of hollows in larger trees on the lower slopes and gullies that have not been logged. The impact of the fence clearing on the overall density of hollow-bearing trees and associated wildlife is expected to be low. Koala food trees located along the proposed fence line clearing include small-fruited grey gum (*Eucalyptus propinqua*) and tallowwood (*Eucalyptus microcorys*). Survey of the fence line indicated a density of 34 koala food trees per hectare. These tree species are mostly found in the grey gum – ironbark – mahogany – spotted gum complex and blackbutt association. It is estimated that approximately 34 ha of koala habitat will be cleared within the 40 ha fence line corridor that requires clearing – this represents 0.3% of the koala habitat within the nature reserve and is proportionally much less when considering the habitat available in the surrounding area (i.e. national parks, state forests and private forests). Approximately 0.15 ha of plant community type (PCT) 670 will be affected by the fence line clearing and crossing construction. Elements of PCT 670 are closely associated with the Lowland Subtropical	Refer to the safeguards listed in the other sections under the following headings: • Pre-clearing survey and clearing supervision • Hollow-bearing tree removal • Hollow log and bush rock salvage.

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
			Rainforest in the North Coast Bioregion Endangered Ecological Community (EEC). Whilst classification as part of the EEC is challenging, the proposal will only affect 0.05 ha of vegetation that could be classified as part of the EEC. The significance assessments carried out for the proposal determined that it is not expected to significantly impact on the potentially occurring threatened community or threatened species known or potentially occurring within the construction footprint due to the extent of vegetation to be retained, the fact that potential local populations of the subject species would extend well beyond the study area, and the proposed safeguards recommended in the assessment.	
3. Endanger, displace or disturb terrestrial or aquatic fauna, including fauna of conservation significance, or create a barrier to their movement?	☒	Short-term; low negative Long-term; high, positive	Tests of significance were undertaken for the following species which have been recorded or are likely to occur within the study area: • giant barred frog (*Mixophyes iteratus*) • green-thighed frog (*Litoria brevipalmata*) • Stephens' banded snake (*Hoplocephalus stephensii*) • glossy black-cockatoo (*Calyptorhynchus lathami*) • little lorikeet (*Glossopsitta pusilla*) • sooty owl (*Tyto tenebricosa*) • masked owl (*Tyto novaehollandiae*) • powerful owl (*Ninox strenua*) • brown treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)	**Pre-clearing survey and clearing supervision** The clearing extent is to be inspected for fauna by a suitably qualified fauna spotter/catcher immediately prior to commencement of any vegetation removal involving machinery and/or tree-felling. This is to occur each morning if clearing spans over multiple days/weeks. The ecologist is to flag any habitat features which may contain fauna and trees which contain nests or dreys. If a koala is present in an area subject to vegetation removal/modification, works must be suspended until the koala moves along on its own volition. If the koala is located in a position that a 50 m buffer may be established around, works may proceed outside this

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
			• dusky woodswallow (*Artamus cyanopterus cyanopterus*) • brush-tailed phascogale (*Phascogale tapoatafa*) • koala (*Phascolarctos cinereus*). *Ecological assessment for Ngambaa rewilding project* (Biological Australia 2021 at Appendix A) details the occurrence assessments and significance assessments. The fence will be a permanent barrier to the movement of medium and large non-volant (i.e. non-flying or gliding) mammal species and large reptiles. As a consequence, populations of some species inside the fence will be isolated from populations in the broader landscape. The species most likely affected included echidna / short-beaked echidna (*Tachyglossus aculeatus*), common ringtail possum (*Pseudocheirus peregrinus*), common brushtail possum (*Trichosurus vulpecula*), koala, spotted-tailed quoll (if present), rufous bettong (if present), red-necked wallaby (*Macropus rufogriseus*) and swamp wallaby (*Wallabia bicolor*). Collision or entanglement may result in the injury or mortality of some animals. In Australia, the main species involved in collisions or entanglements with fences are reported to be birds (especially night-flying and ground-nesting species), as well as the echidna, medium-sized reptiles, snakes and turtles (Long and Robley 2004; Hayward and Kerley 2009; Hayward et al. 2014). According to the review conducted by Long and Robley (2004):	buffer. In this event, the ecologist is to remain on site to monitor the koala for signs of distress. A wildlife rescue organisation (e.g. FAWNA, WIRES) should be made aware of operations in case any injured fauna are found. If an animal is trapped or injured an animal-handling expert, wildlife carer or appropriately qualified ecologist would be contacted to assist with the capture and relocation. The following wildlife rescue organisations are in the area: • FAWNA Wildlife Rescue Port Macquarie (preferred) 02 6581 4141 • WIRES 1300 094 737. All animals encountered will be treated humanely, ethically, and in accordance with relevant codes under the NSW *Prevention of Cruelty to Animals Act 1979*. The ecologist is to remain on site to supervise removal of any flagged habitat features and manage any fauna interactions. Other than koalas, any detected fauna are to be relocated outside of the fence corridor. Any bird nest considered active is to be removed in a manner that allows retrieval of eggs/young, and these are to be taken into care by FAWNA. **Hollow-bearing tree removal** It is recommended that hollow-bearing trees are to be retained where the proposal design permits. Where hollow-bearing trees cannot be retained, they are to be felled in a manner that will minimise the risk of injury/mortality of denning/roosting fauna within the limitation of work health and safety (WHS) guidelines.

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
			‘Most fence managers indicated that native animals had been injured or killed in their exclusion fence. However, in all cases this occurred infrequently and is not considered to constitute a serious impact on resident fauna populations.’ The significance assessments carried out for the proposal determined that it is not expected to significantly impact the potentially occurring threatened community or threatened species known or potentially occurring within the construction footprint due to the extent of vegetation to be retained, the fact that potential local populations of the subject species would extend well beyond the study area, and the proposed safeguards recommended in the assessment.	This is suggested to be achieved by the following general procedure: • Non-hollow-bearing trees are to be removed first. • Hollow-bearing trees should be left to stand for 24 hours after all other vegetation has been removed. • If removed with an excavator, the hollow-bearing trees are to be gently bumped several times prior to removal to encourage any fauna present to vacate. • If the hollow is determined to be occupied and fauna do not require assistance (e.g. roosting bats), the entrance is to be blocked and the log placed in a shaded and protected area on the edge of the site. The obstacle is to be removed just prior to dusk to allow passive escape of the fauna within. The log may then be removed if required. • A suitably qualified fauna spotter/catcher is to be present during felling and sectioning of the hollow-bearing trees in case of animal injury. Hollows are to be inspected for fauna once the tree is felled. All uninjured animals are to be released in the retained habitat in the nature reserve. Any hollow-bearing trees deemed suitable for salvage at the time of clearing are recommended to be relocated on the ground within nearby vegetation. Where feasible, hollows may be sectioned and relocated onto a nearby retained tree within the nature reserve. After cutting, the hollow should be capped with timber or sheet metal and loosely fastened to a lower branch of a nearby tree. The hollow is to be secured to the retained tree using wire with garden hose to protect the tree.

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
				Nest boxes will be erected to compensate for hollows that cannot be salvaged and relocated. Nest box numbers may be decided at NPWS's discretion. Nest boxes are to be mounted within adjoining habitats in close proximity to the subject site. **Hollow log and bush rock salvage** Existing hollow logs and bush rock requiring removal for the proposal should be relocated within adjoining habitats in close proximity to the subject site. Population sizes of medium-sized mammals will be monitored in line with the ecological health and monitoring framework (DPE 2022) both inside and outside fenced areas. Most medium-sized mammals are expected to benefit from release of predation by feral cats and foxes inside the fenced area, resulting in a population increase. Nevertheless, populations may still be sufficiently small to be subject to loss of genetic diversity. In these cases, occasional manual dispersal through translocation (capture and release) across the fence will maintain connectivity between populations. The required rate of dispersal to maintain genetic diversity is likely to be low: a widely accepted number is one individual per generation from either side of the fence (depending on which side is the larger population). Trial a range of 'escape poles' specifically designed for koalas on either side of the fence to allow koala movement into and out of the feral predator–free area. Monitor for use by koalas and other animals to evaluate effectiveness.

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
4. Result in the removal of protected flora or plants or fungi of conservation significance?	☒	Low, negative	As part of the ecological assessment, the fence line was surveyed for threatened plants. Milky silkpod (*Parsonsia dorrigoensis*) occurs at 3 locations within the 20 m construction footprint. Scrub turpentine (*Rhodamnia rubescens*) and rainforest cassia (*Senna acclinis*) have single records adjacent to the proposed fence line. The ecological assessment (Appendix A) recommended safeguards to protect these plants from clearing and/or damage during construction of the proposal. The recommended safeguards are detailed in this section.	**Threatened flora protection** The scrub turpentine and milky silkpod individuals within the subject site to be clearly marked out with flagging tape or fencing prior to works commencing to prevent accidental removal or damage. The threatened flora on site are to be retained in situ and protected via permanent post and rail fencing at a 2 m radius around the plants. Site induction is to ensure that all personnel on site are aware of the plants' location and to specify that no clearing is to occur within the fenced area(s). The proposed predator-proof fence will be aligned to avoid these threatened flora species where possible.
5. Contribute to a key threatening process to biodiversity or ecological integrity?	☒	Medium, negative High, positive	The proposal contributes to the following key threatening processes (KTPs): • clearing of native vegetation • loss of hollow-bearing trees. The ecological assessment includes BC Act tests of significance for threatened species that may be impacted by the proposal, which includes an assessment of the potential impact of the KTP on the threatened species. The proposal will not result in the loss of any local species and will not increase fragmentation. The ecological assessment (Appendix A) includes recommended mitigation measures to minimise potential impacts from KTPs. The assessment states in each test of significance that if these measures are followed, impacts from KTPs are unlikely.	Refer to the safeguards listed in the above section under the following headings: • General clearing • Pre-clearing survey and clearing supervision • Hollow-bearing tree removal • Hollow log and bush rock salvage

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
			The proposal addresses predation by the feral cat and predation by the European red fox KTPs under the BC Act and will have a positive effect on native species including threatened species. By controlling other feral animals, the proposed activity will also mitigate negative impacts of other KTPs: predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*); and environmental degradation caused by various species of feral deer. The feral predator–free area will prevent illegal collection of firewood, further reducing the effects of the removal of dead wood and dead trees KTP. Overall impact of the proposal on KTPs is likely to be positive and threatened species benefit from the overall reduction in impacts from KTPs.	
6. Introduce weeds, pathogens, pest animals or genetically modified organisms into an area?	☒	Negligible	An increase in vehicle and foot traffic within the subject site vegetation during the construction phase has the potential to increase the spread of weeds along the roadside and fence line. Increased vehicle and machinery movements have the potential to introduce pests and pathogens into the site. With the implementation of mitigation measures, no significant negative impacts are expected.	Disturbance of vegetation and soils on the site will be limited to the areas of the proposed work and will not extend into adjacent vegetation. Construction vehicles, plant and equipment will be washed down prior to entering the site. Inspection of exteriors should be undertaken and ensure all plant propagules (such as seeds) have been removed from vehicle tyres, undercarriages, grills, floors and trays. Any weed material or propagules identified within the vehicle are to be removed and disposed of in accordance with the *Weed management and disposal guide* (TfNSW 2015). NPWS will undertake targeted, site-based weed control using physical and chemical methods to control weeds.

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?	☐	NA	Not applicable	
2. Affect sites important to the local or broader community for their recreational or other values or access to these sites?	☒	Low, positive	Visitation is not a primary objective for Ngambaa NR and visitation is considered low. The PoM amendment to establish the feral predator–free area was distributed to neighbours, user groups and stakeholders for comment. No submissions referred to impacts on recreational use or access. Unauthorised public access will not be permitted within the proposed feral predator–free area, however restricted public access will be permitted following establishment. Community use through provision of educational and scientific opportunities is aligned with the objectives of the nature reserve and will improve the overall experience for visitors. Access to Cedar Park Picnic Area and walking track, and public access along Taylors Arm Road and Briggs Tower Road remain open to the public. Overall, there is little to no change in the level of public visitation within the reserve.	During construction, signage around the reserve will indicate why it is closed, a brief summary of the program, and that future access will be possible in some form. Ongoing community consultation will be undertaken to ensure neighbours, park users and conservation groups are aware of and involved in the project.
3. Affect economic factors, including employment, industry and property value?	☒	Low, positive	The feral predator–free area program includes the creation of 4 roles within NPWS Coffs Coast Area. Three of these roles, including an Aboriginal identified and Aboriginal targeted position, are to be based in the Nambucca Shire. Construction of the fence and associated infrastructure will be contracted. It is estimated that construction will	

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
			occur over a 12-month period at a value of over $2 million. A proportion of this will contribute to the local Nambucca Valley economy.	
4. Have an impact on the safety of the community?	☒	Negligible	Unauthorised public access to the feral predator–free area will affect some community movement, particularly during bushfire and flood. The feral predator–free area siting allows for alternate access through the reserve. The PoM amendment to establishment the feral predator–free area was distributed to neighbours, user groups and stakeholders for comment. No submissions referred to impacts on recreational use or access.	An operations plan will be developed in consultation with local emergency services that will address access and procedures for operation during emergencies, particularly bushfire and flood.
5. Cause a bushfire risk?	☒	High, positive	The program will include the review of the reserve fire management strategy as well as an updated fire trail network. Fire will be managed in the reserve with regular hazard reduction burning, with small-sized mosaic style burns, to allow movement of fauna within the reserve.	
6. Affect the visual or scenic landscape?	☒	Low, negative	The predator-proof fence will largely not be visible from public roads and trails, except for primary vehicle access points and 4 km along Briggs Tower Road where the fence will be offset but will be visible from the road. Ngambaa NR feral predator–free area is surrounded by state forest and private holdings. The feral predator–free area will not be visible from scenic lookouts nor will it disturb sight lines or horizon views.	Signage will be installed to communicate the purpose of the fence, detailing 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?	☐	NA	Vegetation management is addressed in section 9.2. There will be no other use or degradation of natural resources (water, fuels or extractive materials) as part of the activity.	Large trees removed during construction may be redistributed for coarse woody debris throughout the feral predator–free area.
2. Affect the use of, or the community's ability to use, natural resources?	☐	NA	As described above, the activity does not impact on the use of, or the community's ability to use, natural resources, including water, air and minerals.	Not applicable.
3. Involve the use, wastage, destruction or depletion of natural resources including water, fuels, timber or extractive materials?	☐	NA	There are limited opportunities to use recycled materials (e.g. timber) or accredited alternatives (e.g. timber from certified sustainable sources). Fence materials have been selected based on their effectiveness, durability and maintenance requirements.	Not applicable.
4. Provide for the sustainable and efficient use of water and energy?[2]	☐	NA	There are limited opportunities to incorporate sustainability outcomes such as water and energy efficiency into the activity. Opportunities for the use of renewable energy (e.g. photovoltaics), may be suitable at some sites.	Not applicable.

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?	☒	Low, negative	An *Aboriginal cultural heritage assessment report* was completed for the proposal by Everick Heritage (2021a), and is attached at Appendix C. As a result of the field inspections and consultation with registered Aboriginal parties, the assessment report concluded: • The ground surface is considered to be significantly disturbed from the following: o historic forest clearing in Ngambaa NR, particularly on the ridgetops and ridgelines o construction and maintenance of forestry roads through the reserve historically and to provide access for tourist purposes o use of flat ridges and spurs along Stockyard Creek Road as historic forestry log dumps. • The proposed fence is predominantly confined to flat areas or ridgelines/saddles that have been subject to quarrying and cut and fill construction methods to provide for the adjacent forestry trails. • Ground surface visibility (GSV) was generally poor due to accumulation of leaf litter, bark and stick fall. GSV is estimated to be at approximately 5% through the project area, with exposures confined predominantly to the disturbed road corridors. • No Aboriginal objects were identified as a result of the site inspection of the project area.	Aboriginal sites officers will check trees identified for removal for Aboriginal modifications ahead of clearing and survey ground disturbance from vegetation clearing and post holes for occurrence of stone artefacts. The registered Aboriginal Site Briggs Tower Road Core 1 is avoided during the works. A 2 m exclusion buffer should be used during the works to avoid any inadvertent impact to the site. Monitoring of ground-penetrating works located in the vicinity of the sites recorded by Uncle Mark Flanders (see Table 4 in Appendix C) will be undertaken by a representative from Kempsey or Unkya LALC or Aboriginal site identification trained personnel. Unexpected finds of Aboriginal objects remain protected by the NPW Act. If any such objects, or potential objects, are uncovered during the activity, work in the vicinity must cease, and Heritage NSW and Kempsey and Unkya LALCs be contacted for advice. If the Aboriginal object cannot be avoided as part of the works, then an Aboriginal heritage impact permit (AHIP) is required. Although it is unlikely that human remains will be located at any stage during earthworks within the project area, should this event arise all works must halt in the immediate area to prevent any further impacts to the remains. The site will be cordoned off and the remains themselves should be left untouched. The nearest police station (Macksville), the registered Aboriginal parties and the Heritage NSW Regional

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
			• Additional stone artefacts, including cores that were identified by Mark Flanders in April 2021 on Briggs Tower Road were unable to be re-identified during the course of the survey. While it is noted that they were likely to have been placed beside a prominent tree or landmark on the roadside, inspection of the centroids provided by NPWS returned no artefacts. • Aspects of the fence design will result in disturbance of topsoil deposits with the potential to contain Aboriginal objects, in particular: o construction of a mesh fence using standard agricultural star pickets and 90 mm round metal corner posts o removal of above-ground vegetation and trees using mobile industrial mulcher including permanent vehicular access along the fence line for maintenance. • More than one-third (10 km) of the proposed fence has been previously disturbed following existing formed roads and old forestry trails. The likelihood of the proposal harming an Aboriginal site or artefact is low, however the proposed works do have the potential to harm isolated stone artefacts located within topsoil deposits on spurs and ridge crests particularly along Briggs Tower Road.	Office (Coffs Harbour) are all to be notified as soon as possible. If the remains are found to be of Aboriginal origin and the police do not wish to investigate the site for criminal activities, the Aboriginal community and Heritage NSW should be consulted as to how the remains should be dealt with. Work may only resume after agreement is reached between all notified parties, provided it is in accordance with all parties' statutory obligations. It is also recommended that in all dealings with Aboriginal human remains, the proponent should use respectful language, bearing in mind that they are the remains of Aboriginal people rather than scientific specimens.
2. Affect or occur in close proximity to known Aboriginal	☒	Low, negative	Briggs Tower Core 1 was positively identified as a stone core / unifacial chopper at the intersection of	The registered Aboriginal site, Briggs Tower Road Core 1, is avoided during the works. A 2 m exclusion buffer

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
objects or Aboriginal places? If so, can impacts be avoided? How?			Briggs Tower Road and Buds Crossing Road. It is located within 50 m of the proposed fence line.	should be used during the works to avoid any inadvertent impact to the site.
3. Affect areas: a. within 200 m of waters b. within a sand dune system c. on a ridge top, ridge line or headland d. within 200 m below or above a cliff face e. within 20 m of or in a cave, rock shelter or a cave mouth? f. If so, can impacts be avoided? How?	☒	Low; negative	The construction footprint crosses 7 creek lines. An *Aboriginal cultural heritage assessment* was undertaken for the proposal by Everick Heritage (2021a), and is attached at Appendix C. The assessment did not identify any issues relating to the listed areas.	No mitigation measures are proposed.
4. Affect wild resources which are used or valued by the Aboriginal community or affect access to these resources?	☐	NA	Not applicable.	
5. Affect access to culturally important locations?	☐	NA	Not applicable.	

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?	☒	Minor, negative	A *Historic cultural heritage assessment report* (Everick Heritage 2021b) was prepared for the proposal, and is attached at Appendix D. Buds Crossing Bridge is a heritage item on the s 170 Heritage Register. Use of Buds Crossing Road as a haul road for materials for the proposal may exacerbate existing structural faults with Buds Crossing Bridge.	Repairs to Buds Crossing Bridge have been identified under the fire trail access program. Repairs to Buds Crossing Bridge will be addressed under a specific REF for repairs.
2. Impact on vegetation of cultural landscape value (e.g. gardens and settings, introduced exotic species, or evidence of broader remnant land uses)?	☐	NA	Not applicable.	

9.7 Matters of national environmental significance under the Environment Protection and Biodiversity Conservation 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)?	☒	Medium, negative	Section 9 of the ecological assessment (Appendix A) contains a MNES significance assessment. **Threatened ecological communities** No threatened ecological communities listed under the EPBC Act were recorded within the construction footprint. **Threatened species** One federally listed threatened fauna species (koala), and 2 federally listed flora species (scrub turpentine and milky silkpod), were recorded within the subject site during site surveys. Potential occurrence assessments identified an additional 4 threatened species listed under the EPBC Act that are considered to potentially occur in the construction footprint: • giant barred frog • spotted-tail quoll • greater glider (*Petauroides volans*) • slender marsdenia. The proposal is not considered to significantly impact any of these species if the recommended mitigation measures are implemented. A revised assessment of significance for the koala under the EPBC Act following the listing of the koala from vulnerable to endangered was completed. This assessment recommends that the proposed feral predator–free area will not have a significant impact on koala populations because:	Refer to mitigation measures listed in Section 9.2

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
			• the proposal only affects a small proportion (0.3%) of koala habitat within the reserve • with mitigations, the fence does not create a barrier to koalas dispersing out of the feral predator–free area or fragment populations by impacting identified landscape koala corridors • the breeding cycle is not disrupted • invasive weeds or diseases will not be introduced or increased • the recovery of the species will not be interfered with • habitat inside the fence is managed to benefit koalas.	
2. Listed migratory species?	☒	Negligible	Two migratory species – black-faced monarch (*Monarcha melanopsis*) and the rufous fantail (*Rhipidura rufifrons*) – are considered potential occurrences in the locality. Assessments of significance were undertaken for these species. It is considered unlikely that the project would significantly impact any migratory species listed under the EPBC Act. The ecological assessment includes recommended mitigation measures, which have been incorporated into section 9.2 of this REF.	
3. The ecology of Ramsar wetlands?	☐	NA	Not applicable.	
4. World heritage values of world heritage properties?	☐	NA	Not applicable.	
5. The national heritage values of national heritage places?	☐	NA	Not applicable.	

9.8 Cumulative impacts during all stages of the activity

Other projects that have been approved, are proposed or have recently been completed in the vicinity of the proposal include:

- works to improve and upgrade fire trails in line with the local Fire Access Fire Trail Plan
- timber harvesting operations on neighbouring state forest and private lands.

As summarised below, it is considered these other projects have the potential to interact with the current proposal at the construction phase and operation phase but with the impact levels remaining at a low level.

When considered with other projects, is the proposed activity likely to affect…	Applicable? *	Impact level (negligible; or low, medium or high adverse; 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. natural landscape or biodiversity values through cumulative impacts?	☒	Low, negative	Timber harvesting operations and roadworks have already removed some habitat from the vicinity of the proposal – the clearing associated with the proposal will add to this loss of habitat across the landscape.	Refer to mitigation measures listed in Section 9.2
2. cultural (Aboriginal, shared and historic heritage) values through cumulative impacts?	☒	Negligible	While the ground disturbance associated with timber harvesting and roadworks may have led to some loss of cultural values in the landscape, there is little additional loss associated with the project.	Refer to mitigation measures listed in Section 9.5
3. social (amenity, recreation, education) values through cumulative impacts?	☒	Negligible	As discussed in Section 9.3, there will be low negative impacts to the visual or scenic landscape, and to recreational values. These are considered minor compared to the visual impacts of the timber harvesting operations and roadworks.	
4. the community through cumulative impacts on any other part of environment (e.g. due to traffic, waste generation or perceived over-development?	☒	Negligible	Generation of waste, dust and noise will be short-term and minor compared to those associated with timber harvesting and roadworks	Refer to mitigation measures listed in Section 9.1

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

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 Commonwealth EPBC Act.

Assessments of significance under the BC Act and the EPBC Act have been completed. These assessments recommend that the proposed feral predator–free area will not have a significant impact on koala populations because:

- The area affected is a small proportion (0.3%) of the habitat available in Ngambaa NR and an even smaller proportion of the surrounding habitat.
- The impact is linear, with the clearing being less than 20 m wide and will not cause a barrier to movement or fragmentation. Based on experience from other feral predator–free areas it is likely koalas will be able to climb the fence out of the area.
- The removal of feral predators from within the area is likely to have a positive effect on koalas, reducing the occurrence of attacks from wild dogs.
- The ecological health and monitoring plan for Ngambaa feral predator–free area will monitor the density of koalas and any impacts of over-abundance. Translocations into and out of the area will be implemented if identified as necessary through monitoring.

Threatened species tests of significance for species listed under the BC Act and EPBC Act can be seen in Appendix A.

A number of potential residual environmental impacts from the proposal have been identified and amended during the design development and options assessment. The residual impacts are summarised below.

Category of impact	Significance of impacts		
	Extent of impact	Nature of impact	Environmentally sensitive features
Physical and chemical	Low	Possibility of short-term air pollution from dust and chemical and oil spills from use of heavy machinery. The mitigating measures prescribed will minimise any impacts and reduce the potential for spills. Erosion and sedimentation during rainfall events is also possible during construction. Mitigations and control measures recommended will reduce the risks of these potential impacts.	Eungai, Allgomera and Stockyard creeks catchments
Biological	Low	The proposal involves the clearing of approximately 40 ha of vegetation. This represents 0.3% of the vegetation in Ngambaa NR (including koala habitat) and is proportionally much less when considering the habitat available in the broader landscape (including national parks, state forests and private forests) surrounding the proposal. The overall impact to vegetation is expected to be less than the maximums indicated. The significance assessments carried out for the proposal determined that it is not expected to significantly impact on the potentially occurring threatened ecological community or threatened species known or potentially occurring within the construction footprint due to the extent of vegetation to be retained, the fact that potential local populations of the subject species would extend well beyond the study area, and the proposed safeguards recommended in the assessment. 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 to medium term impacts.	• koala • scrub turpentine • milky silkpod
Natural resources	Low	Apart from vegetation management there will be no other use or degradation of natural resources (water, fuels or extractive materials) as part of the activity.	Nil
Community	Low	Unauthorised public access will not be permitted within the proposed feral predator–free area. Restricted public access will be permitted and improve following establishment with appropriate community use through provision of educational and scientific opportunities. Access to Cedar Park Picnic Area and walking track remain open to public. Visitation is not a primary objective for Ngambaa NR and visitation is considered low.	Nil

Category of impact	Significance of impacts		
	Extent of impact	Nature of impact	Environmentally sensitive features
Cultural heritage	Low	The project site has been subject to a history of ground disturbance and the likelihood of the proposal harming an Aboriginal site or artefact is low. The ameliorative measure recommended in the *Aboriginal cultural heritage assessment report* will reduce the impacts to the Aboriginal cultural landscape. The proposal involves ongoing engagement and involvement of Aboriginal people in the management of cultural heritage and conservation of threatened species.	Potential for stone artefacts

There is not likely to be a significant effect on any of the environmental factors listed in s 171 of the EP&A Regulation as follows:

Environmental factor	Consideration	Significance of impact*
(a) the environmental impact on the community	Social, economic and cultural impacts as described in Sections 9.3, 9.5 and 9.6	Not significant
(b) the transformation of the locality	Human and non-human environment as described in Sections 9.1, 9.2 and 9.4	Not significant
(c) the environmental impact on the ecosystems of the locality	Amount of clearing, loss of ecological integrity, habitat connectivity/ fragmentation and changes to hydrology (both surface and groundwater) as described in Sections 9.1, 9.2 and 9.4 and, for nationally listed threatened ecological communities, in Section 9.7.	Not significant
(d) reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	Visual, recreational, scientific and other impacts as described in Section 9.3.	Not significant
(e) the effects on any locality, place or building that has— (i) aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or (ii) other special value for present or future generations	Impacts to Aboriginal and historic heritage associated with a locality (including intangible cultural significance), architectural heritage, social/community values and identity, scenic values and others, as described in Sections 9.3, 9.5 and 9.6.	Not significant
(f) the impact on the habitat of protected animals, within the meaning of the Biodiversity Conservation Act	Impacts to all native terrestrial species, including but not limited to threatened species, and their habitat requirements, as described in Section 9.2.	Not significant
(g) the endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air	Impacts to all listed terrestrial and aquatic species, and whether the proposal increases the impact of key threatening processes, as described in Section 9.2	Not significant

Environmental factor	Consideration	Significance of impact*
(h) long-term effects on the environment	Long-term residual impacts to ecological, social and economic values as described in all parts of Section 9.	Not significant
(i) degradation of the quality of the environment	Ongoing residual impacts to ecological, social and economic as described in Section 9.4.	Not significant
(j) risk to the safety of the environment	Impacts to public and work health and safety, from contamination, bushfires, sea level rise, flood, storm surge, wind speeds, extreme heat, rockfall and landslip, and other risks likely to increase due to climate change as described in Sections 9.1, 9.3 and 9.4.	Not significant
(k) reduction in the range of beneficial uses of the environment	Impacts to natural resources, community resources and existing uses as described in Sections 9.3 and 9.4.	Not significant
(l) pollution of the environment	Impacts due to air pollution (including odours and greenhouse gases); water pollution (water quality health); soil contamination; noise and vibration (including consideration of sensitive receptors); or light pollution, as described in Sections 9.1 and 9.3.	Not significant
(m) environmental problems associated with the disposal of waste	Transportation, disposal and contamination impacts as described in Section 9.3.	Not significant
(n) increased demands on natural or other resources that are, or are likely to become, in short supply	Impacts to land, soil, water, gravel, minerals and energy supply as described in Section 9.4.	Not significant
(o) the cumulative environmental effect with other existing or likely future activities	The negative synergisms with existing development or future activities as considered in Section 9.8.	Not significant
(p) the impact on coastal processes and coastal hazards, including those under projected climate change conditions	Impacts arising from the proposed activity on coastal processes and impacts on the proposed activity from those coastal processes and hazards, both current and future, as considered in Section 9.1.	Not significant
(q) applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1	Inconsistency with the objectives, policies and actions identified in local, district and regional plans, as considered in Section 3.2.2.	Not significant
(r) other relevant environmental factors.	Any other factors relevant in assessing impacts on the environment to the fullest extent, such as native title (as considered in Section 5.1).	Not significant

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.

In conclusion:

- An environmental impact statement is not required.
- There is not likely to be a significant effect on threatened species, populations, ecological communities or their habitats, within the meaning of the NSW BC Act, and a species impact statement is not required.
- The activity is not likely to have a significant impact on matters of national environmental significance listed under EPBC Act, and so will not require referral to the Commonwealth Government.

The activity will not require certification to the *Building Code of Australia*, *Disability (Access to Premises – Buildings) Standards 2010* or Australian Standards in accordance with the NPWS *Construction Assessment Procedure*.

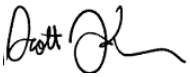
12. Supporting documentation

Documentation supporting this application is detailed below, including appendix number.

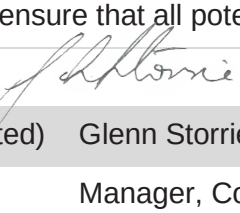
Appendix	Document title	Author	Date
Appendix A	*Ecological assessment for Ngambaa rewilding project*	Biological Australia	Rev. 3.0 September 2021
Appendix B	*Historic cultural heritage assessment report*	Everick Heritage	2 July 2021
Appendix C	*Aboriginal cultural heritage assessment report*	Everick Heritage	24 September 2021
Appendix D	Fence and gate detail	Prichard Francis Civil	March 2022
Appendix E	Basecamp design	Fisher Design and Architecture	6 June 2021
Appendix F	Hollow-bearing tree removal guidelines	National Parks and Wildlife Service	
Appendix G	*Steel bridges, waterway crossings Ngambaa rewilding area*	Nambucca Engineering	February 2022
Appendix H	*Review of reintroductions to Ngambaa NR*	University of Newcastle	September 2021

13. Declarations

As the person responsible for the preparation of the REF, I certify that, to the best of my knowledge, this REF is in accordance with the EP&A Act, the EP&A Regs and the Guidelines approved under section 170 of the EP&A Regs, and the information it contains is neither false nor misleading.

Signature 	
Name (printed)	Scott Filmer
Position	Project Officer
Date 28 August 2022	

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 	
Name (printed)	Glenn Storrie
Position	Manager, Coffs Coast Area, North Coast Branch
Date	29 August 2022

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More information

- Indigenous land use agreements
- NPWS policies and procedures:
  - Beekeeping policy
  - Boundary fencing policy
  - Construction Assessment Procedure
- Acts, regulations and environmental planning instruments:
  - Coal Mine Subsidence Compensation Act 2017
  - Environmental Planning and Assessment Regulation 2021, Schedule 3
  - Fisheries Management Act 1994 No 38
  - National Parks and Wildlife Act 1974
  - State Environmental Planning Policy (Resilience and Hazards) 2021, Chapter 2
  - State Environmental Planning Policy (Transport and Infrastructure) 2021, s 2.73
  - State Environmental Planning Policy (Planning Systems) 2021, Schedule 3(7)

Appendices

Appendices A to E, G and H are provided as separate documents that can be accessed via the REF webpage.

Appendix C may be withheld or parts redacted due to culturally sensitive information.

Appendix F is below.

Appendix F – Hollow-bearing trees removal guidelines

1. Clearly mark the hollow-bearing tree (HBT) to be removed and/or retained by differentiating with coloured flagging tape.
2. Check for animals in the zone of disturbance before clearing and scare or remove them before beginning operations.
3. Ensure that a suitably qualified and licensed ecologist (who is vaccinated for Australian bat lyssavirus) supervises the removal of the HBT. Any bats found must only be handled by a person vaccinated for lyssavirus. Bats will be placed in calico bags and stored in a cool quite ventilated area and released after dark the same day.
4. Remove all non-hollow bearing vegetation prior to the removal of the HBT.
5. Leave the HBT standing for at least one night after other clearing to allow any animals the opportunity to remove themselves after site disturbance.
6. Before felling the HBT, tap along the trunk using an excavator or loader to scare animals from the hollows. Repeat several times. The aim of this procedure is to ‘substantially’ shake the tree. The majority of animals will exit the tree during this process.
7. After clearing, re-check to ensure no animals have become trapped or injured during clearing operations. Any animals found should be safely located to nearby habitat.
8. If taking the HBT tree down in stages, the non-hollow-bearing branches should be removed before the hollow-bearing branches are removed.
9. Fell trees into the zone of disturbance to avoid damaging adjacent vegetation
10. Take care when moving equipment near the vegetation to be retained.
11. Rather than mulching or burning cleared vegetation, logs from the felled trees should be distributed into areas of vegetation to be retained where it would not be considered a fire hazard. This will provide additional potential habitat for ground dwelling animals such as reptiles and small mammals.