North Tuncurry Urban Release Area
Public Environment Report - (EPBC Reference: 2011/5954)

25 February 2022

Prepared for Landcom

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EXECUTIVE SUMMARY

Landcom and the former Crown Lands Division of the Department of Primary Industry (DPI) proposed to construct a 'mixed use' development (residential, employment, tourism, community, open space, recreational and conservation lands) on parts of a 635.79 ha parcel of Crown land at the Lakes Way in North Tuncurry, New South Wales (NSW), known as the North Tuncurry Urban Release Area (NTURA).

The study area has been identified as a potential new urban release area since 2003 to address the housing needs of the MidCoast area and was declared a State Significant Site by the then NSW Minister for Planning in 2011. The overall vision for the project was a low-medium density coastal community with approximately 2,200 – 3,000 dwellings over 183 ha centred around a new village centre, 48 ha of employment lands, 55 ha of eco-tourism, 60 ha reconfigured golf course and new open space and conservation lands. Providing new housing and neighbourhood supermarket and specialty stores to support local residents, future development will integrate with the existing Tuncurry-Forster urban area.

The modified footprint, after further measures to avoid impacts to Matters of National Environmental Significance (MNES) will now impact 227.81 ha of the study area, which includes 201.67 ha of existing native vegetation in 25 stages over an approximate 35 year period (approximately 6.5 ha per year), into approximately 2,100 dwellings over 156.5 ha of residential land (including roads), 13.2 ha of employment land and a new Village Centre comprising a re-located Golf Course Club House, Community Centre, modern surf club and speciality retail including neighbourhood supermarket and cafes. The proposed action will commence in the south adjacent to existing urban and commercial development and proceed in a clockwise direction around the existing Forster-Tuncurry Golf Course). A further 90.37 ha of the study areas comprises 'retained' land being the existing Foster-Tuncurry Golf Course (29.93 ha), land owned by the Foster Local Aboriginal Land Council (9.09 ha), an existing powerline maintenance corridor (9.63 ha) and public beach (41.72 ha)

The proposal will permanently dedicate 317.63 ha of land as a permanent on-site conservation area, that will be registered as a Biodiversity Stewardship Site (BSA) under the NSW *Biodiversity Conservation Act* 2016 (An application to register a Biobank site under the now repealed Threatened Species Conservation Act 1995 savings provisions was submitted in July 2020 but couldn't be registered by 24 August 2021 and has thus lapsed). A further 350-400 ha off-site offset area will be secured either via the registration of a second BSA site at Nabiac, owned by MidCoast Council, or via the purchase and retirement of the required additional biodiversity credits from other registered stewardship sites in the region or the NSW Biodiversity Conservation Fund (BCF).

The study area has been subject to numerous historical disturbances including plantation forestry activities, mineral sand extraction and recreational uses but has recovered well and vegetation communities on the site are generally in good condition. Part of the study area and surrounding lands, including Darawank Nature Reserve to the north and the Nabiac Sandbeds to the west, were burnt in the 2019/2020 summer wildfires.

Extensive Flora and fauna surveys have been conducted on the site since 2005, and updated since the 2019/20 bushfires, that have recorded one nationally threatened plant, the Tuncurry Midge Orchid (TMO), and three EPBC Act threatened fauna species (New Holland Mouse, Grey-headed Flying-fox and Green Turtle). In addition, the site may be used from time to time by the Koala, Spotted-tail Quoll, Swift

Parrot and Regent Honeyeater. There are no listed threatened communities under the EPBC Act within or adjacent to the study area that will be impacted by the action.

The proposed action was referred to the then Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) in May 2011 and a delegate for the then Australian Government Minister for SEWPaC (the Minister) determined in June 2011 that the proposed action was a 'controlled action' and requires approval under the EPBC Act.

The proposed action was regarded to potentially have a significant impact on '*Listed threatened species and communities*' protected under Part 3 of the EPBC Act, specifically, the proposed action was determined to 'likely to have a significant impact' on *Corunastylis littoralis* (Tuncurry Midge Orchid - listed as Critically Endangered under the EPBC Act) via removal of habitat and fragmentation of the population on-site, *Dasyurus maculatus* (Spotted tail Quoll, SE mainland population – listed as Endangered under the EPBC Act) via the removal of a substantial area of suitable habitat and possibly other species including *Pteropus poliocephalus* (Grey-headed Flying-fox), *Pseudomys novaehollandiae* (New Holland Mouse), *Potorous tridactylus* (Long-nosed Potoroo), *Cryptostylis hunteriana* (Leafless Tongue orchid) and *Allocasuarina defungens* (Dwarf Heath casuarina) due to removal of habitat.

The delegate of the Minister also determined that the proposed activity be assessed by a Public Environment Report (PER) and issued guidelines for its preparation.

This PER will be used by Commonwealth agencies as the basis for environmental assessment of the proposed action.

The direct and potential indirect impacts to these species, including cumulative and consequential impacts of the 2019/2020 wildfires, are discussed in the PER (Section 6). The footprint of the project has been re-designed and modified several times since the referral in 2011 to avoid, minimise and mitigate to the maximum extent possible the impacts to threatened fauna and flora species, however, the proposed action, to construct a mixed use development at the Lakes Way, North Tuncurry, remains unchanged.

A comprehensive package of mitigation measures have been developed (Section 7 of this PER), that will form part of an Environmental Management Plan to reduce and mitigate both direct and indirect impacts. These measures include pre-clearance surveys, fencing, signage and restricted access to on-site conservation areas, sympathetic management of the existing powerline corridor and a TMO and shorebird/turtle research and monitoring program to inform better management of offset areas. Following consideration of these mitigation measures, the final impacts to MNES have been assessed as:-

- 63 individual TMO plants at 25 locations of the 2,433 plants recorded at 434 locations in the study area (or 2.59% of the 2,433 known individuals within the study area)
- 201.36 ha of moderate quality New Holland Mouse habitat
- 201.36 ha of moderate quality Grey-headed Flying-fox foraging habitat
- 55.23 ha of low and moderate quality potential / occasional foraging habitat for the Swift Parrot
- 30.61 ha of low quality potential foraging habitat for the Regent Honeyeater
- 201.36 ha of potential foraging habitat for the Spotted-tailed Quoll

- Potential indirect impacts to occasional Green Turtle nesting sites

However due to the nature and locality of the proposed action, some residual impacts on threatened species were unavoidable. Accordingly, a biodiversity offset package, consistent with the EPBC Act Offset Policy, has been proposed to protect and manage important habitats for these threatened species, within a 317.63 ha North Tuncurry Crown Land Biodiversity Stewardship site, which will meet all of the calculated offset requirements for the first 12 stages of the development for TMO, Regent Honeyeater and Spot-tailed Quoll, 89% for Grey-headed Flying Fox, 87.5% for the New Holland Mouse and 81% for the Swift Parrot. A commitment to secure a further 300-315 ha off-site offset area either via the registration of a second stewardship site at Nabiac, on land owned by MidCoast Council (MidCoast Council has provided in principle agreement to the use of this land as a biodiversity offset) or via the purchase and retirement of the required additional credits from other registered stewardship sites in the region or the NSW Biodiversity Conservation Fund (BCF) is included to meet the residual offset requirements for Stages 1-12 and prior to any impacts in Stages 13 onwards occurring.

The proposed 317.63 ha North Tuncurry Crown Land Biodiversity Stewardship site includes important habitat for the Tuncurry Midge Orchid and 62% of all known individuals in the study area, confirmed habitat for New Holland Mouse and Grey-headed Flying Fox, and potential foraging habitat for Spot-tailed Quoll, Swift Parrot and Regent Honeyeater. The offset area will be secured within 12 months of the project being approved, and prior to any impacts occurring, and will be progressively managed from Year 1 of the project meeting all the offset requirements for the main access road, business park and the first 12 Stages of development.

Whilst part of the offset area was burnt in the 2019/2020 bushfires, development will commence in the south of the site as will management of the offset area, with the regeneration of burnt areas being significantly progressed at the end of the first five years of development (2029) at which time less than 15% of the impacts will have occurred.

Extensive consultation has been undertaken with the community (including indigenous stakeholder groups), MidCoast Council and government agencies during the formulation of the rezoning proposal for North Tuncurry. A Community Reference Group was established in June 2013 to facilitate an exchange of information between key stakeholders and Landcom. A Communication and Community Engagement Report has been prepared which details the involvement of the local community and key stakeholders in the project to date, including details of consultation activities which have occurred since the commencement of project planning in late-2011. These activities will be supplemented by ongoing community consultation during the formal exhibition and assessment of the Study and, should the proposal proceed, during detailed design, planning applications and construction of individual stages of the proposed development.

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Definitions

Abbreviation	Description
Action	To construct a mixed use development at the Lakes Way in North Tuncurry, NSW.
Action Area	The area to be directly and indirectly impacted by the proposed action (coloured red in Figure 1)
In the Vicinity of the action area	Includes bushland adjacent to the study area (e.g. Bushland around the Tuncurry TAFE site to the south, bushland around Ducks Swamp to the eats of the Lake Way and bushland around the Tuncurry Rubbish Depot and Darawank Nature Reserve to the north.
Study area	The focus area of flora and fauna investigations (outlined in black in Figure 1)
Locality	10km radius of action area
Region	The Karuah-Manning IBRA Subregion
MNES	Matters of National Environmental Significance
Listed threatened species and ecological communities	Species listed under Section 18 & 18A of the EPBC Act as at 11 June 2011 Does not include migratory species, or those species listed after the controlled action decision date of 6 June 2011 (i.e. Koala and Greater Glider)
Threatened species 'likely' to be present	Includes those MNES known to occur in the study area (i.e. have been recorded) are have a medium to high probability of using the site based on nearby records and suitable habitat within the study areas
Cumulative impacts	Includes a consideration of the impacts of the proposed action in combination with other developments in the locality. In the context of this PER, it includes the impacts of the 2019/2020 bushfires in the region (Part of the study area was burnt by wildfires in October 2019)
Consequential impacts – Section 527E of EPBC Act	Means as a direct or indirect consequence of the action (as defined by Section 527E of the EPBC Act 1999).

Abbreviations

Abbreviation	Description
BC Act	NSW Biodiversity Conservation Act 2016
BCF	Biodiversity Conservation Fund
BCT	Biodiversity Conservation Trust
BioNet	NSW Biodiversity spatial data atlas
BSA	Biodiversity Stewardship Site Agreement
BSS	Biodiversity Stewardship Site
CEMP	Construction Environmental Management Plan
DAWE	Australian Government Department of Agriculture, Water and the Environment
DEWHA	former Australian Government Department of the Environment, Water, Heritage and the Arts (now Department of Agriculture, Water and the Environment
DoL	former NSW Department of Lands
DotEE	former Australian Government Department of the Environment and Energy (now Department of Agriculture, Water and the Environment)
DPIE	NSW Department of Planning, Industry and the Environment
DSEWPaC	former Australian Government Department of Sustainability, Environment, Water, Population and Communities (now Department of Agriculture, Water and the Environment)
ELA	Eco Logical Australia
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
FMP	Fauna Management Plan
GHFF	Grey-headed Flying Fox (*Pteropus poliocephalus*)
GLC	Great Lakes Council (now MidCoast Council)
IWCMS	Integrated Water Cycle Management Strategy
LALC	Local Aboriginal Land Council
MCC	MidCoast Council
MCW	Mid Coast Water
MNCRS	Mid North Coast Regional Strategy
MNES	Matters of National Environmental Significance
NHM	New Holland Mouse (*Pseudomys novaehollandiae*)
NTDP	North Tuncurry Development Project now the NTURA
NTURA	North Tuncurry Urban Release Area
OEH	former NSW Office of Environment and Heritage (now Department of Planning, Industry and Environment)
PER	Public Environment Report
PEAR	Preliminary Environmental Assessment Report

Abbreviation	Description
PMST	EPBC Act Protected Matters Search Tool
SPRAT	EPBC Act Species Profile & Threats Database
SSS	State Significant Site
TMO	Tuncurry Midge Orchid (*Corunastylis littoralis*)
WSUD	Water Sensitive Urban Design
4WD	Four Wheel Drive

1. General Information

1.1 Background and title of the action

In 2011, Landcom and the then Crown Lands Division of the Department of Primary Industries (the designated proponents) (now both part of the NSW Department of Planning and Environment) proposed to construct a '*mixed use' development at the Lakes Way in North Tuncurry, New South Wales'* (NSW) (**Figure 1**), referred to as the 'North Tuncurry Mixed Use Development'. The proposal was for 183 ha of residential development, 48 ha employment, 55 ha eco-tourism, modifications/re-design of an existing 60 ha golf course, new Village Centre with community facilities (surf club, community centre, supermarket, cafes), open space, recreational and conservation lands.

The proposed action was referred to the then Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (now Department of Agriculture, Water and the Environment (DAWE)) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) on 10 May 2011 (**Appendix A** – the referral RPS 2011).

On 6 June 2011, a delegate for the then Australian Government Minister for DSEWPaC) determined that the proposed action is a 'Controlled Action' and requires approval under the EPBC Act (**Appendix B**). The proposed action was regarded to potentially have a significant impact on *'Listed threatened species and ecological communities*' protected under Part 3 of the EPBC Act (Section 18 and 18A of the EPBC Act), which are Matters of National Environmental Significance or MNES). The delegate of the Minister also determined, on 6 June 2011, that the proposed activity be assessed by a '*Public Environment Report*' (PER)(**Appendix B**).

The controlled action decision refers directly to 'listed threatened species and communities (sections 18 & 18A of the EPBC Act 1999) consequently there is no requirement to address potential impacts to 'migratory species' listed under the EPBC Act in this PER.

The proposed action was determined to 'likely to have' a significant impact on the Tuncurry Midge Orchid (*Corunastylis littoralis*) via removal of habitat and fragmentation of the population on-site, and Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) via the removal of a substantial area of 'suitable habitat' and likely fragmentation of a 'key regional fauna corridor', and possibly other species including Grey-headed Flying-fox *(Pteropus poliocephalus*), New Holland Mouse (*Pseudomys novaehollandiae*), Long-nosed Potoroo (*Potorous tridactylus*), Leafless Tongue Orchid (*Cryptostylis hunteriana*) and Dwarf Heath Casuarina (*Allocasuarina defungens*) due to removal of habitat.

In addition Section 158A of the EPBC Act provides that listing events that occur after the referral decision has been made (in this case 6 June 2011), do not affect the assessment and approval decision under the EPBC Act. As such the vulnerable Koala (*Phascolarctos cinereus*) and Greater Glider (*Petauroides volans*) which were listed on 2 May 2012 and 5 May 2016 respectively, are not required to be considered in this PER. However, given the public interest in the Koala, and the impacts of the 2019/20 bushfires on this species in NSW, an assessment of the potential habitat and impacts to these species has been included in this PER.

The then DSEWPaC issued specific guidelines for the content of this PER, and these are included at **Appendix C**.

This PER has been prepared by Eco Logical Australia Pty Ltd (ELA) on behalf of the proponents. The PER includes technical data and results of surveys undertaken by ELA and other ecological consultants since 2005 including ERM 2005 and 2010a&b; Paget 2008; RPS 2010, 2011a, 2012a, 2012b & 2013, Flora Search 2013, 2014 & 2108, ELA 2011, 2015, 2019, 2020 and 2021) as discussed in **Section 4.5**. These reports are provided as Appendices to this report (**Appendix D**).

The names, qualifications and work undertaken by all persons involved in preparing this PER (or whose data has been used in the PER) are provided at **Appendix E**. The names, qualifications and work undertaken by other consultants are included in the relevant reports in **Appendix D**).

The PER is also required to provide a list of the persons and agencies consulted during the preparation of the PER (**Section 9**) and assess compliance of the action with the Principles of Ecologically Sustainable Development as set out in the EPBC Act (**Appendix F**) and the objects of the Act (**Appendix G).**

The purpose of the PER is to provide sufficient information to allow the Minister to make an informed decision whether or not to approve the taking of the proposed action under Part 9 of the EPBC Act.

Table 1 provides a summary of where the requirements of the PER Guidelines (**Appendix C**) have been addressed in this report.

Table 1: Information requirements to be addressed in the PER

PER information requirement	PER Section
PER to include a copy of the PER guidelines issued by DSEWPaC in June 2011	Appendix C
Names, qualifications and work done by all persons involved in preparing the PER	Appendix E
Compliance of the action with the principles of ESD	Appendix F
Compliance of the action with the objects of the EPBC Act	Appendix G
Contact details for the Proponent of the action	Section 1.2
Description of the action	Section 2
Feasible alternatives	Section 3
Description of the environment and relevant MNES	Sections 4 & 5
Relevant impacts to MNES	Section 6
Proposed safeguards and mitigation measures	Section 7
Other approvals and conditions	Section 8
List of persons and agencies consulted during the PER	Section 9
Information sources	Section 10
Environmental records of proponent	Section 11
Conclusion	Section 12

1.2 Proponent(s) contact details

The proponents for the action, as included in the 2011 referral were:

- Landcom (CAN 268 260 688) at postal address PO Box R220, Royal Exchange NSW 1225; and
- Crown Lands Division of the NSW Department of Primary Industry (ABN 33 537 762 019), at GPO Box 5477, Sydney NSW 2001, Australia.

Due to changes in NSW Government Agency names since the referral was determined, Landcom and DPI are now both part of the broader NSW Department of Planning and Environment (DPE) and as a consequence, the ABN for Crown Lands is now 20 770 707 468.

As a result, the proponents have submitted a request to 'change the person proposing to take the action' under Section 156F of the EPBC Act.

1.3 The objectives of the action

The action, as described in the referral was to:

> *Construct a mixed use development at the Lakes Way in North Tuncurry, NSW.*
>
> *The development will be staged and comprise approximately 2,200 – 3,000 dwellings, employment lands, a new local neighbourhood centre incorporating retail, business and commercial floor space, industrial, tourist, community and education facilities with associated roads and utilities (power, telecommunications and gas) and open space and environmental conservation* areas.

The footprint of the project has been re-designed and modified several times since the referral in 2011 to avoid, minimise and mitigate to the maximum extent possible the impacts to threatened fauna and flora species, however, the proposed action, to construct a mixed use development at the Lakes Way, North Tuncurry, remains unchanged. The current proposed Concept Plan is shown in **Figure 2**.

1.4 Location of the action

The 'study area' is located within the former Great Lakes Local Government Area (LGA), now MidCoast LGA, approximately 320 km north of Sydney along the NSW coast (**Figure 3**). The study area encompasses an area of 635.79 ha on the eastern side of The Lakes Way, directly to the north of, and adjoining, the existing Tuncurry town centre (**Figure 1**). The study area includes Lot 331 (a Crown Reserve for future public purposes), Lots 294 and 295 DP 43110 (Crown land currently used under licence by the Foster-Tuncurry Golf Club as a golf course), a 9.09 ha parcel of land owned by the Forster Local Aboriginal Land Council (LALC)(Lot 279 Dp 753207), and an area of approximately 42 ha of beach that extends below the Mean High Water Mark (**Figure 1**)**.**

Existing development within the subject site includes an 18-hole golf course called Forster / Tuncurry Golf Club on the southern portion of the site (which will be modified by the action), and a 66 kilovolt powerline and associated maintenance corridor (9.63 ha) running along the western edge of the site, parallel to The Lakes Way (which will be retained). A number of access roads and 4WD tracks traverse the site and provide informal pedestrian and four wheel drive (4WD) beach access.

The proposed action is to 'develop' 227.81 ha of the study area shown in **Figures 2** and **10**, of which 201.67 ha is extant native vegetation in various condition states including regrowth from former pine plantations and restoration from mineral extraction (which comprises habitat for MNES), into a total of approximately 2,100 dwellings, employment land, a new local neighbourhood, tourist, community and educational facilities as described in Section 2.1, over an approximate 35 year period (subject to demand). The proposed action will be staged from the south in a clockwise direction around the existing Forster-Tuncurry Golf Course (**Figure 2**).

1.5 Background to the development of the action

The land subject to the action is owned by the State of NSW and development is to be undertaken by way of an agreement between the then NSW Land and Management Authority (now Crown Lands Division of NSW Department of Planning Industry and Environment) and Landcom. The proposal is to develop the site in approximately 25 stages over approximately 35 years to generate approximately 2,100 dwellings, employment lands, a new local neighbourhood centre incorporating retail, business and commercial floor space, tourist, community, education facilities, open space and environmental conservation purposes (Landcom 2011)(**Figure 7**).

The project site has been subject to a broad range of strategic planning investigation and environmental assessments over a number of years by the former Great Lakes Council (GLC), the former Department of Planning, Landcom and the former Department of Lands.

The North Tuncurry site was earmarked for residential and employment uses within the former GLC's Forster-Tuncurry Conservation and Development Strategy (GLC 2003), was identified as an urban growth area in the Mid North Coast Regional Strategy (DoP 2009), designated a State Significant Site by the NSW Minister for Planning in February 2011 and identified as a potential new urban release area in the NSW Government's Hunter Regional Plan 2036 (DPE 2016) to address the future housing needs of the MidCoast area (Ethos Urban 2020).

The North Tuncurry project site is contiguous with existing urban development in Tuncurry and has been subjected to numerous historical disturbances including forestry activities, mineral sands extraction and recreational uses.

The study area was previously known as '*Tuncurry State Forest No. 283'* and was subject to historic planting of various *Pinus species* since the1890's with the earliest documented planting in 1911 (Bailey 1931). Bailey (1931) describes the methods of planting as either '*cleared and burnt*', '*felled and burnt*' or '*brushed, mattocked and planted'* to make way for pine plantations. Remnants of these pine plantations are still evident as dense stands of pine or where pine is a co-dominant species. The areas treated for pine plantation as shown in **Figure 4**.

The northern part of the study area was subject to some mineral sands extraction in the 1960's-70's (**Figure 5**).

The study area has had a number of wildfires burn part of the area, including in 2007 which burnt the north-east section of the project site and the northern part of the study areas and surrounding lands in October 2019. The study area has also been subject to a number of smaller fires, likely arson in 2013 and 2017 which burnt an area in the south-west of the study area near the Lakes Way (**Figures 5** and **6**).

With the exception of the dense network of tracks and the operating golf course, vegetation within the study has recovered well from these past disturbances, with scattered occurrences of *Pinus elliottii* (Slash Pine) as one of the few relics of past disturbance. Accordingly, the current vegetation on site is largely regrowth of approximately 7-80 years of age following cessation of forestry activities.

The proposed action has been the subject of biodiversity investigations since 2005 (ERM 2005, Paget 2008, ERM 2010a & b, RPS 2010-2013, ELA 2014-2020, FloraSearch 2013, 2014 and 2018).

Landcom initially submitted a preliminary environmental assessment report (PEAR) to the then NSW Department of Planning and Infrastructure (now Department of Planning, Industry and Environment (DPIE)) in January 2011 for a proposed mixed-use development (Landcom 2011) and the land was declared a State Significant Site (SSS) by the NSW Minister for Planning in February 2011.

As part of the SSS assessment process, the former NSW Office of Environment and Heritage (OEH)(now DPIE) and Great Lakes Council (now MidCoast Council) requested that matters of ecological significance be addressed 'strategically' at the rezoning stage to simplify the subsequent development application process.

Accordingly an Ecological Inventory and Constraints assessment was completed by RPS in 2012 (RPS 2012a **Appendix D5**) and a Biodiversity Certification Assessment Report & Biodiversity Certification Strategy (Eco Logical Australia, 2019 **Appendix D10**), which identified land to be biodiversity certified (developed) and land to be secured for in perpetuity conservation (registered as Biobank sites) was prepared for the NSW Department of Planning, Industry and Environment (the applicant for biodiversity certification) and was submitted for assessment in July 2019.

A rezoning study to support a State Environment Planning Policy amendment to the Great Lakes LEP 2014 for the North Tuncurry Urban Release Area (Ethos Urban 2020 – **Appendix H**) was submitted to the DPIE in April 2020 with the project now been referred to as the North Tuncurry Urban Release Area or NTURA.

An application to register a North Tuncurry Crown Land Biobank site over 317.63 ha was submitted to the DPIE in August 2020 (ELA 2020 – **Appendix D14**), consistent with the commitments in the Biocertification Assessment (ELA 2019, 2021). The savings provisions for which this application was made expired on 24 August 2021 and this assessment will be re-submitted as an application to register a Biodiversity Stewardship site (BSA) within 12 months of the project being approved.

1.6 How the action relates to other actions proposed or approved in the region

There are currently no other Major Projects in the MidCoast Council area on the DPIE Major Projects Register.

Other recently approved Major Projects in the broader region include the Karuah Quarry, Rock Hill Coal Mine, Stratford Mine Complex, Possum Brush Quarry, and Duralie Mine Complex.

1.7 Current Status of the action

It is expected that the Planning proposal to rezone the land and Biocertification Assessment will be placed on public exhibition in at the same time as this PER Report.

1.8 Legislative background for the proposal

1.8.1 EPBC Act

The proposed action was referred to the then Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (now Department of Agriculture, Water and the Environment (DAWE)) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) on 10 May 2011 (**Appendix A** – the referral RPS 2011).

On 6 June 2011, a delegate for the then Australian Government Minister for DSEWPaC) determined that the proposed action is a 'Controlled Action' and requires approval under the EPBC Act (**Appendix B**). The proposed action was regarded to potentially have a significant impact on *'Listed threatened species and ecological communities*' protected under Part 3 of the EPBC Act (Section 18 and 18A of the EPBC Act), which are Matters of National Environmental Significance or MNES). The delegate of the Minister also determined, on 6 June 2011, that the proposed activity be assessed by a '*Public Environment Report*' (PER) (**Appendix B**).

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The proposed action was determined to 'likely to have' a significant impact on the Tuncurry Midge Orchid (*Corunastylis littoralis*) via removal of habitat and fragmentation of the population on-site, and Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) via the removal of a substantial area of 'suitable habitat' and likely fragmentation of a 'key regional fauna corridor', and possibly other species including Grey-headed Flying-fox *(Pteropus poliocephalus*), New Holland Mouse (*Pseudomys novaehollandiae*), Long-nosed Potoroo (*Potorous tridactylus*), Leafless Tongue Orchid (*Cryptostylis hunteriana*) and Dwarf Heath Casuarina (*Allocasuarina defungens*) due to removal of habitat.

Section 158A of the EPBC Act provides that listing events that occur after the referral decision has been made (in this case 6 June 2011), do not affect the assessment and approval decision under the EPBC Act. As such the vulnerable Koala (*Phascolarctos cinereus*) and Greater Glider (*Petauroides volans*) which were listed on 2 May 2012 and 5 May 2016 respectively, are not required to be considered in this PER. However, given the public interest in the Koala and Greater Glider, and the impacts of the 2019/20 bushfires on these species in NSW, an assessment of the potential habitat and impacts to these species has been included in this PER.

The then DSEWPaC issued specific guidelines for the content of this PER, and these are included at **Appendix C**.

1.8.2 Other relevant legislation, including State and Local

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation that relates to the site. It provides a framework for the overall environmental planning and assessment of the proposed action. Various legislative instruments such as the NSW *Biodiversity Conservation Act 2016* (BC Act) (replacing the now repealed *Threatened Species Conservation Act 1995* (TSC Act)), *Water Management Act 2000* (WM Act) and *Rural Fires Act 1997* are integrated with EP&A Act.

Other legislation, policies and guidelines that apply to the site as listed below:

- *Catchment Management Act* 1989
- *Contaminated Land Management Act* 1997
- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Heritage Act 1977*
- *Local Government Act 1993* (LG Act)
- *Local Government Amendment (Ecologically Sustainable Development) Act 1997*
- *Noxious Weeds Act 1993*
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Rural Fires Act 1997* (RF Act)
- *Soil Conservation Act 1938*
- *Water Management Act 2000* (WM Act).

1.8.2.1 Relevant Local legislation

The study area is currently zoned a mixture of RU2 (Rural Landscape), RE1 (Public Recreation – the existing Tuncurry Golf Course) and E2 (Environmental Conservation (dune vegetation) under the Great Lakes Local Environmental Plan (LEP) 2014 (**Figure 8**).

It is proposed to rezone the land subject to the action as a mix of R2 (Low Density Residential), R3 (Medium Density Residential), RE2 (Private Recreation (Golf Course), B5 (Business Development), IN1 (General Industrial) and E2 and E3 (Environmental Conservation and Environmental Management - land proposed as a Biobank site) as show in **Figure 9** and described in Ethos Urban (2020).

1.9 Consequences of not proceeding with the action

The growth of Forster/Tuncurry is constrained by National Parks to the north (Darawank NR) and to the south (Booti NP), by the ocean to the east and by Wallis Lake and the Wallamba River to the west. Land available for future development is therefore very limited.

The Midcoast LGA is forecast to experience a population increase of between 10 and 20% to the year 2036 (DPE 2016). The twin towns of Forster/Tuncurry enjoy the most attractive lifestyle benefits in the LGA and this coupled with the recent surge in the work from home community means they could expect to achieve growth toward the top end of this range. Adopting a mid-point growth rate of 15% would see demand for an additional 1,500 dwellings in the next 15 years alone.

The North Tuncurry site is the last significant site available for rezoning and has been identified for urban release in State and Local Government planning strategies for over 30 years. The site is critical for housing supply in the district. The proposal has also committed to:

- Provide 5-10% of all new homes as affordable housing
- Deliver 10-15% of all new dwellings as diverse housing
- Achieving 20% of dwellings to be 'Design' and As-built' Liveable Housing Australia Silver Certified

These outcomes provide considerable community benefit particularly considering the age and socio-economic profile of the population. Should the project not proceed not only would these outcomes be lost but the reduced housing supply would place considerable upward pressure on housing prices.

The provision of an additional 2,100 dwellings will provide enormous economic benefit to Forster/Tuncurry not only in job creation during construction and within the employment zones but by delivering approximately 4,000 new residents to support existing businesses.

The action will result in the protection and in perpetuity active conservation management of a significant proportion of the known population of the critically endangered *Corunastylis littoralis* (Tuncurry Midge Orchid) which otherwise would not occur given the classification and current use of the subject land.

The site is also the subject of a Native Title Agreement between the Crown and the traditional owners – Lakkari. The Agreement provides significant benefits financially and in employment opportunities for this group. Should the project not proceed these benefits would be lost.

Figure 1: Study area and action area boundaries

Figure 2: Proposed Master Plan (Source Roberts Day 2015)

Note: The tracks shown to the beach are indicative of the location of existing 4WD access tracks

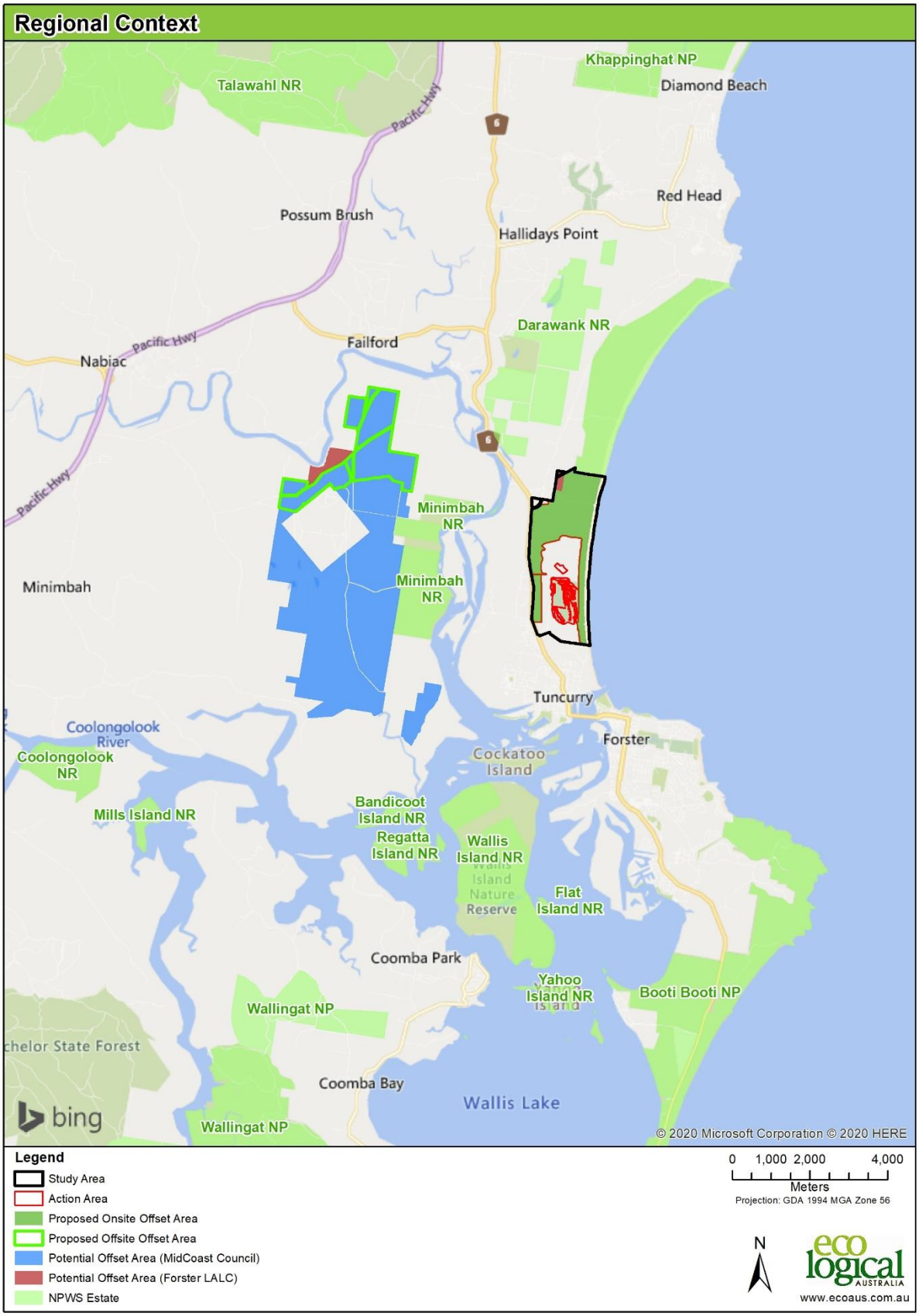


Figure 3: North Tuncurry project site in a regional context

Figure 4 Historic pine plantations and existing stands of wild pine (Source RPS 2012)

Figure 5: Extent of historical mineral extraction and pre-2019/2020 fire history

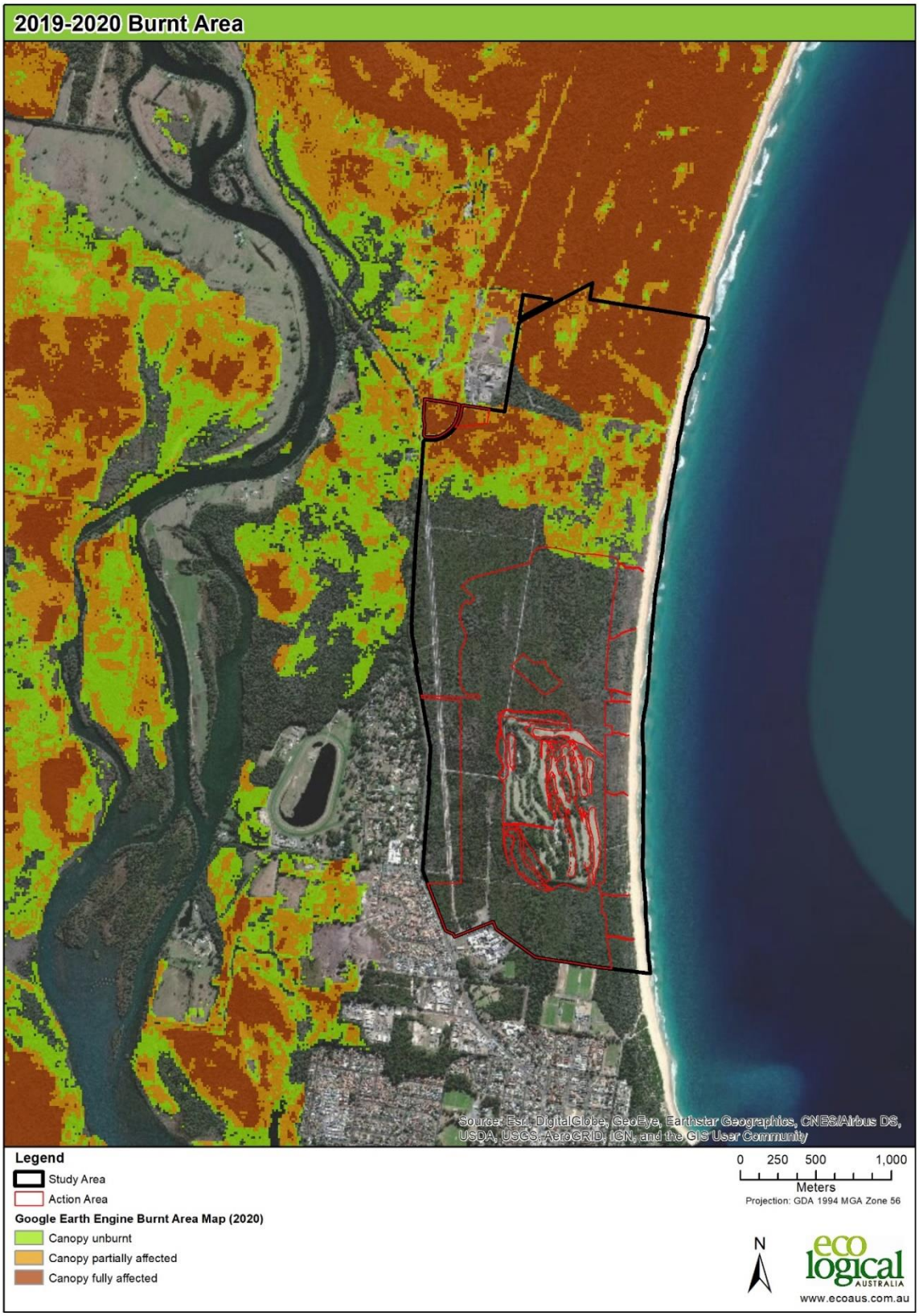


Figure 6: Extent and intensity of 2019/2020 summer bushfires in and adjacent to study area (Source Google Earth Engine Burnt Area Map 2020

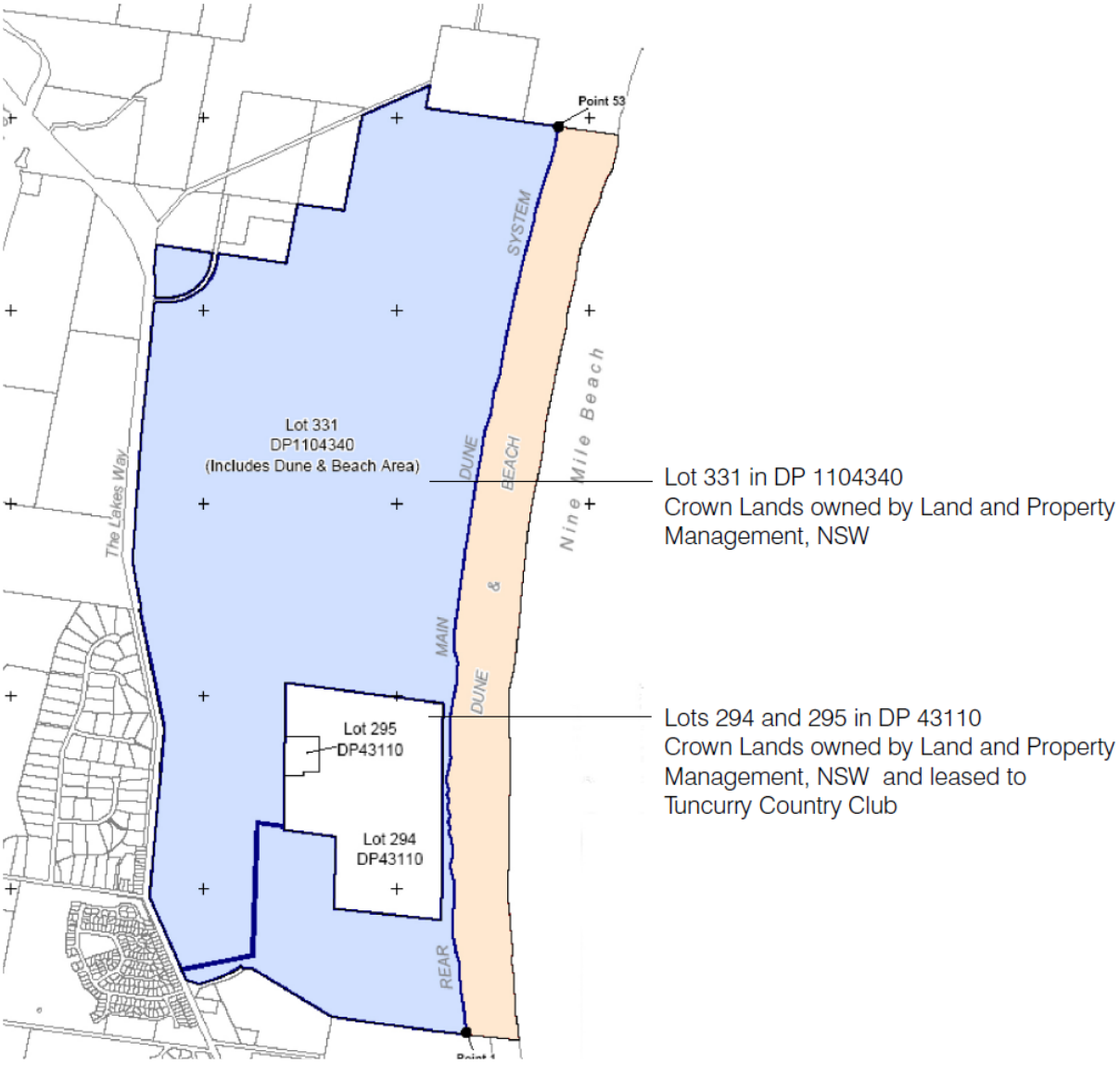


Figure 7: Land ownership status of the study area

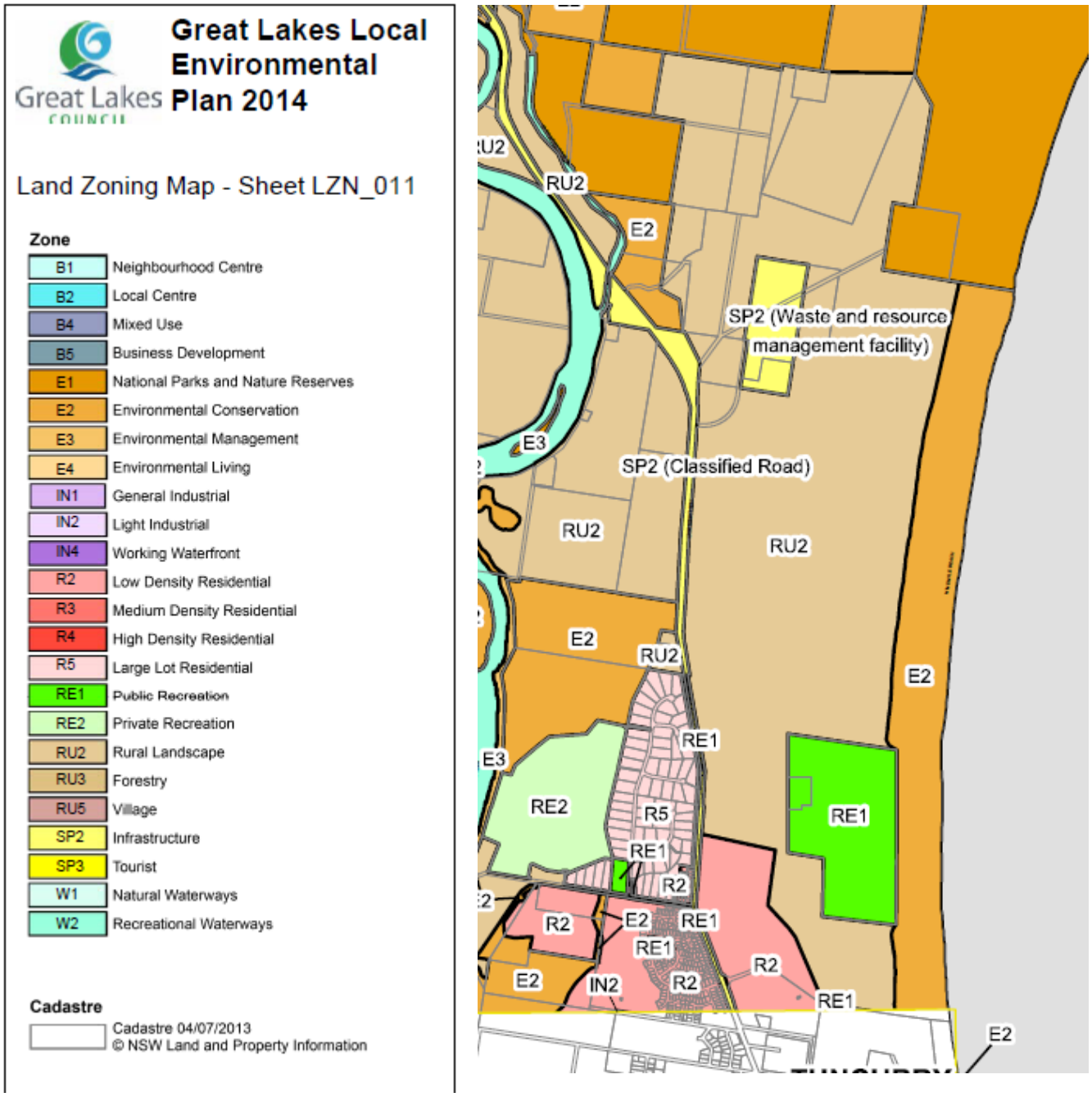


Figure 8: Current Zoning under Great Lakes LEP 2014

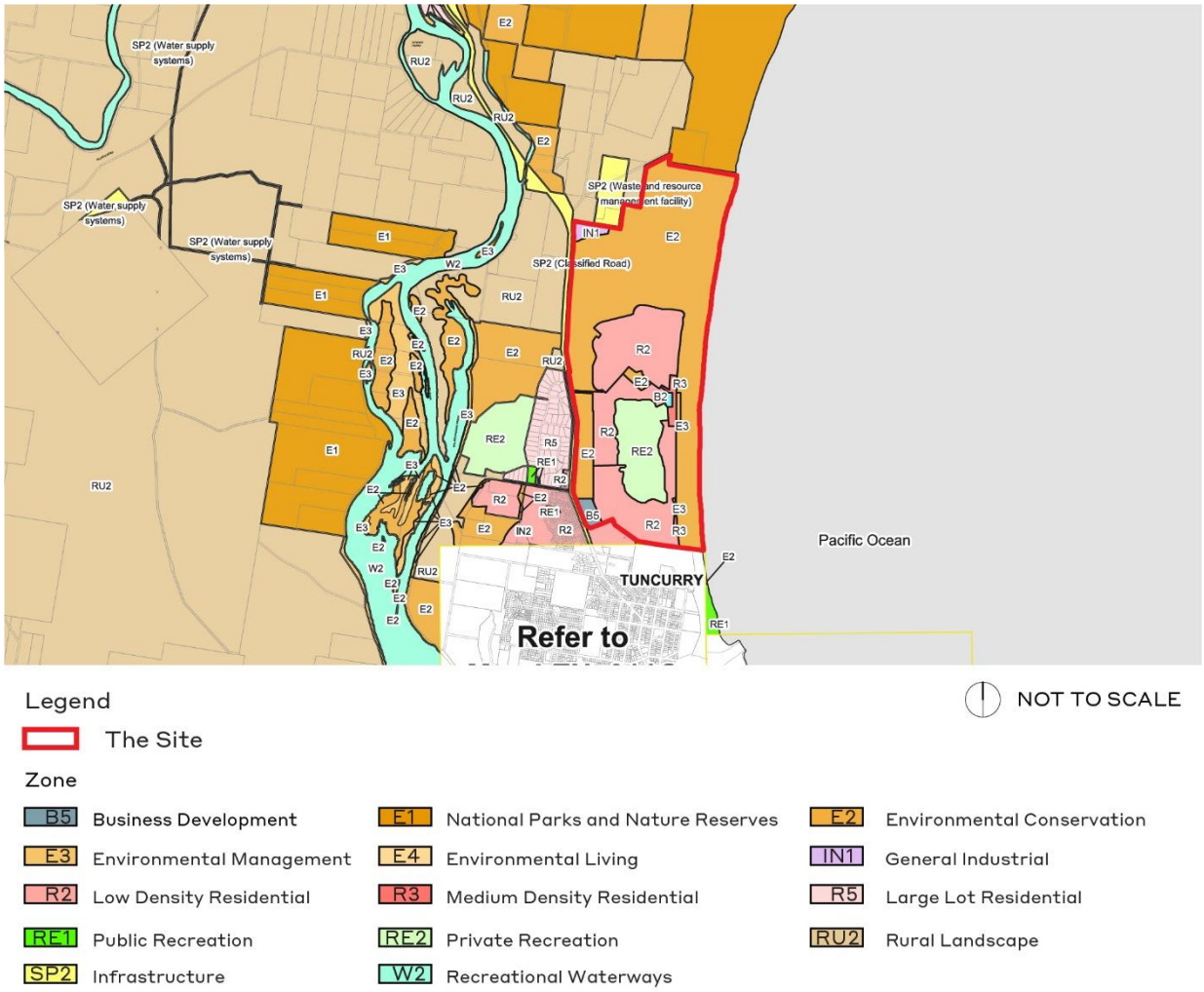


Figure 9: Proposed Zoning (Source Ethos Urban 2020)

2. Description of the Action

Section 2 of the Guidelines for the PER require the PER to include a description of the Action that should include comprehensive detail and informative maps of:-

a) all components of the proposed action, including actions to be undertaken during the preparation, construction and operation phases of the development;

b) the precise location and area in hectares of all components of the action including proposed zoning, proposed allotments, any works to be undertaken, structures to be built and all other elements of the action that may have impacts on EPBC Act listed threatened species and ecological communities;

c) the proposed timing and duration of the works to be undertaken;

d) how the works are to be undertaken and design parameters for those aspects of structures or components of the action that may have relevant impacts;

e) proposed public works such as entry and exit sites, roads, sewerage, powerlines etc., including locations and map(s);

f) location, size, operation and maintenance plans proposed for waste (including

chemical and hazardous waste) disposal; sediment and erosion control; sewage, wastewater and stormwater storage and treatment systems to be employed;

g) the zoning and management plans for any open space, drainage areas and conservation areas, including map(s);

h) full details of the standards being adopted in relation to conservation of ecosystems, stormwater discharge, energy, resource and transport efficiency and water conservation and reuse;

i) consistency of the proposed action with relevant environmental guidance and policy (for example, the National Water Quality Management Strategy guidelines); and

j) Identification and quantification of hazards and risks, including cumulative hazards and risks. For example, but not necessarily limited to, potential threats from flood, landslip and storm surge, air pollution, chemical spills, failure of treatment systems, heavy or prolonged rainfall.

This Section addresses these requirements.

2.1 Components of the proposed action

The proposed action is to develop 227.81 ha of the study area (of which 201.67 ha is extant native vegetation and habitat for MNES), into a total of approximately 2,100 lots over an approximate 35 year period (**Figure 10**). The proposed action will be staged from the south in a clockwise direction around the existing Forster-Tuncurry Golf Course (**Figure 11**). **Figure 2** shows the Master Plan for the proposed action with indicative precinct boundaries for urban development.

The proposal will incorporate the following components:

- Clearing up to 201.67 ha of vegetation and threatened species habitat within the subject site
- Earthworks to establish site levels and installation of public works (for example, new road network, sewerage, water, gas, power lines and communications)
- Remodelling of the Forster Tuncurry Golf Course to include a new practice range, a three hole beginners course, a new clubhouse and pro-shop, the relocation of five holes along the foreshore to other areas and the introduction of water into the design
- A new 'Village Centre' which co-locates the new golf clubhouse, Community Centre and modern Surf Club, potential Cultural Centre, neighbourhood supermarket, speciality retail, destination cafes and restaurants focused around the proposed Village Green connecting the main basin to the foreshore area (**Figure 2**)
- 107.6 ha of net residential land to incorporate urban lots (200-374 square metre (sqm) minimum lot size and apartments at the Village Centre), sub-urban lots (375-799 sqm minimum lot size) and large lots (800-1000 sqm minimum lot size)(**Figure 12**)
- Use of eight (8) existing vehicle tracks adjacent to the development footprint (as shown in **Figure 2 and 10**) to access Nile Mile Beach
- 13.2 ha employment lands
- Establishment and maintenance of Asset Protection Zones (**Figure 13**)
- Provision of open space parks and drainage areas, environmental conservation lands, and local active and passive recreation facilities; and
- Appropriate conservation of European and Aboriginal heritage located on the site.

All components of the proposed action (access, residential, recreation, roads, utilities, water, sewer, APZs, etc) are fully contained within the development footprint shown in **Figure 10**.

2.2 Proposed Public Works

Proposed public works entry and exit sites, roads, water servicing, waste water management (sewerage) are shown in **Figures 17-20**.

All components of the proposed action (access, residential, recreation, roads, utilities, water, sewer, APZs, etc) are fully contained within the development footprint shown in **Figure 10**.

Figure 10: North Tuncurry project site and proposed development areas

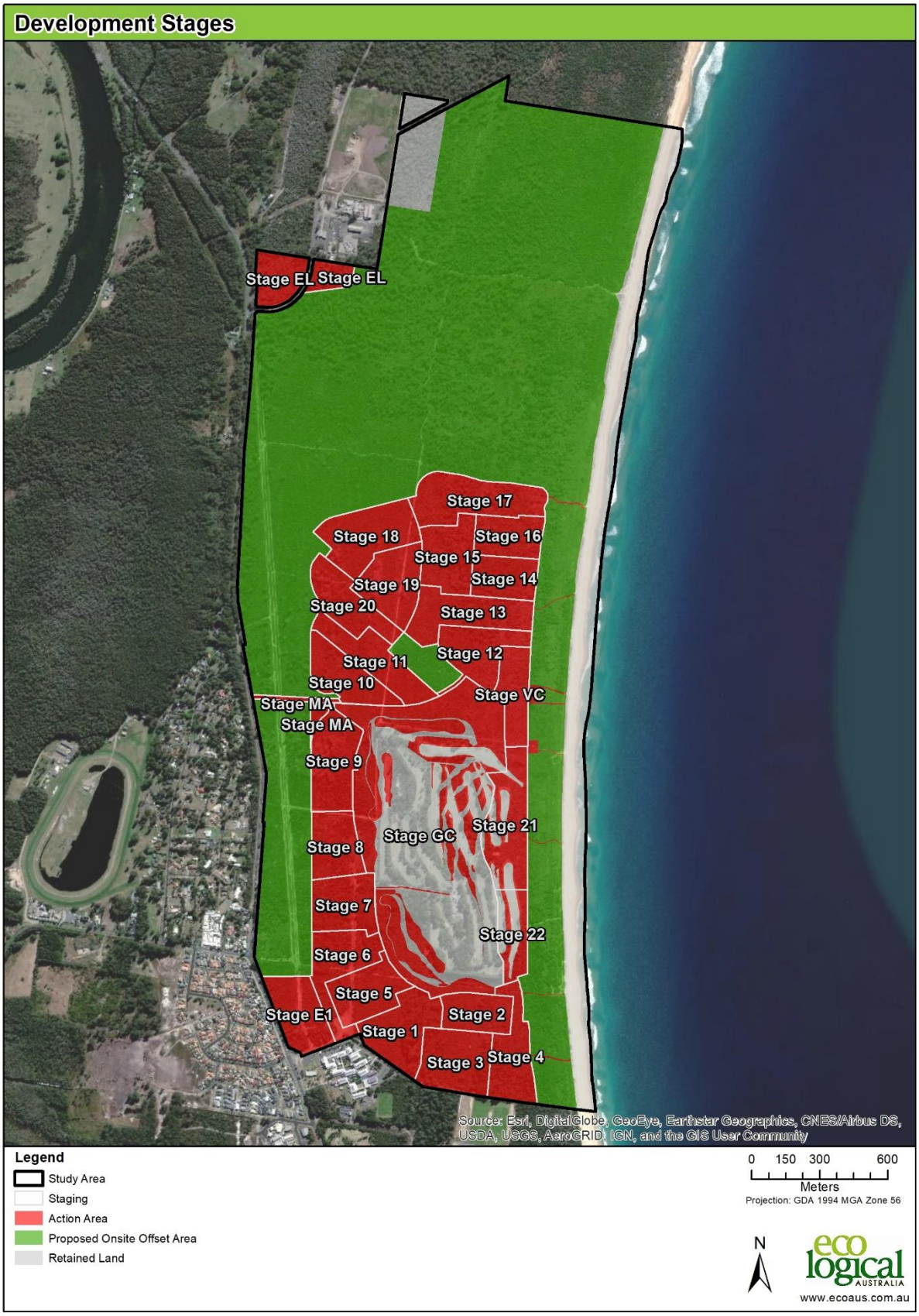


Figure 11: Indicative Stages (timing) of the proposed action over 35 years

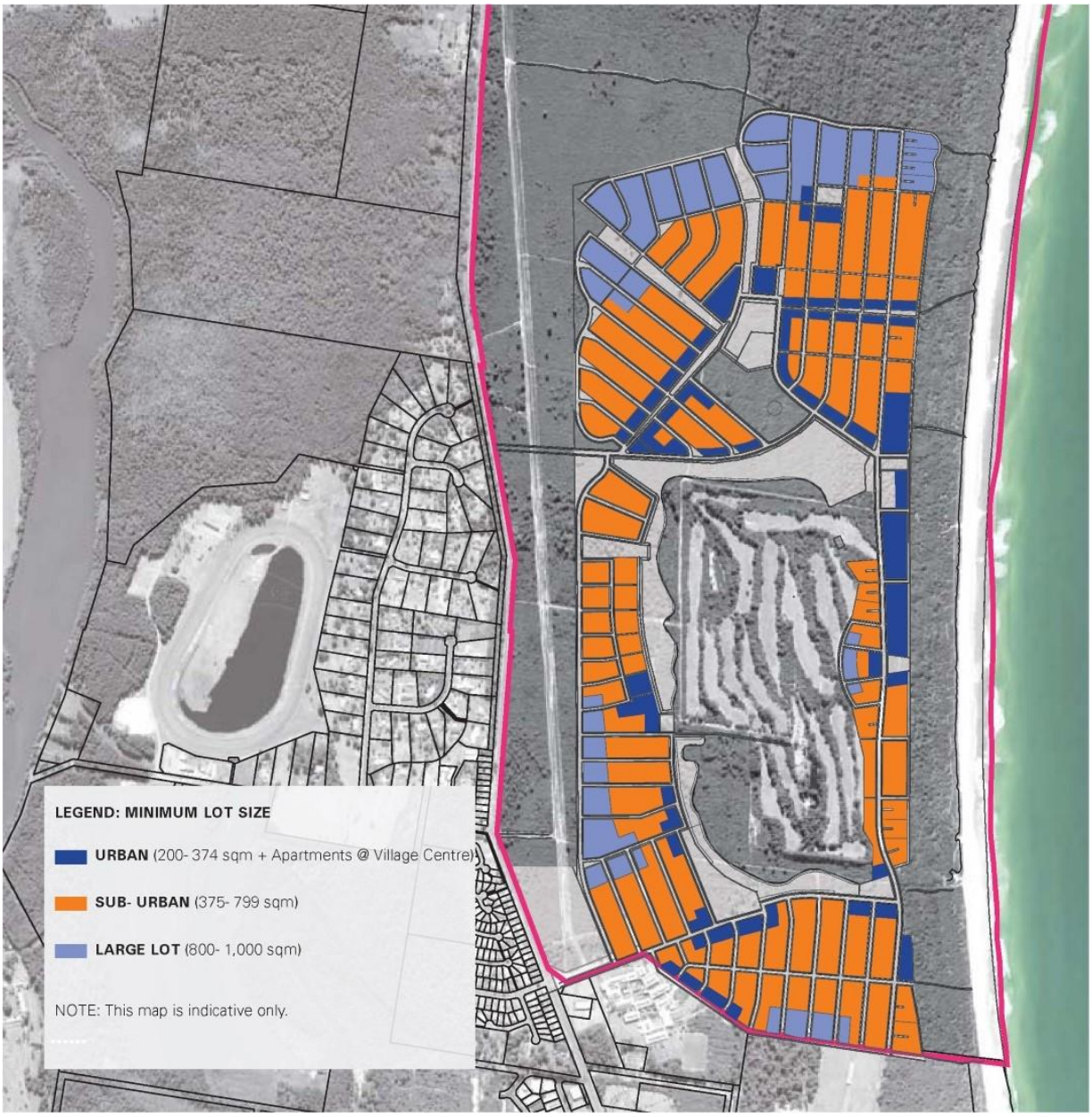


Figure 12: Indicative density yield (Source Ethos Urban 2020)

Figure 13: Asset Protection Zones (Source RPS 2020)

2.3 Precise location and area of all components of the action

Figures 10-13 show the locations of all components of the action.

2.4 Proposed timing and duration of works to be undertaken

The proposed action will be staged from the south in a clockwise direction around the Forster-Tuncurry Golf Course over an approximate 25 year period commencing from 2025 (**Figure 11**)

2.5 How works will be undertaken and design parameters for those aspects that may have impacts to MNES

The action has been subject to a comprehensive analysis of site constraints (biodiversity, cultural heritage, flood, fire, sea level rise etc) since 2005 (as summarised in Ethos Urban 2020 (**Appendix H**) and **Figure 14** and **15**), a preliminary environmental assessment (Landcom 2011) and a series of Masterplans to address and accommodate these constraints (Landcom and Roberts Day 2019, Ethos Urban 2020, **Figure 16 A-D**), a Sate Significant Precinct Study (Ethos Urban 2019) and a detailed Urban Design (Ethos Urban 2020).

An Environmental Management Plan (EMP) will be prepared (refer to Section 7**)** which will set out the framework for the short and long-term mitigation strategies, monitoring and ongoing management of the relevant impacts of the action which includes water quality risk management, erosion and sediment control, acid sulfate soil management, stormwater and waste water management, wildlife impact and a vegetation rehabilitation plan. The EMP will be prepared to be consistent with the Commonwealth EMP guidelines.

Further, an application to register a Biodiversity Stewardship Agreement (BSA) (an in perpetuity conservation covenant on title) will be submitted within 12 months of project approval. A BSA will also include a conservation management plan for the in perpetuity management of the 317.63 ha on-site offset area and includes annual monitoring and reporting, and annual compliance and audit undertaken by the NSW Biodiversity Conservation Trust (BCT).

Further, management plans will be prepared under the *Local Government Act* 1993 for all open space recreation areas and community land.

Figure 14: Environmental constraints and urban capability land analysis (Ethos Urban 2020)

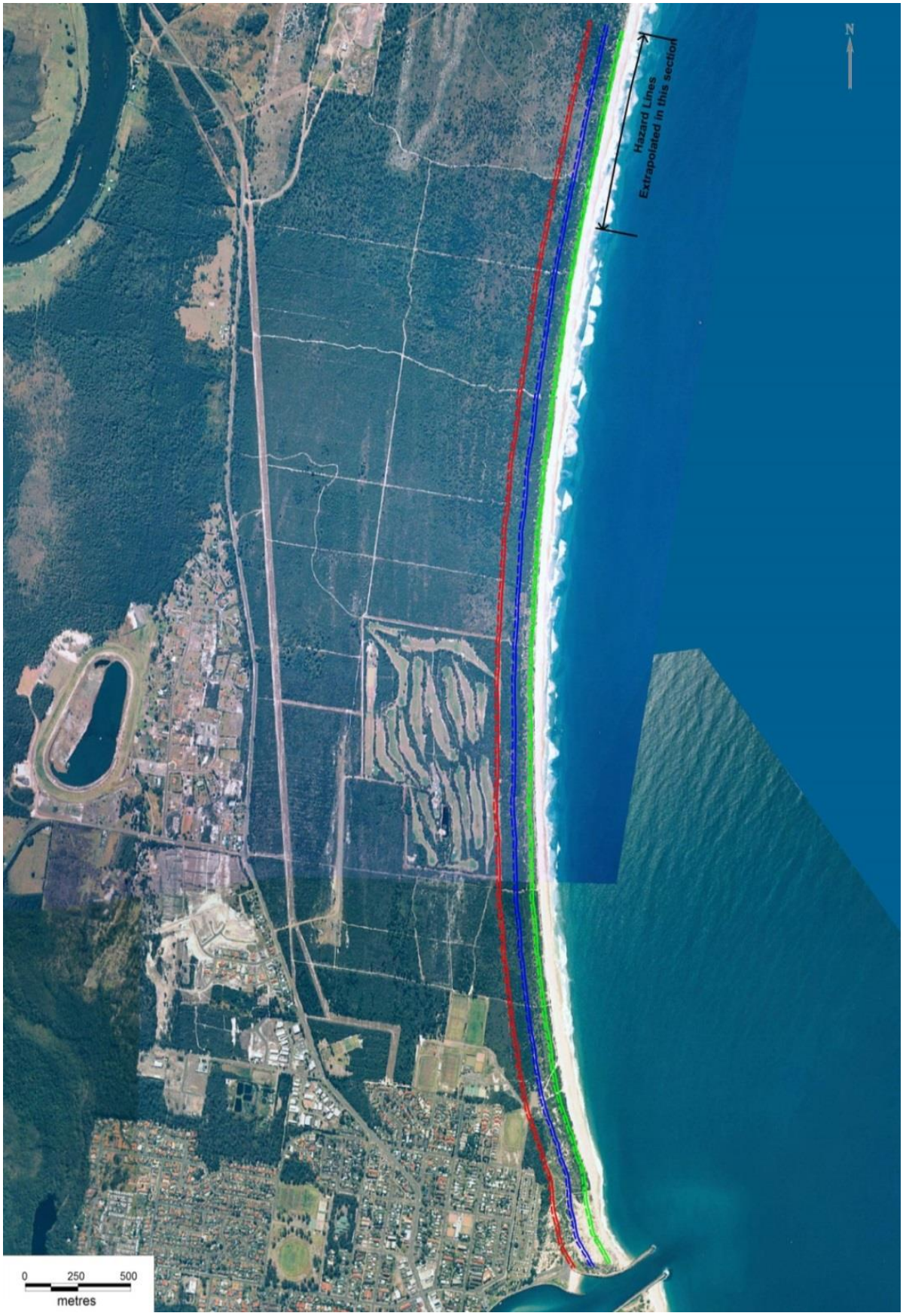
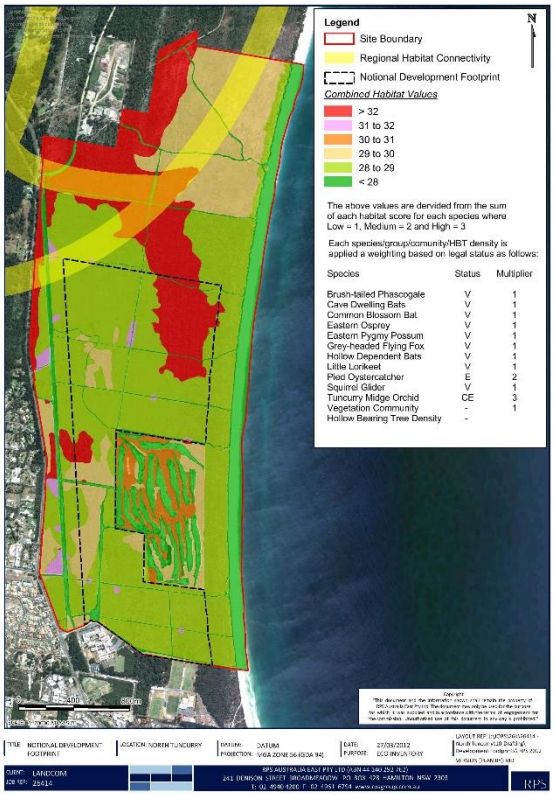


Figure 15: Coastal Hazard diagram (Source Worley Parsons 2019)



Indicative Footprint from referral (RPS 2011)

2014 SSS Study Masterplan (ELA 2014)

Final Biocertification Footprint (ELA 2021)

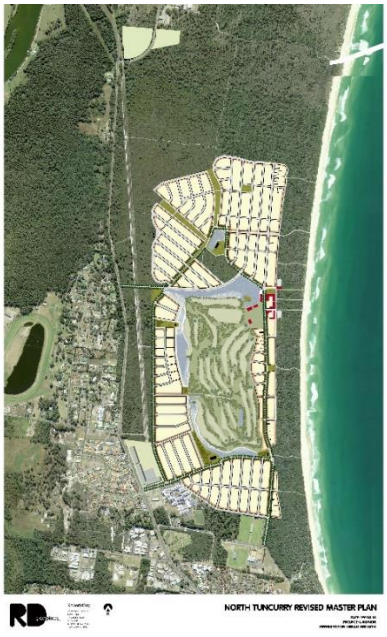


Figure 16: Alternative Masterplans considered

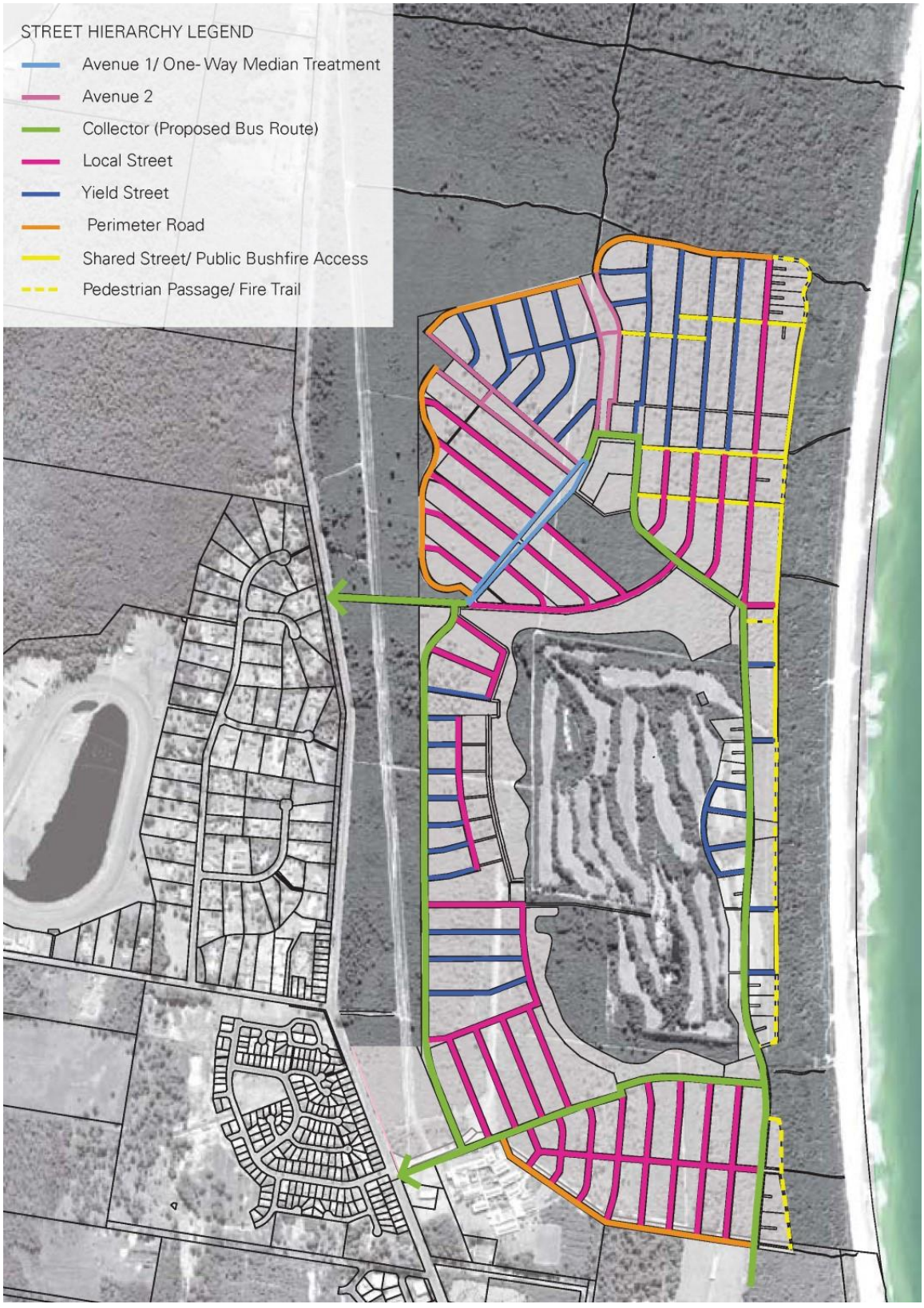


Figure 17: Entry and exit points and internal road hierarchy (Source Roberts Day 2019 and AECOM 2019)

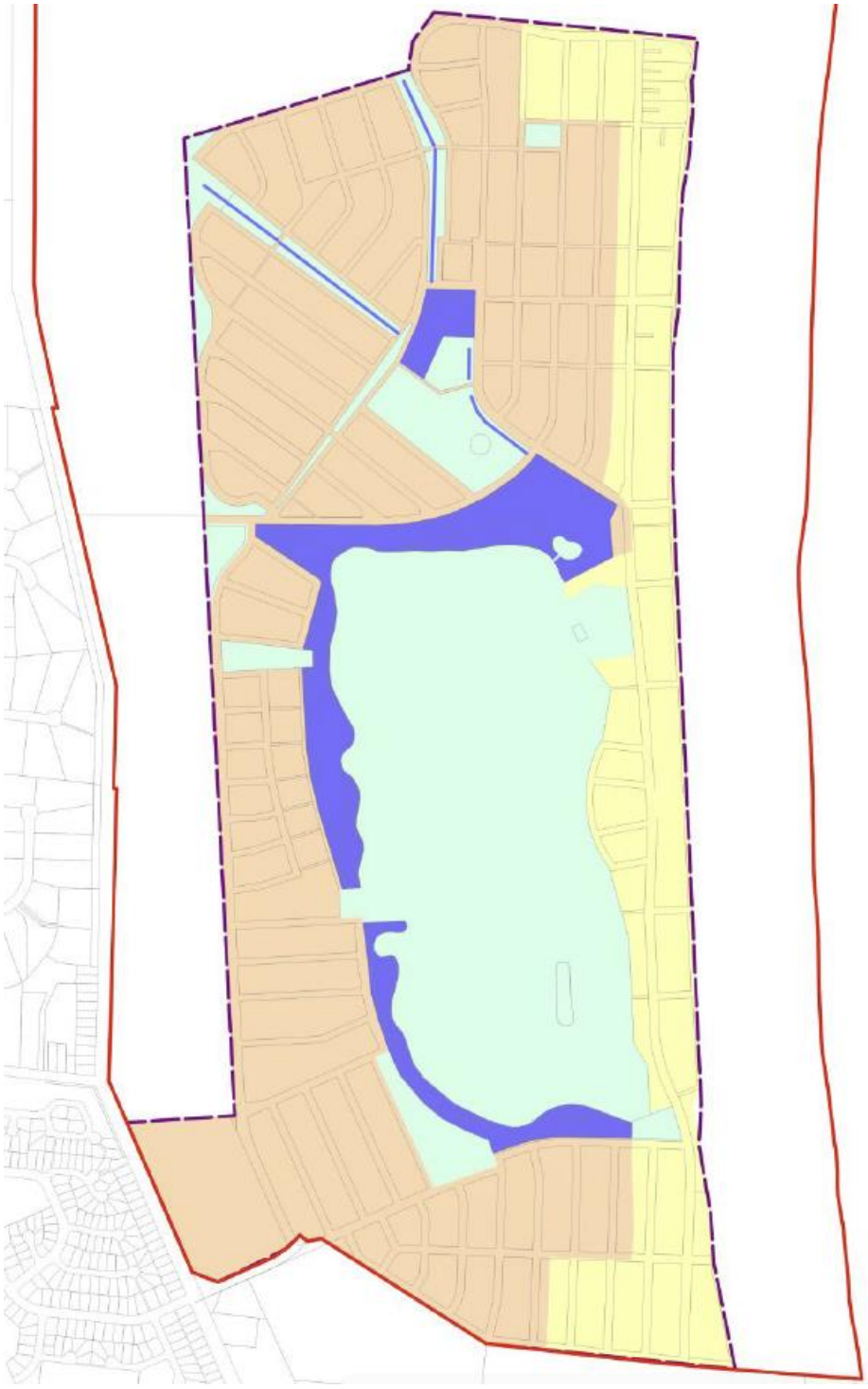


Figure 18: Integrated Water Cycle Management Strategy (Source SMEC 2019)

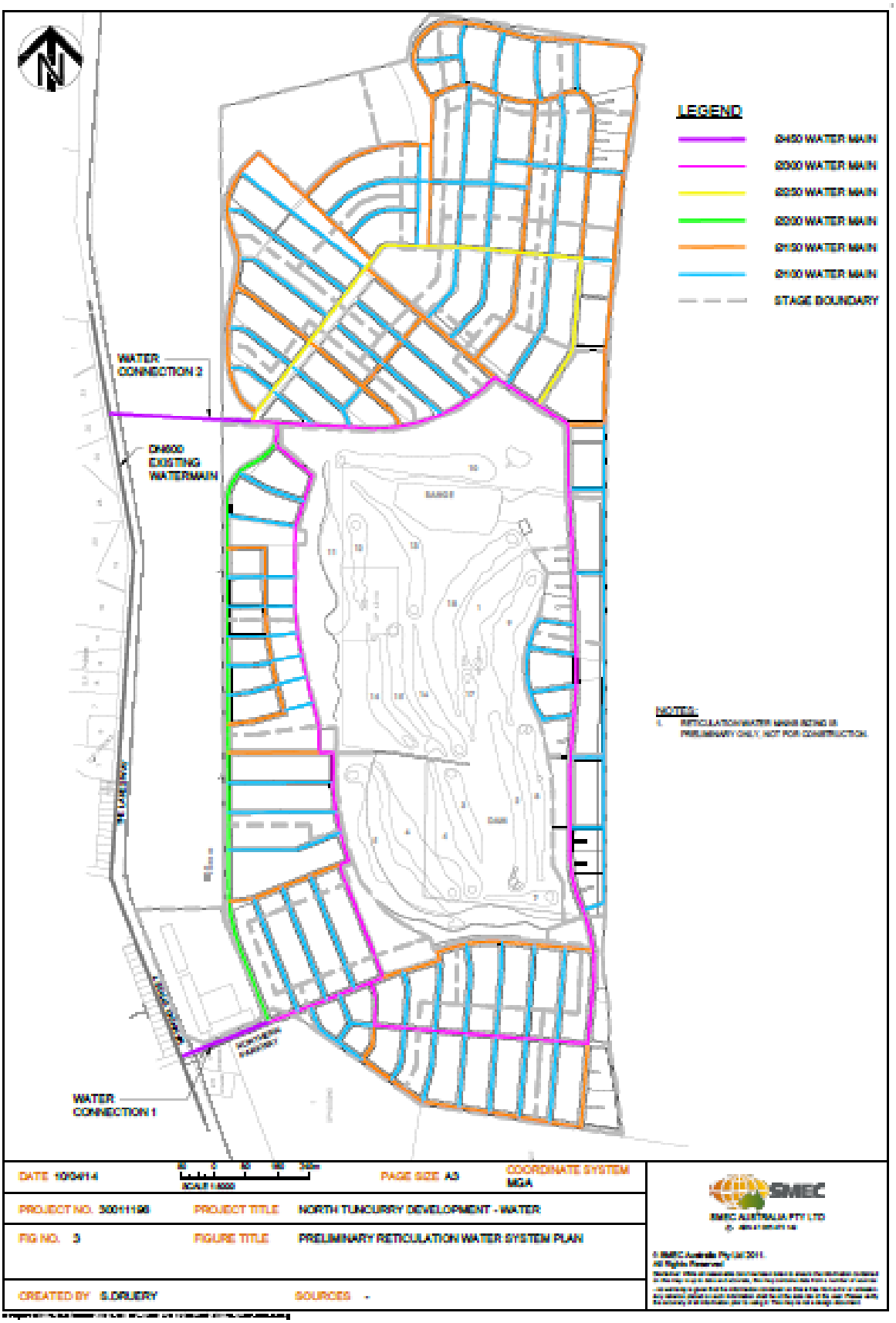


Figure 19: Water servicing plan (Source SMEC 2019)

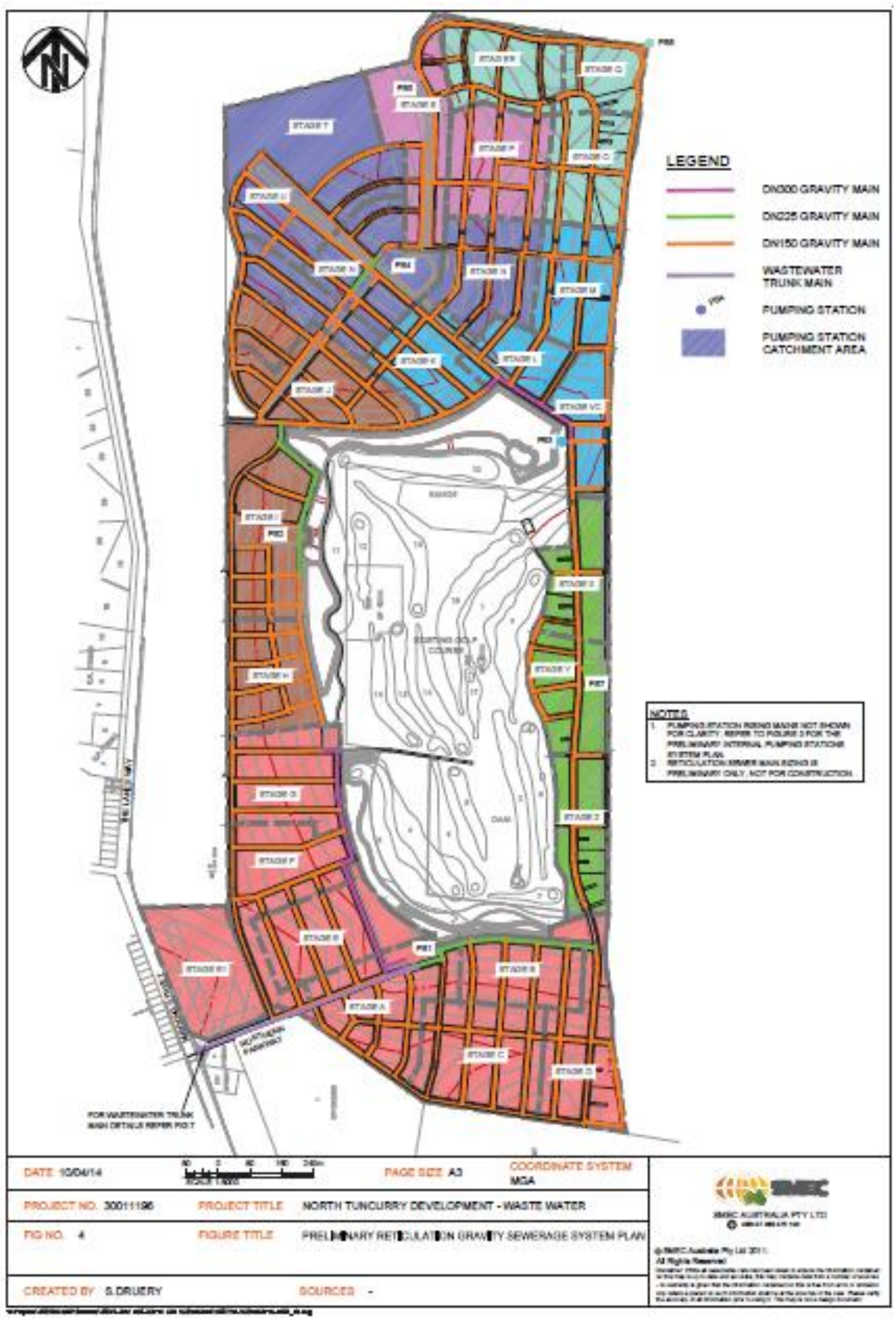


Figure 20: Waste water management (SMEC 2019)

2.6 Maintenance Plans for waste disposal, sediment and erosion control, sewerage and stormwater storage

Operation and maintenance plans for waste, sediment control, sewerage, wastewater and stormwater will be addressed as part of the preparation of Development Applications at the detailed design stage and form part of the EMPs.

2.7 Zoning and management plans for open space and conservation areas

Figures 8 and **9** shows the current and proposed zoning of the action area and study area which includes E2 zoning for the proposed on-site conservation/offset areas which will also be subject to the registration of a Biobank Agreement and a fully funded, Biobank site management plan.

Mgt Plans for open space will be prepared in accordance with the *Local Government Act* 1993.

2.8 Standards adopted for conservation of ecosystems, stormwater discharge, energy and transport efficiency

The standards adopted for conservation of ecosystems, stormwater discharge, energy and transport efficiency are detailed in the following reports:-

- ELA 2020. North Tuncurry Biobank Site Management Plan (**Appendix D14**)
- AECOM 2019. North Tuncurry Development Project Traffic Management and Accessibility. Report prepared for Landcom, 8 March 2019 (Appendix L of **Appendix H**).
- Roberts Day 2019. *Urban Design Report North Tuncurry*. Report prepared for Landcom, January 2019 (Appendix B of **Appendix H**).
- SMEC 2019a. Review of Water and Wastewater Servicing Strategies for the North Tuncurry Development Project. Letter to Savills Australia on behalf of Landcom, 29 March 2019 (Appendix X of **Appendix H**) .
- SMEC 2019b. North Tuncurry Development Project Integrated Water Cycle Management Strategy. Report prepared for Landcom, 11 April 2019 (Appendix P of **Appendix H**).
- Worley Parsons 2019 North Tuncurry Coastal Processes, Hazards and Planning Study – Hydrogeology. Report prepared for Landcom, Worley Parsons Resources and Energy, 6 March 2019 (Appendix I of **Appendix H**).

2.9 Consistency of proposed action with relevant environmental guidance and policy

The proposed action is consistent with relevant environmental guidance and policy including the National Water Quality Management Strategy guidelines.

2.10 Identification and quantification of hazards and risks (flood, landslip, storm surge, air pollution, chemical spills, failure of treatment systems

Relevant hazards and risks have been identified in the following reports and incorporated into the detailed Master Planning for the study area (Roberts Day 2019):-

- Doo-wa-kee, Rob Yettica Cultural Heritage 2011 Aboriginal Cultural Heritage Assessment of North Tuncurry
- Douglas and Partners 1988. Report on Geotechnical Investigation - North Tuncurry Planning Study

- RPS 2019. Bushfire Assessment. North Tuncurry Development Project
- SMEC 2014. North Tuncurry Development Project Groundwater Modelling Technical Report. Report prepared for Landcom, June 2014.
- SMEC 2014. North Tuncurry Development Project Detailed Acid Sulfate Soil Investigation. Report prepared for Landcom, July 2014
- Worley Parsons 2010. North Tuncurry Residential Land Development Soil Contamination Investigation, 23 April 2010
- Worley Parsons 2019. North Tuncurry Coastal Processes, Hazards and Planning Study, 6 March 2019

3. Feasible alternatives and consequences of not proceeding with the action

Section 3 of the Guidelines for the PER for the North Tuncurry Mixed Use Development issued on 4 July 2011 require the PER to describe, to the extent reasonably practical, any feasible alternatives to the proposed action including:-

a) if relevant, the alternative of taking no action;

b) constraints and opportunities for alternative development footprints and uses;

c) a comparative description of the impacts of each alternative on EPBC Act listed threatened species and ecological communities; and

d) sufficient detail and supporting information to make clear why any alternative is preferred to another

The short, medium and long-term advantages and disadvantages of each alternative should be discussed.

This Section addresses these requirements.

The growth of Forster/Tuncurry is constrained by National Parks to the north (Darawank NR) and to the south (Booti NP), by the ocean to the east and by Wallis Lake and the Wallamba River to the west. Land available for future development is therefore very limited.

The Midcoast LGA is forecast to experience a population increase of between 10 and 20% to the year 2036 (DPE 2016). The twin towns of Forster/Tuncurry enjoy the most attractive lifestyle benefits in the LGA and this coupled with the recent surge in the work from home community means they could expect to achieve growth toward the top end of this range. Adopting a mid-point growth rate of 15% would see demand for an additional 1,500 dwellings in the next 15 years alone.

The North Tuncurry site is the last significant site available for rezoning and has been identified for urban release in State and Local Government planning strategies for over 30 years. The site is critical for housing supply in the district. The proposal has also committed to:

- Provide 5-10% of all new homes as affordable housing
- Deliver 10-15% of all new dwellings as diverse housing
- Achieving 20% of dwellings to be 'Design' and As-built' Liveable Housing Australia Silver Certified

These outcomes provide considerable community benefit particularly considering the age and socio-economic profile of the population. Should the project not proceed not only would these outcomes be lost but the reduced housing supply would place considerable upward pressure on housing prices.

The provision of an additional 2,100 dwellings will provide enormous economic benefit to Forster/Tuncurry not only in job creation during construction and within the employment zones but by delivering approximately 4,000 new residents to support existing businesses.

The action will result in the protection and in perpetuity active conservation management of a significant proportion of the known population of the critically endangered *Corunastylis littoralis* (Tuncurry Midge Orchid) which otherwise would not occur given the classification and current use of the subject land.

The site is also the subject of a Native Title Agreement between the Crown and the traditional owners – Lakkari. The Agreement provides significant benefits financially and in employment opportunities for this group. Should the project not proceed these benefits would be lost.

A number of alternative Master Plan designs have been considered during the extensive planning stage of the proposal as shown in Figure 16. The final Master Plan has the smallest footprint and thus the smallest impacts to MNES and is the preferred Master Plan for ecological considerations.

4. Description of the Environment of the study area

Section 4 a-c of the Guidelines for the PER require the PER to include a description of the environment of the proposed site and the surrounding areas that may be affected by the action, including:-

a) a description (with maps) of the location, extent, distribution and species composition of vegetation on and surrounding the site;

b) a description (with maps) of the geology, soil type/s and geomorphology of the site - supported by adequate data;

c) a description (with maps) of the area, distribution and abundance of invasive species within and surrounding the project area;

This Section addresses these requirements.

4.1 Site history

The Study area has been subjected to numerous historical disturbances including forestry activities, mineral extraction, wildfire and recreational uses.

The study area, previously known as Tuncurry State Forest No. 283, has been subject to historic planting of various *Pinus* species since the1890's with the earliest documented planting in 1911 (Bailey 1931). Bailey (1931) describes the methods of planting as either 'cleared and burnt', 'felled and burnt' or 'brushed, mattocked and planted' to make way for pine plantations. Remnants of these pine plantations are still evident as dense stands of pine or where pine is a co-dominant species (**Figure 4**).

The northern part of the study area has also been subject to mineral sands extraction in the 1960's and 1970's (**Figure 4**).

The study area has had a number of wildfires burn part of the area, the most recent being a wildfire in October 2019 which affected most of Darawank Nature Reserve to the north of the study area (**Figure 21)**.

There are numerous 4WDs tracks across the study area providing formal and informal access to Nine Mile Beach which has also led to destruction and damage to vegetation, rubbish dumping and weed invasion (**Figure 25**).

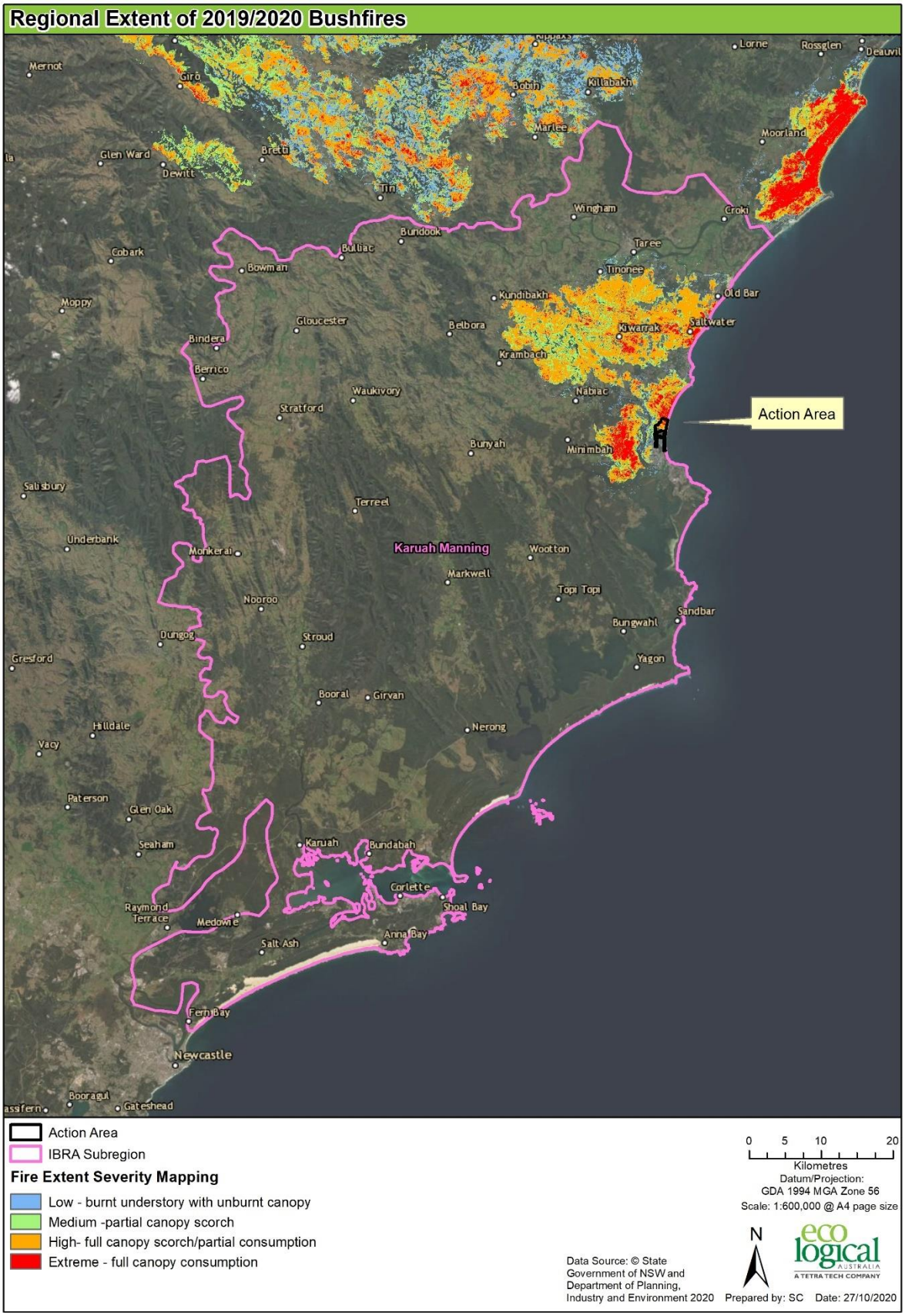


Figure 21: Regional extent of 2019/2020 bushfires (Source Google Engine Burnt Area Maps – DPIE 2020)

4.2 Description of vegetation and species composition on and surrounding the study area

Vegetation surveys conducted within the study area by RPS 2012 included vegetation mapping and condition assessment, 23 full floristic plots (conducted according to the BCAM (DECW 2011) and 48 rapid data points (methodology outlined in RPS 2012 – **Appendix D5**). This vegetation mapping and condition stratification was validated and refined by Eco Logical Australia (ELA) in March 2014 with a further 13 biometric vegetation survey plots collected in March 2014, four in May 2015 and 29 plots in June 2020 (ELA 2020 & 2021 **Appendix D10** and **D14**) and is shown in **Figure 22**.

ELA mapped the vegetation using biometric vegetation types which differed from the names used by RPS 2012. This conversion between RPS 2012 and ELA vegetation mapping is shown in **Table 2**.

The study area (635.79 ha) was found to include 545.64 ha of native vegetation comprising three vegetation types, split into 13 condition zones, none of which are listed as endangered ecological communities under the EPBC Act. The remaining 90.15 ha of the study area comprises cleared land (mainly the Foster -Tuncurry Golf Course, clearing under an existing 32kv powerline, roads, 4WD tracks and beach/sand).

The native vegetation communities on-site are:

- Blackbutt – Smooth-barked Apple shrubby open forest on coastal sands of the southern NSW North Coast Bioregion;
- Banksia dry shrubland on coastal sands of the NSW North Coast Bioregion; and
- Coast Banksia – Coast Wattle dune scrub, Sydney Basin and South East Corner.

The distribution of these vegetation communities is related to soil depth and distance from the ocean. Generally, forest and woodland vegetation occurred in areas with increased soil depth, with shrublands occurring in areas with shallower soils across the remainder of the site.

Full descriptions and a characteristic photo of each vegetation type within the study area are included in Appendix L of **Appendix D10.**

Table 2: Relationship between the Biometric Vegetation Types mapped by ELA in 2019 and RPS (2012)

Biometric Vegetation Type (ELA)	RPS (2012)
Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern NSW North Coast Bioregion	*Eucalyptus pilularis* Dry Sclerophyll Forest (Dunal)
Banksia dry shrubland on coastal sands of the NSW North Coast Bioregion	Banksia aemula Dry Heathland
Coast Banksia-Coast Wattle dune scrub, Sydney Basin and South East Corner	*Leptospermum laevigatum* Dry Sclerophyll Shrubland
Beach Dune*	Foredune Complex

*Beach dune is not a biometric vegetation type

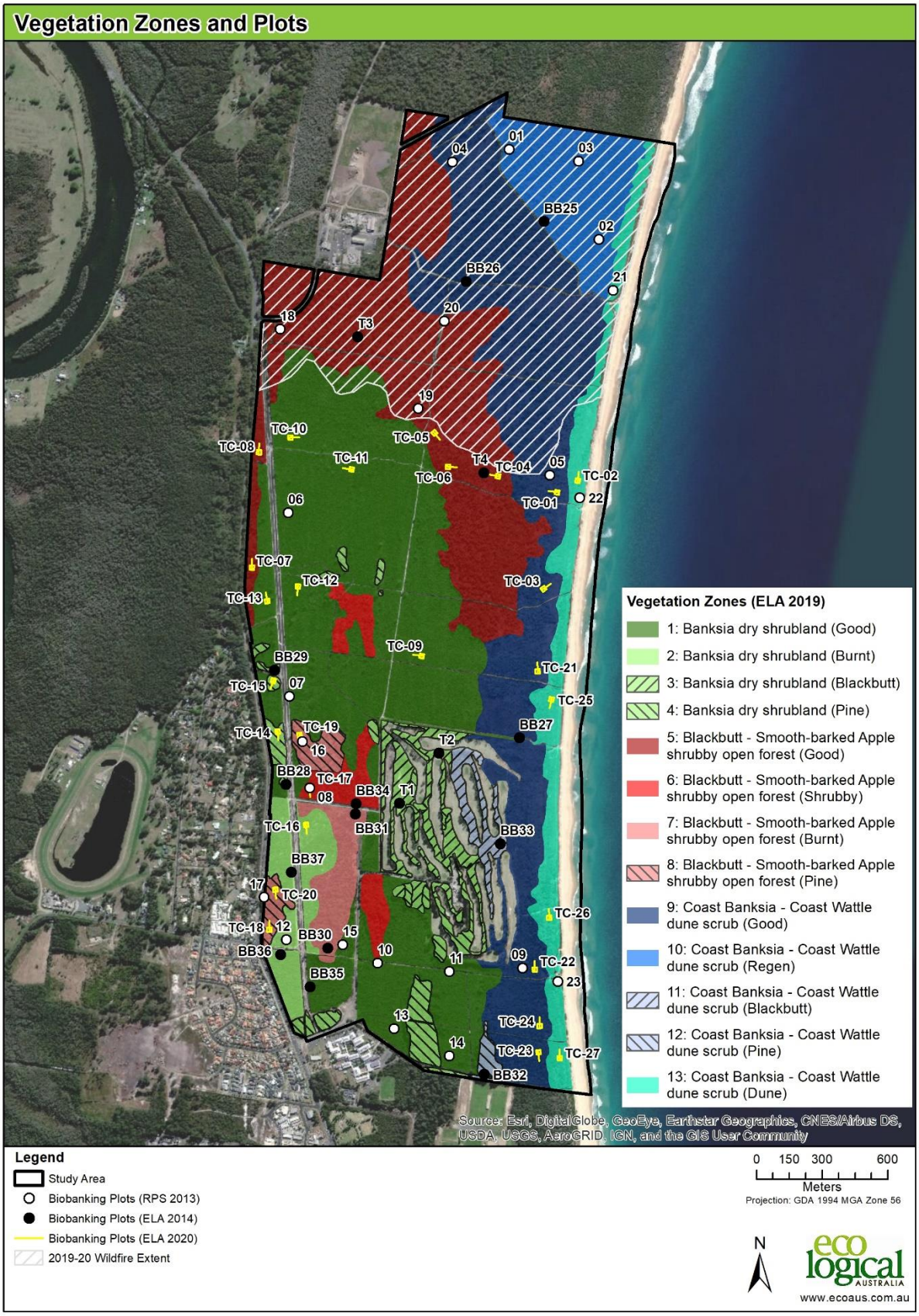


Figure 22: Vegetation zones within the study area and vegetation survey plots

4.3 Description of landform, geology, soils and geomorphology

The landform and geology in the area is described as stable, gently undulating, Holocene quartz sand sheets, beach ridges and low dunes with slopes of 0 - 5%, local relief of 2 - 10 m and an elevation of 3 - 40 m. Low sandy dunes and swales are the dominant landform elements.

Soils are predominately within the Hawks Nest soil landscape. Hawks Nest soils are characterised very deep (150 - 500 cm), well-drained Aeric Podosols (Podzols); deep (100 - <150 cm), rapidly drained Rudosols (Silceous Sands); and shallow (25 - <50 cm), very poorly drained Hydrosols and Organosols (Acid Peats and Peaty Sands) (OEH, 2018). The acid sulphate soil probability in the area is considered low (OEH, 2016).

The topography of the land is considered typical of a beach ridge barrier, comprising an undulating dune field. The landform does not display significant variations in level but instead undulates in a series of crests and troughs formed through the coastal processes that have shaped the land. Topographic maps for the site do not reveal the presence of any watercourses through the site which is normal given the foundation and porosity of the sand preventing runoff of water in storm events.

4.3.1 Geology

The 1:250,000 Geological series (Sheet S1 56-2) Newcastle Map Sheet, indicates that the site is underlain by Quaternary age gravel, sand, silt and clay, ("Waterloo Rock" marine and fresh water deposits) **Figure 23**). Underlying the sediments are the Devonian age: mudstone, sandstone, conglomerate, greywacke, tuff and chert, including the "Barraba Mudstone", "Baldwin Formation" and "Barraba Series" (WorleyParsons, 2010).

Review of the Geological Survey of New South Wales Department of Mineral Resources (1988) report (ref. 15) indicates that the site is located within the Bulahdelah 1:100,000 Geological Sheet, where surrounding areas are known to contain significant mined/quarried deposits and resources of various industrial minerals and rock (Worley Parsons, 2010).

The 1:25,000 Forster Area Coastal Quaternary Geology map prepared by the Department of Primary Industries defines the subject site within the following coastal barrier system. The beach is Holocene sandy beach: marine sand, shell, gravel (Qhbb); the dunes are Holocene dune: marine sand (Qhdb) and the vegetated areas on the subject site are underlain by Holocene beach ridge and associated sandplain, marine sand, shell, gravel (Qhbr).

4.3.2 Soils

Soils are predominately within the Hawks Nest soil landscape with a small area within the Frogalla Swamp soil landscape unit. Hawks Nest soils are characterised by well drained aeric podsols on older dunes with deep rudosols on younger seaward dunes. Frogalla Swamp soils comprise of poorly drained acid peats/siliceous sands or acid/peat/humic gley intergrades (ERM 2010a) (**Figure 24**).

4.3.3 Geomorphology

The topography of the land is considered typical of a beach ridge barrier, comprising an undulating dune field. The landform does not display significant variations in level but instead undulates in a series of crests and troughs formed through the coastal processes that have shaped the land. Topographic maps for the site do not reveal the presence of any watercourses through the site which is normal given the

foundation and porosity of the sand preventing runoff of water in storm events. Previous studies for the land have shown that the groundwater table for the land is highly variable. Variations in groundwater levels can be in the order of several metres. Such variations of water table generally occur after significant rain periods (Coastplan 2005).

The closest surface water bodies are the Wallamba River and Millers Mistake Creek situated approximately between 0.5 and 1.0 km to the west of the site, the Nine Mile Beach (Pacific Ocean) located approximately 300 m to the east, and Wallis Lake situated approximately 1.0 km to the south. The majority of the site is characterised by low lying remnant sand dunes in the west, through to more defined, undulating dunes in the east. The dunes are arranged roughly parallel to the coastline (Worley Parsons 2010).

Adjacent to the site, the Wallamba River (which flows south into Wallis Lake estuary) is tidal, and significant mangrove and saltmarsh communities are associated with the downstream limits of the river. The Wallis Lake estuary is a complex system of lakes, rivers and interconnecting channels which separate Tuncurry and Forster.

The geology, soils and major hydrological flows are shown in **Figures 24** and **25**.

4.4 Distribution and abundance of invasive species within and surrounding the project area

Occasional occurrences of *Lantana camara* (Lantana) and *Chrysanthemoides monilifera* (Bitou bush) (weeds of national significance) were observed by RPS (2012) across the site along with several other environmental weed species and exotic grasses. *Pinus elliottii* (Slash Pine) dominate the canopy in several places as a relic of previous plantations in the study area (**Figure 25**). However, most habitats away from tracks and other disturbance have few or no weeds and are in moderate to good condition.

Figure 23: Geology of study area (Source NSW 1:250,000 Newcastle Geological Mapsheet)

Figure 24: Soils of study area

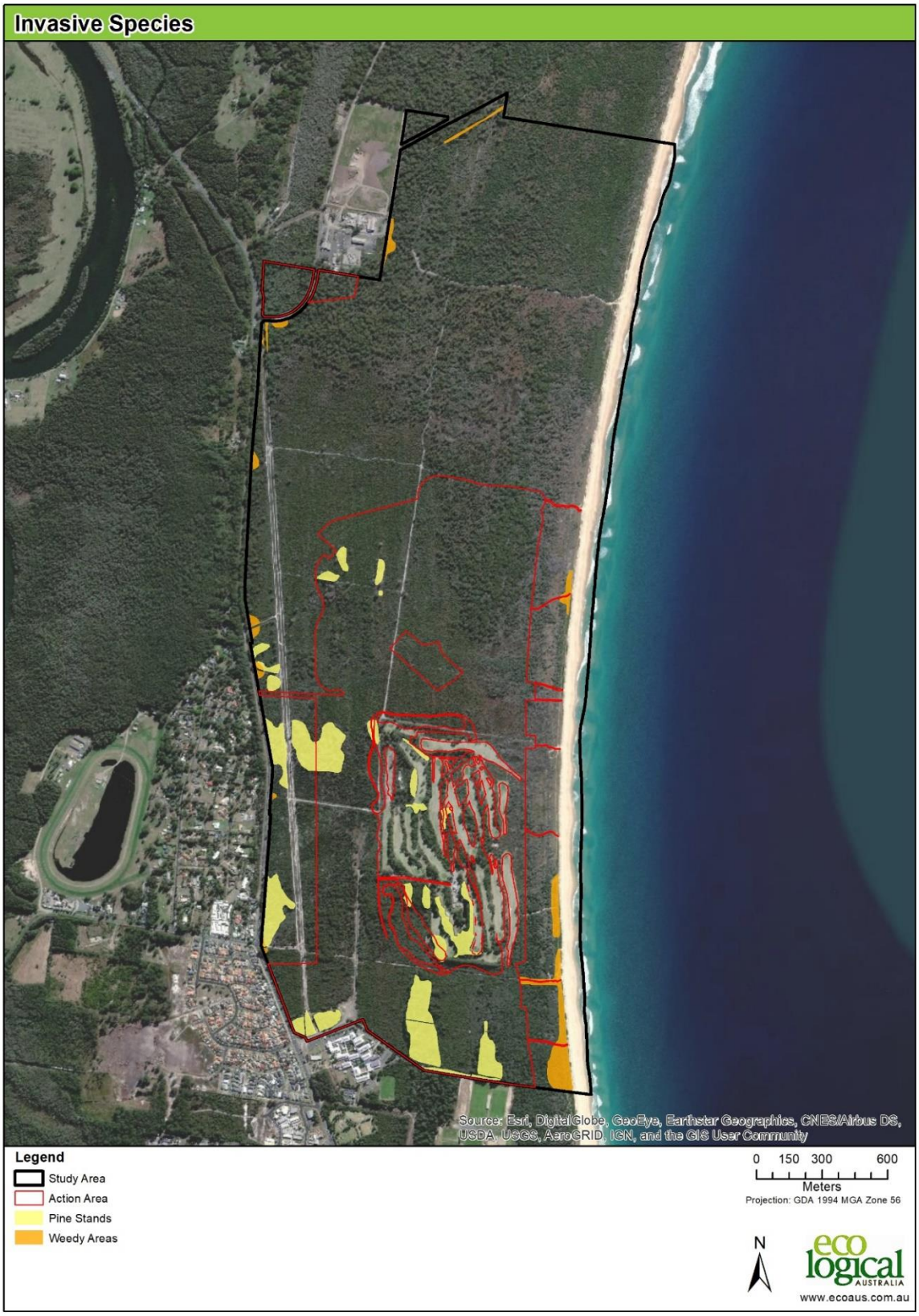


Figure 25: Invasive species within the study area

4.5 Description of nature, location and extent of EPBC Act listed threatened species and ecological communities and suitable habitat likely to be present on and in the vicinity of the proposed action

To determine MNES relevant to the proposed action. The following tasks were completed.

- Literature review of previous ecological surveys conducted across the site (ERM 2005 & 2010a, Paget 2008, RPS between 2010 and 2012 and ELA 2020)
- A review of relevant databases including the NSW Wildlife Atlas (now BioNet) and EPBC Act Protected Matters Search Tool (PMST)
- Aerial photography interpretation

The PER assessment has used a 10 km radius of the centre of study area to define "in the vicinity of the proposed action" and used these co-ordinates to create an initial list of MNES using the Protected Matters Search Tool (PMST) on 9 August 2021, to ensure any relevant recent records of EPBC Act listed threatened species were captured and described in this PER (**Appendix I**).

The PMST reported five (5) listed threatened communities and seventy-seven (77) listed threatened species (27 excluding exclusively marine species such as Cetaceans, Albatross, Petrels and Fish) that may occur in the study area and may be impacted by the proposed action.

No additional EPBC act listed threatened species or communities were considered likely to, or have potential to, occur in the study area.

A 'likelihood of occurrence' assessment (**Appendix J)** was undertaken based on the results of these combined database searches, habitat types and condition present in the study area, connectivity to other areas of habitat and past survey records with those species 'known to occur' or considered 'likely to occur' on or 'within the vicinity' of the proposed action area summarised in **Table 3**. All other species recorded by the PMST search are considered 'not likely to occur' for the reasons stated in **Appendix J**.

No EPBC Act listed ecological communities are known to occur in or adjacent to the study area. **Figure 26** shows the distribution of three EPBC Act listed ecological communities in the '*vicinity of the study area'* (10km). These TECs are restricted to the margins of Lake Wallis and the Wallamba and Coolongolook Rivers. There are no rivers or creeks within the study area.

Eleven (11) threatened species (4 flora and 7 fauna) are considered to have potential to occur on-site (or are already known to occur) or have been recorded in the '*vicinity of the study area*' and were subject to targeted survey in accordance with EPBC Act and NSW survey and assessment guidelines (DEC 2004, DECC 2009, DSEWPC 2004a 7b, DEWHA 2010a, 2010b, 2013) and are considered further in this PER. These species are summarised in **Table 3** and their distribution in the locality (10km radius of the study area) is shown in **Figure 27** and **Figure 28** respectively**.**

Whilst the Koala has previously been recorded south (1988 and 1991) and north-west (2013) of the study area, and the Greater Glider has been recorded 10km north of the study area, these species are not subject species for this PER as they were not listed at the time the controlled action decision was made on 6 June 2011 but have been included in the assessment due to public interest.

Table 3: Matters of national environmental significance considered in this PER

Scientific name	Common name	EPBC Act status	Likelihood of occurrence and justification
Endangered Ecological Communities			
Coastal Swamp Oak Forest		Endangered	No – not recorded in study area.
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia		Critically Endangered	No – not recorded in study area.
Lowland Rainforest of Subtropical Australia		Critically Endangered	No – not recorded in study area.
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion		Endangered	No – not recorded in study area.
Subtropical and Temperate Coastal Saltmarsh		Vulnerable	No – not recorded in study area.
Threatened Flora			
Allocasuarina defungens	Dwarf Heath Casuarina	Endangered	**Low**. Only known from 5-10 km west of study area at Nabiac. Not recorded in study area despite intensive survey effort since 2005.
Allocasuarina simulans	Nabiac Casuarina	Vulnerable	**Low**. Only known from 5-10 km west of study area at Nabiac. Not recorded in study area despite intensive survey effort since 2005.
Corunastylis littoralis	Tuncurry Midge Orchid	Critically Endangered	**Known** - This species was recorded on site during field investigations between 2008 and 2013. Subsequent monitoring has confirmed persistence of species in study area.
Cryptostylis hunteriana	Leafless Tongue-orchid	Vulnerable	**Low-Moderate** - Not observed during targeted field surveys, however potential habitat exists within the forest/heath communities on site since 2005.
Threatened Fauna			
Anthochaera phrygia	Regent Honeyeater	Critically Endangered	**Low** – Not recorded during field survey. Limited foraging resources available on site (occasional Swamp Mahogany within Blackbutt Forest), therefore only has limited potential to occur. No records within 10km of the study area
Dasyurus maculatus maculatus	Spot-tailed Quoll	Endangered	**Low-Moderate** - Not detected during field surveys. Shelter habitat is limited however foraging habitat exists and therefore this species has the potential to occur within the site. The sites connectivity to Darawank Nature Reserve may further increase the potential of occurrence. Recorded 3 km north-west of the study area in 2006
Lathamus discolor	Swift Parrot	Critically Endangered	**Moderate** - Not recorded during field survey, however some winter foraging resources (Blackbutt Forest with Swamp Mahogany) are available on site, therefore has the potential to use the site from time to time. Three observations south of study area in urban parts of Foster (2002, 2007, 2008) and two north-west of study area in 2010). Record in study area (2002) is from Halliday's Point 10 km north of study area (incorrect co-ordinates in database).

Scientific name	Common name	EPBC Act status	Likelihood of occurrence and justification
Phascolarctos cinereus	Koala	Vulnerable	**Low**. Not recorded in study area despite intensive survey effort over 15 years since 2005. Abundance of preferred browse trees very low, occasional Swamp Mahogany in Blackbutt Forest Not required to be assessed in PER as listed after date of controlled action decision**.**
Potorous tridactylus	Long-nosed Potoroo	Vulnerable	**Low-** Not detected during targeted field surveys on site since 2005. Some potential habitat exists within heath communities on site and therefore this species has the potential to occur within the site. Recorded 5-10 km west of study area at Nabiac by ELA 2016.
Pseudomys novaehollandiae	New Holland Mouse	Vulnerable	**Known -**Recorded on-site during targeted surveys in 2020. Also recorded by ELA at Nabiac (2016) and known from Booti National Park approx. 10km south of study area.
Petauroides volans	Greater Glider	Vulnerable	**Low**. Not recorded in study area despite intensive survey effort over 15 years since 2005. Not required to be assessed in PER as listed after date of controlled action decision
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	**Known (foraging habitat)** - This species was recorded on site during field surveys. No camps occur in or adjacent to the study area.
Chelonia mydas	Green Turtle	Vulnerable	**Known** - This species was recorded on Nine Mile Beach in 2007 and 2009

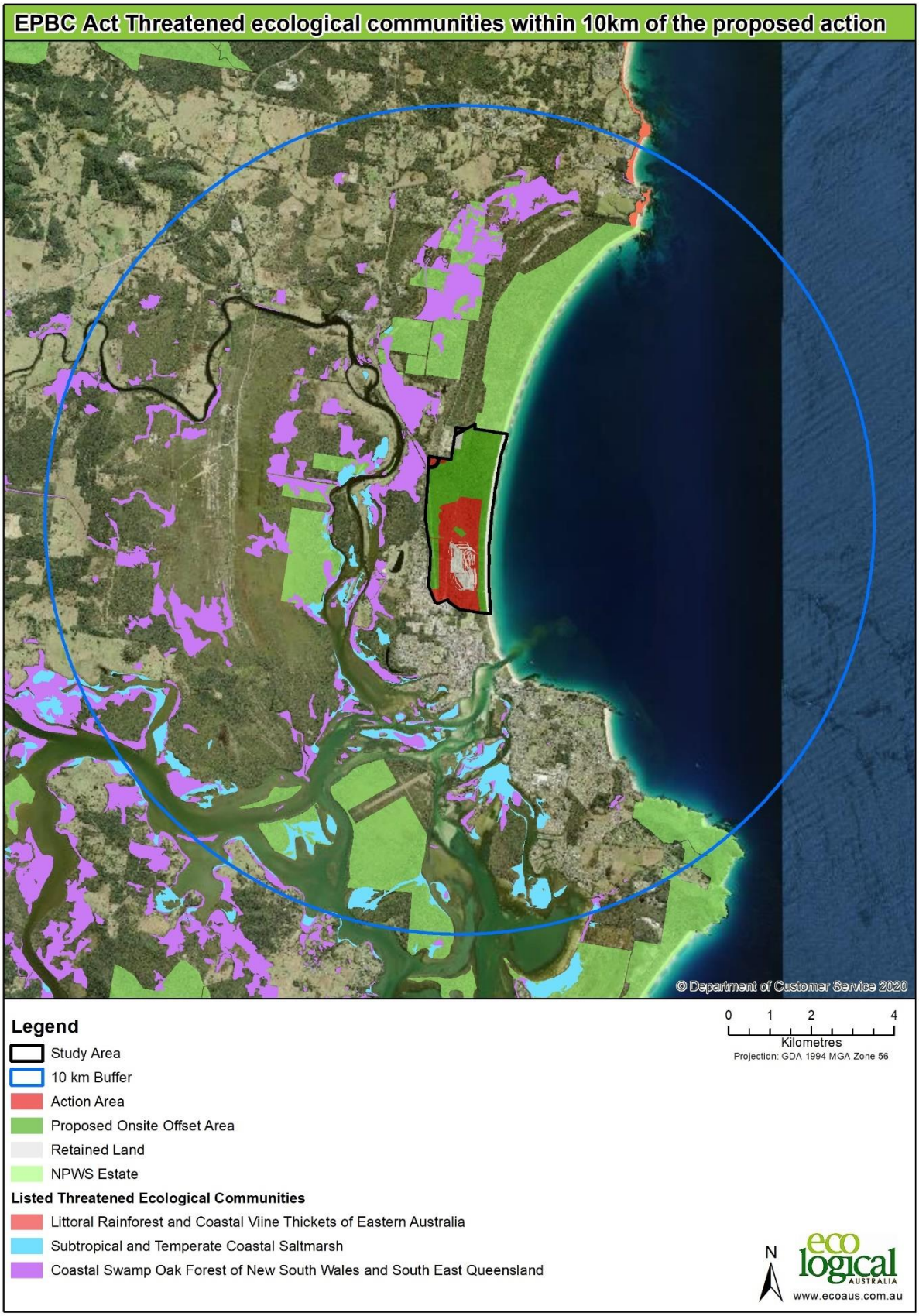


Figure 26: Distribution of threatened ecological communities in the locality

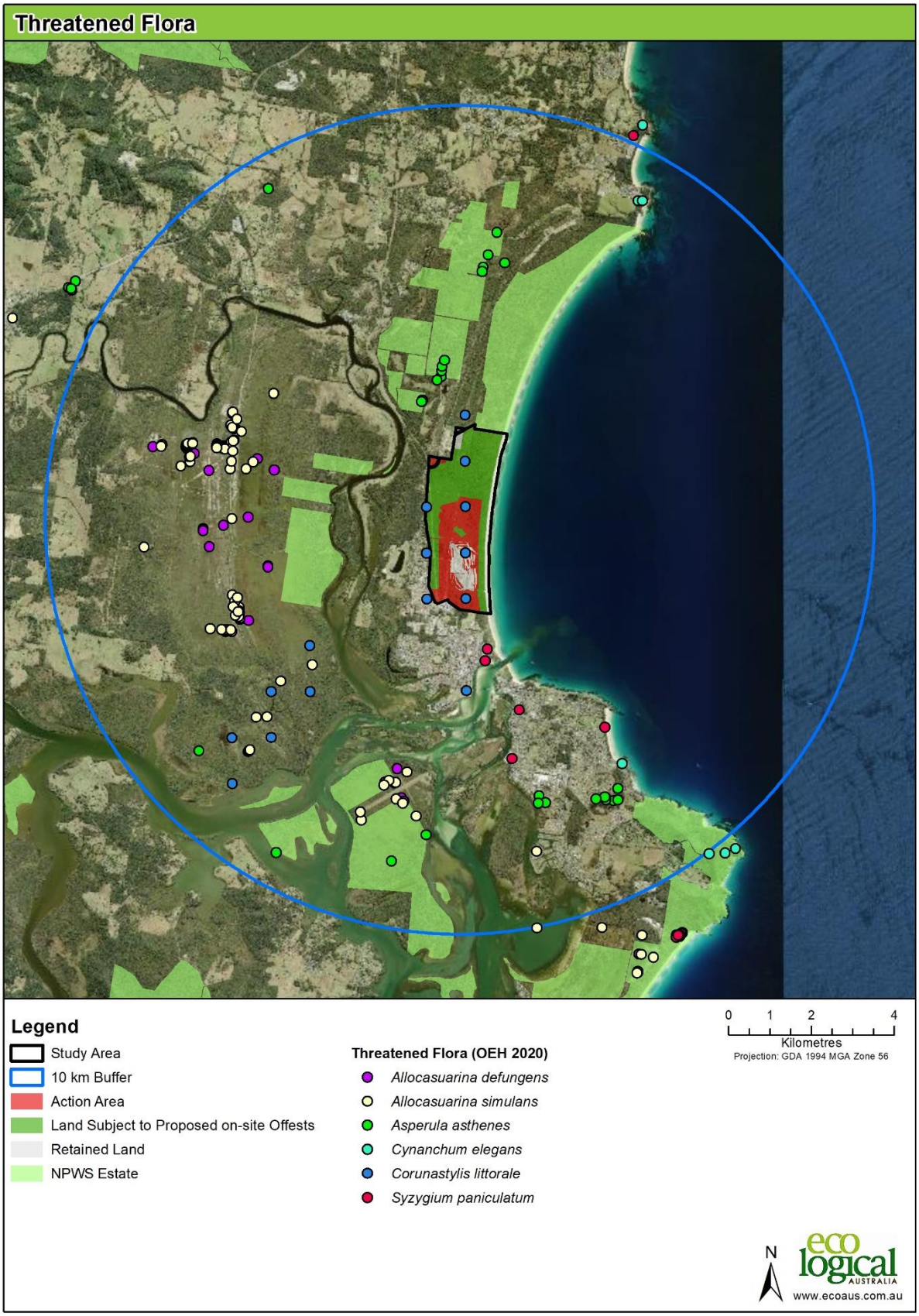


Figure 27: Records of EPBC Act listed threatened flora species within 10km of the proposed action site

Note: Incorrect records of *Allocasuarina defungens* and *A. simulans* east of Wallamba River not shown

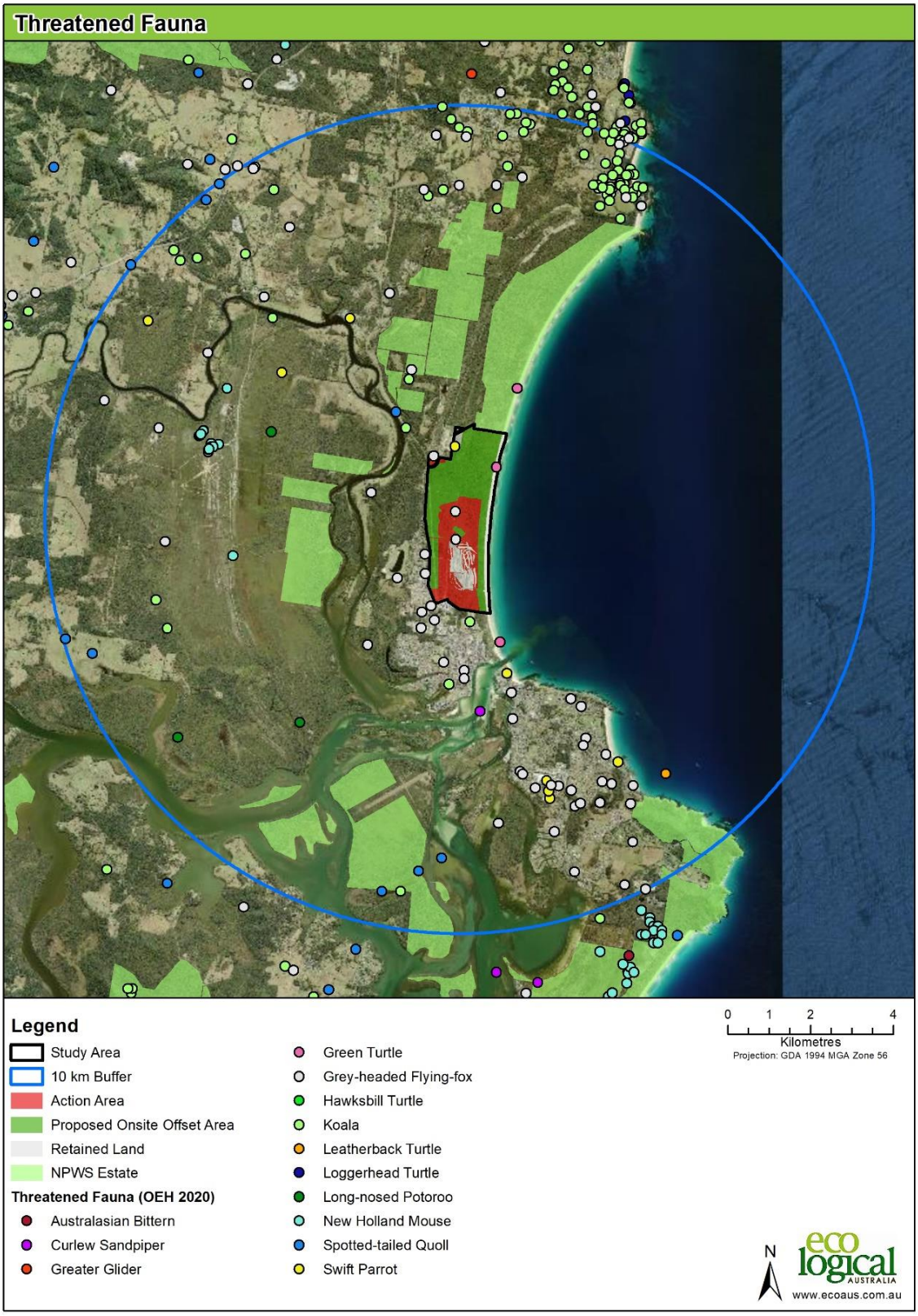


Figure 28: Records of EPBC Act listed threatened fauna species within 10km of the proposed action site

Note this figure does not include migratory species as these are not required to be assessed for this PER. The 2002 Swift Parrot record shown within the study area is a database error as was recorded at Halliday's Point. The Koala and Greater Glider have been previously recorded in the vicinity of the study area, however, they are not required to be considered in this PER as they were not listed as threatened species when the controlled action decision was made.

4.6 Targeted surveys for the presence, distribution and abundance of EPBC Act listed threatened species on and in the vicinity of the proposed action

4.6.1 Previous surveys

The study area has been the subject of several ecological surveys since 2005 (ERM 2005 & 2010a & b; Paget 2008 and RPS 2009-2012).

This PER has been informed by these previous surveys and in particular the 'Ecological Inventory Report – North Tuncurry' compiled by RPS (2012 – **Appendix D5**) which incorporates and summarises the findings of these previous surveys. Copies of previous ecological surveys reports undertaken in the study area are included as **Appendix D1-D14**.

Targeted surveys, during periods appropriate to detect the target species, were undertaken for all threatened flora and fauna species listed under the EPBC Act, which were considered as having potential to occur within the North Tuncurry site as outlined in Section 4.5, Table 3 and Appendix A of RPS (2012), specifically;

- *Corunastylis littoralis* (Tuncurry Midge Orchid
- *Cryptostylis hunteriana* (Leafless Tongue-orchid)
- *Allocasuarina defungens* (Dwarf Heath Casuarina)
- *Allocasuarina simulans* (Nabiac Casuarina)
- New Holland Mouse
- Long-nosed Potoroo
- Spotted-tail Quoll
- Swift Parrot
- Regent Honeyeater

Tables 4 provides a summary of the threatened flora survey effort undertaken by ERM, Paget and RPS across the study area (87 person days and 75 floristic plots), whilst **Table 5** shows a breakdown of survey effort for each subject species. **Figure 29** shows the distribution of survey effort by RPS for threatened flora across the study area, with **Figure 30** showing the location of random quadrat surveys specifically targeted to determine the abundance of *Corunastylis littoralis.*

Similarly, targeted surveys for EPBC Act listed fauna species considered '*likely to occur*' (particularly New Holland Mouse, Long-nosed Potoroo, Spot-tailed Quoll, Regent Honeyeater, Swift Parrot and Grey-headed Flying Fox) as well as NSW listed threatened fauna species (Squirrel Glider, Brush-tailed Phascogale, Eastern Pygmy Possum, Powerful Owl, Glossy Black Cockatoo, Little Lorikeet and various micro-bat species) have also been conducted across the study area using the following survey techniques: diurnal bird surveys; call playback; spotlighting; Elliott and cage traps; pit fall traps; hair tube surveys; anabat ultrasonic call detectors; harp traps; habitat assessments and incidental observations.

The details, including survey locations, stratification units, weather conditions during surveys and total survey effort, are outlined in RPS (2012). A summary of survey effort in relation to EPBC Act listed threatened fauna undertaken by ERM, RPS and ELA is included in Table 6 and shown in **Figures 31, 32, 33** and **34**.

Figures 36 and **37** show all records of MNES recorded on or in the vicinity of the study areas following targeted survey and that are subject to the assessment requirements of this PER.

Table 4: Threatened flora survey effort in relation to EPBC Act listed threatened species considered in this PER and National guidelines

Target Species	Method		Coast Banksia – Coast Wattle 166 ha	*Banksia* Dry Shrubland 210 ha	Blackbutt – Smooth-barked Apple shrubby Open Forest 133 ha	Foredune Complex 32 ha	Site Total 540 ha)
Flora Surveys	Random Meander	Jan-April 2008 Paget (2008)					11 person days in study area
		October 2005 (ERM 2005)	-	-	-	-	2 person days
		November 2008 (ERM 2010					4 person days
		February, March & April, 2010-2012 RPS (2013)					50 person days
		March 2014 (ELA)					6 person days
		May 2015 (ELA)					4 person days
		June & July 2020 (ELA)					10 person days
		Total Undertaken	**22.6**	**23**	**11.6**	**7.7**	**87 person Days**
	20 x 20 full floristic quadrats	November 2008 (ERM 2010)	1	3	2	0	6 quadrats
		2010-2012 (RPS 2013)	6	10	4	3	23 quadrats
		May 2014 (ELA 2019)	5	5	3	0	13 quadrats
		March 2015 (ELA 2019)		2	2		4 quadrats
		June 2020 (ELA 2020)	10	11	14	0	29 Quadrats
		Total Undertaken	**7**	**13**	**6**	**3**	**75 quadrats**

Table 5: Summary of targeted threated flora survey within the study (ERM 2005 / 2010, RPS (2011, 2012 & 2013), ELA 20-14, 2015, 2020, 2021

Refer to **Appendix M** for more details regarding TMO surveys

Date	Effort	Reference	Description	Results
Allocasuarina defungens and simulans	**Survey period all year round**			
October 2005	2 person days	ERM 2005		No Allocasuarina defungens or simulans recorded
5-6 November 2008	4 person days	ERM 2010		No Allocasuarina defungens or simulans recorded
May 2015	4 person days	ELA 2021		No Allocasuarina defungens or simulans recorded
June and July 2020	10 person days	ELA 2020		No Allocasuarina defungens or simulans recorded
Cryptostylis hunteriana	**Survey period October to December**			
October 2005	2 person days	ERM 2005		No Cryptostylis hunteriana recorded
4-7th November 2008	4 person days	ERM 2010		No Cryptostylis hunteriana recorded
20-21 December 2010	4 person days	RPS 2012		No Cryptostylis hunteriana recorded
Tuncurry Midge Orchid	**Survey period March/April**			
Jan-April 2008	11 person days	Paget 2008	Targeted survey of study area during flowering season by Andrew Paget, John Riley and Barry Ralley (& Isaac Mamott)	510 plants recorded east and south-east of Tuncurry tip 72 plants recorded north and north-east of Tuncurry TAFE
Jan-April 2008	3.5 person days	Paget 2008	Targeted survey by Andrew Paget & Di Brown north of Tuncurry Study area (Darawank, Bonny Hills and Crowdy Bay	No plants recorded
Jan-April 2008	2 person days	Paget 2008	Targeted survey by Andrew Paget & Barry Ralley south of Tuncurry Study area (Booti and Mungo Brush)	No plants recorded
19-21 March 2009	3 days	ERM 2010b	Flowering at previously identified reference sites confirmed 19 March 2009 Targeted survey of heathland vegetation types	15 plants recorded during reference site confirmation 47 plants recorded in study area 31 plants recorded southeast of Tip (Outside of study area)
March 2010 (23, 24, 29, 30 and 31) April 2010 (19, 20, 21, 22, 23, 28) May 2010 (14, 17, 18, 19 and 20)	16 days	RPS 2011	Targeted flora survey for the Tuncurry Midge Orchid. Walking transects and random meanders within potential habitat on the subject site. Focused on disturbed areas, previously recorded areas and under surveyed heath area	1,293 plants recorded in study area
Feb 2011		RPS 2012a	Random meander and targeted flora survey for Tuncurry Midge Orchid, (RPS, 2012a)	

Date	Effort	Reference	Description	Results
13/4/2011	1 day		Targeted search	25 plants recorded, (11 considered duplicates of 2010 records)
April 2011 (11, 12 and 13)	6 person days	RPS 2012	Targeted flora survey for the Tuncurry Midge Orchid. Nine random plots (40 x 40 m) within heath vegetation. Within each plot two ecologists walked parallel transects 2 m apart (RPS, 2012a).	9 of the 25 plants recorded in 2011 were in one of the 9 plots
22, 26 & 27 March 2012	3 person days	RPS 2012	22 Transects	309 plants recorded (101 considered new records)
18-22 March 2013 23-24 April 2013	24 person days	RPS 2013	Targeted surveys by Isaac Mamott and Andrew Smith at Tuncurry, South Foster and Minimbah	6 plants recorded at Booti National Park 3 plants recorded on MidCoast Water lands at Minimbah
18 & 19 March 2021	2 person days	This report	Rapid re-survey of previous TMO locations by Shawn Ryan following 2019/2020 wildfires	800 plants rapidly re-located in both burnt and unburnt locations

Table 6: Threatened fauna survey effort in relation to EPBC Act listed threatened fauna species considered in this PER and National guidelines

Target Species	Method		Coast Banksia – Coast Wattle 168 ha		*Banksia* Dry Shrubland 212 ha	Blackbutt – Smooth-barked Apple shrubby Open Forest 133 ha	Foredune Complex 32 ha	Site Total 545 ha)	Comment
			Unburnt 134 ha	Burnt 34 ha					
Swift Parrot & Regent Honeyeater	Diurnal Surveys	RPS June – July 2010 - 2012				>100 hours observations and calls during other activities			
Swift Parrot & Regent Honeyeater	Diurnal Surveys	ELA June and July 2020				>50 hours observations and calls during other activities			
New Holland Mouse	Pitfall Traps	RPS 2010-2102	36	24	72	72	24	216 trap nights	
		ERM 2008	03	02	06	05	02	0 trap nights	
		Total Undertaken	**36**	**24**	**72**	**60**	**24**	**216 trap nights**	

Target Species	Method		Coast Banksia – Coast Wattle 168 ha Unburnt 134 ha Burnt 34 ha	*Banksia* Dry Shrubland 212 ha	Blackbutt – Smooth-barked Apple shrubby Open Forest 133 ha	Foredune Complex 32 ha	Site Total 545 ha)	Comment
		National Survey Guidelines for pitfall traps*	2656	3792	1584	512	8,544 trap nights	Based on 2 sample sites of 10 pits per 5 ha of habitat for 4 nights
New Holland Mouse	Terrestrial Elliott A	RPS	350	400	150	100	1000 trap nights	
		ERM	24	48	48	0	120 trap nights	
		Total Undertaken	**374**	**436**	**198**	**100**	**1120 trap nights**	
		National Survey Guidelines for Elliot trapping*	5,312	7,589	3168	1024	17,088 trap nights	Based on 2 sample sites of 20 traps per 5 ha of habitat for 4 nights
Spotted-tail Quoll	Cage – meat bait (chicken leg)	RPS	36	22	6	10	74 trap nights	
		ERM	0	0	0	0	0 trap nights	
		Total Undertaken	**36**	**22**	**6**	**10**	**74 trap nights**	
Long-nosed Potoroo	Cage – baited with peanut butter, honey & oat mix	RPS	36	22	6	10	74 trap nights	
		ERM	0	0	0	0	0 trap nights	
		Total Undertaken	**36**	**22**	**6**	**10**	**74 trap nights**	
		National Survey Guidelines for cage trapping*	2656	3792	1584	512	8,544 trap nights	Based on 2 sample sites of 10 cages per 5 ha of habitat for 4 nights
New Holland Mouse, Long-nosed Potoroo	Terrestrial Hair Tube – baited with peanut butter, honey & oat mix	RPS	187	165	0	0	352 trap nights	
		ERM	150	300	50	0	500 trap nights	
		ELA June-July 2020 (48 hair funnels, set for 41 nights)					1,968 trap nights	
		Total Undertaken	**337**	**465**	**50**	**0**	**2,820 trap nights**	

Target Species	Method		Coast Banksia – Coast Wattle 168 ha Unburnt 134 ha / Burnt 34 ha	*Banksia* Dry Shrubland 212 ha	Blackbutt – Smooth-barked Apple shrubby Open Forest 133 ha	Foredune Complex 32 ha	Site Total 545 ha)	Comment
		National Survey Guidelines for hair sampling*	18,592	26,544	11,088	3584	59,808 trap nights	Based on 2 sample sites of 20 tubes per 5 ha of habitat for 14 nights
New Holland Mouse Long-nosed Potoroo, Spotted-tail Quoll, Grey-headed Flying-fox	Spotlighting on foot	RPS	4	9	6	2	21 hours	
		ERM	6 hours across the site				6 hours	
		ELA June-July 2020	8 hours across site				8 hours	
		Total Undertaken	**19**	**9**	**6**	**2**	**35 hours**	
		National Survey Guidelines for spotlight surveys on foot (mammals)*	44	63	26	9	142 hours	Based on 400m transect over 2 nights x 5 ha of habitat walking 10 m per minute
	Spotlighting in car	RPS	10	3	6	Driving not possible	19 hours	
		ERM	0	0	0		0 hours	
		Total Undertaken	**10**	**3**	**6**		**19 hours**	
		ERM	-	-	-	-	-	
		Total Undertaken	**22.6**	**23**	**11.6**	**7.7**	**64.9 hours**	
Koala, Spot-tailed Quoll, Long-nosed Potoroo, New Holland Mouse	Remote Cameras	ELA June-July 2020					**984 camera trap nights**	24 remote cameras, set for 41 nights

* National guidelines are derived from the Survey Guidelines for Australia's threatened mammals (DSEWPaC 2011). The recommended survey methods are intended to be used as a guide to indicate a minimum survey effort considered appropriate for detecting the listed mammal fauna. They are not designed to guarantee detection, with more or less survey effort likely to be needed for different species at different locations. The size of the subject site, available time and resources and accessibility of habitat often play a part in determining a survey effort that effectively identifies matters of national environmental significance onsite.

Figure 29: Flora survey effort 2005-2012 (Source RPS 2012 & 2013)

Note this figure does not show the survey effort conducted by Paget 2008 or ELA 2014/15 and 2020

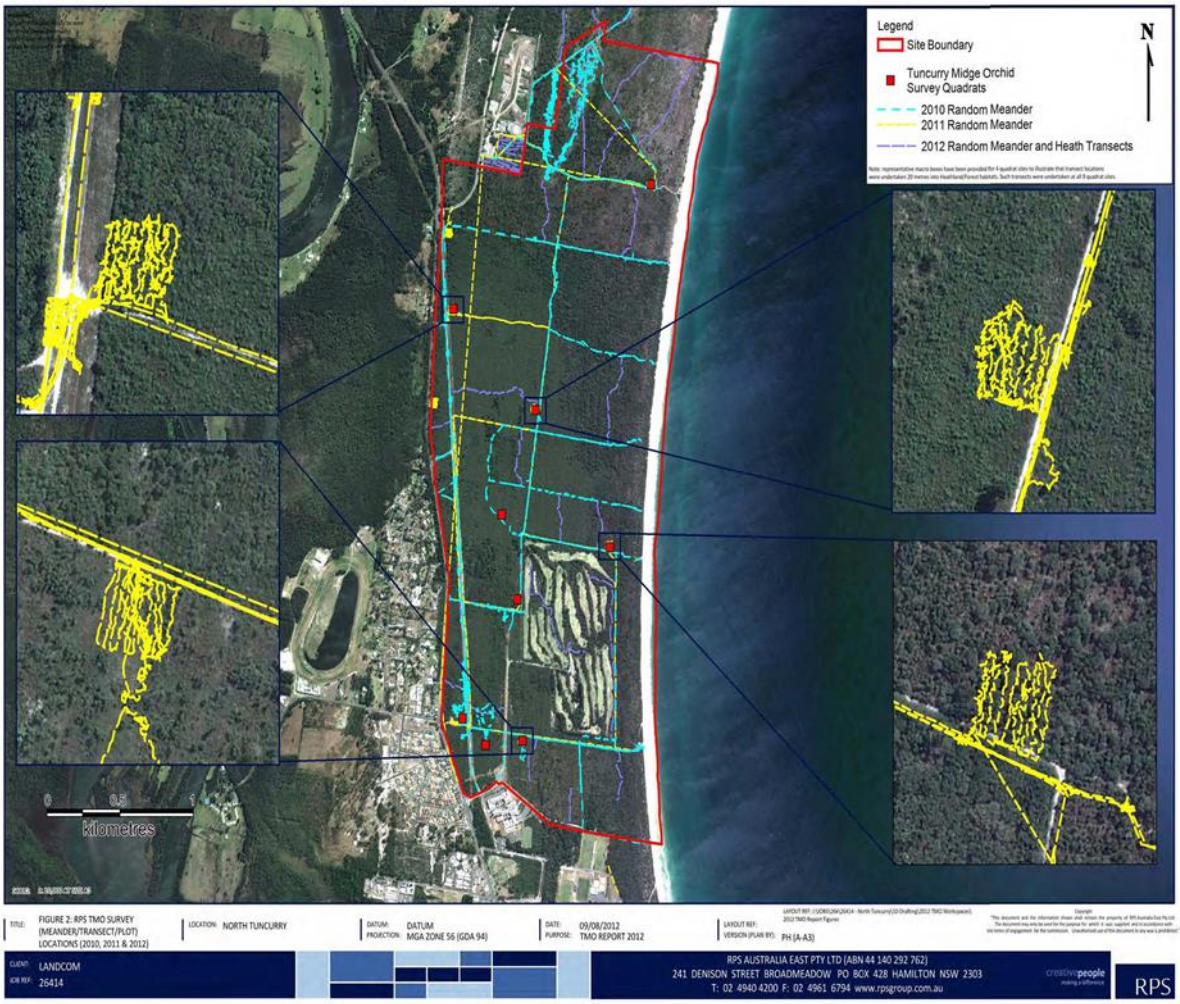


Figure 30: Tuncurry Midge Orchid survey meanders and quadrats (Source RPS 2013)

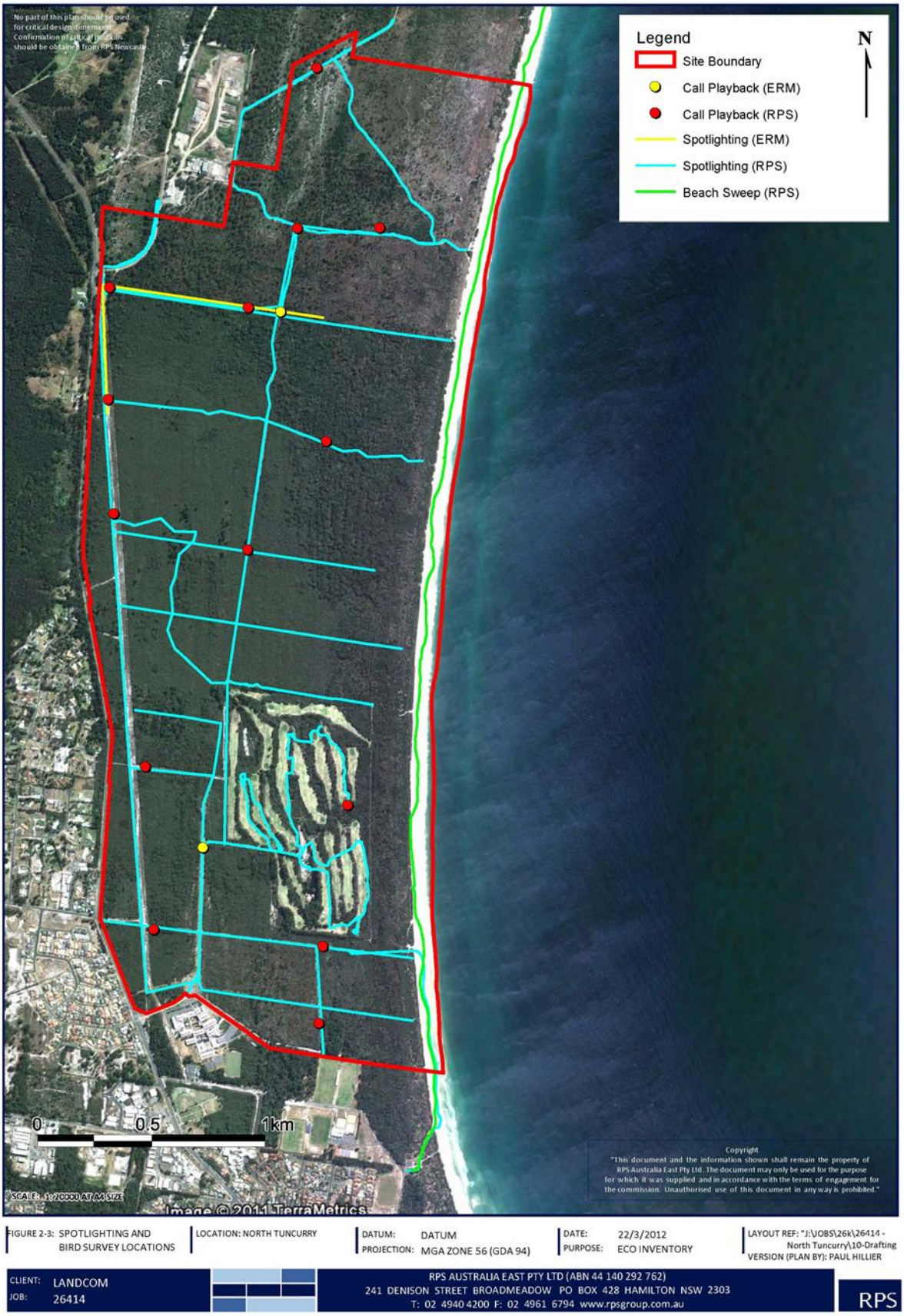


Figure 31: Spotlight surveys and call playback locations 2005-2012 (Source RPS 2013)

Note this figure does not show the spotlighting survey effort conducted by ELA in 2020

Figure 32: survey locations for arboreal and terrestrial mammals 2005-2012 (Source RPS 2013)

Note this figure does not show the remote camera and hair tube survey effort conducted by ELA in 2020

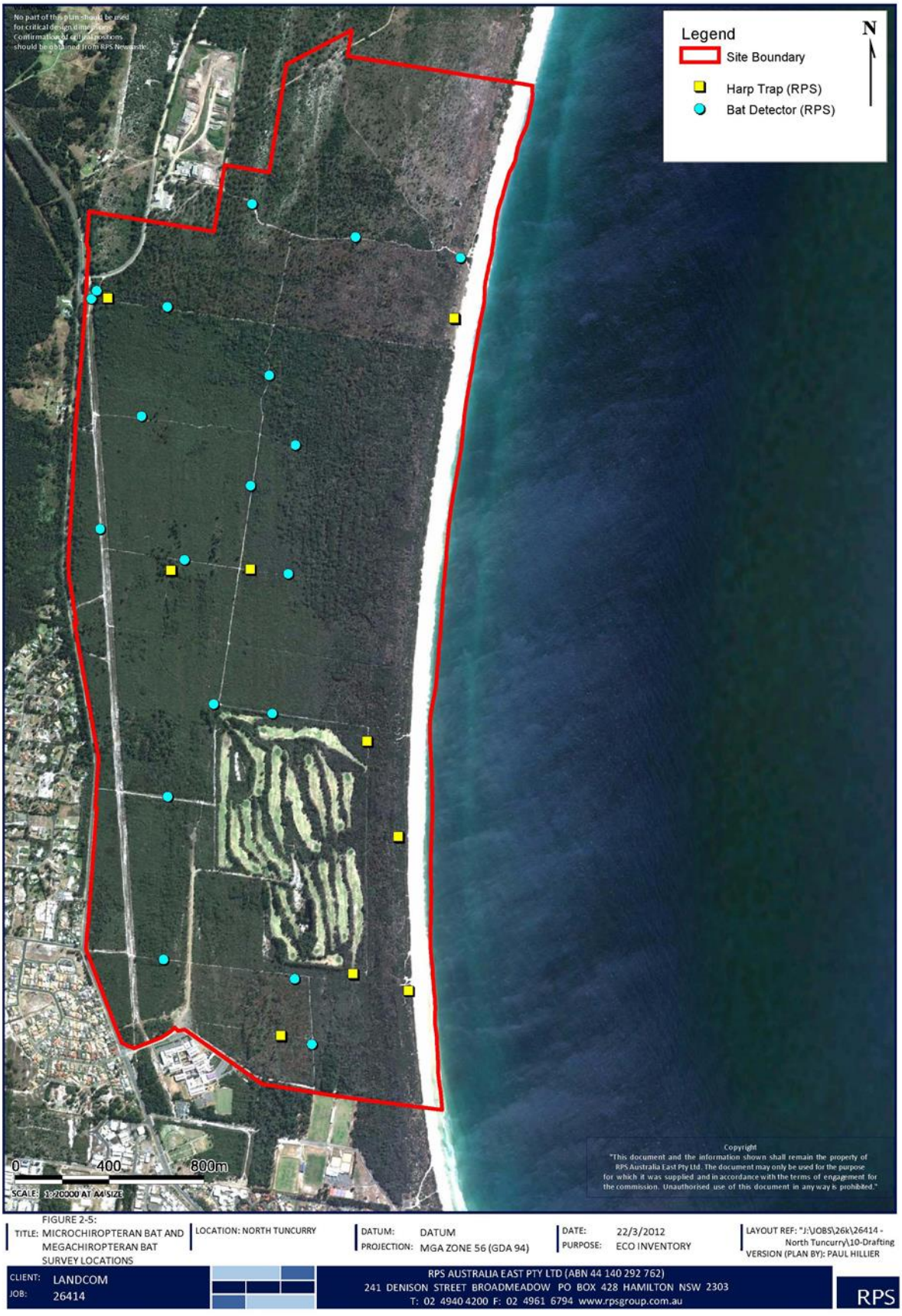


Figure 33: Microchiropteran bat surveys locations (RPS 2013)

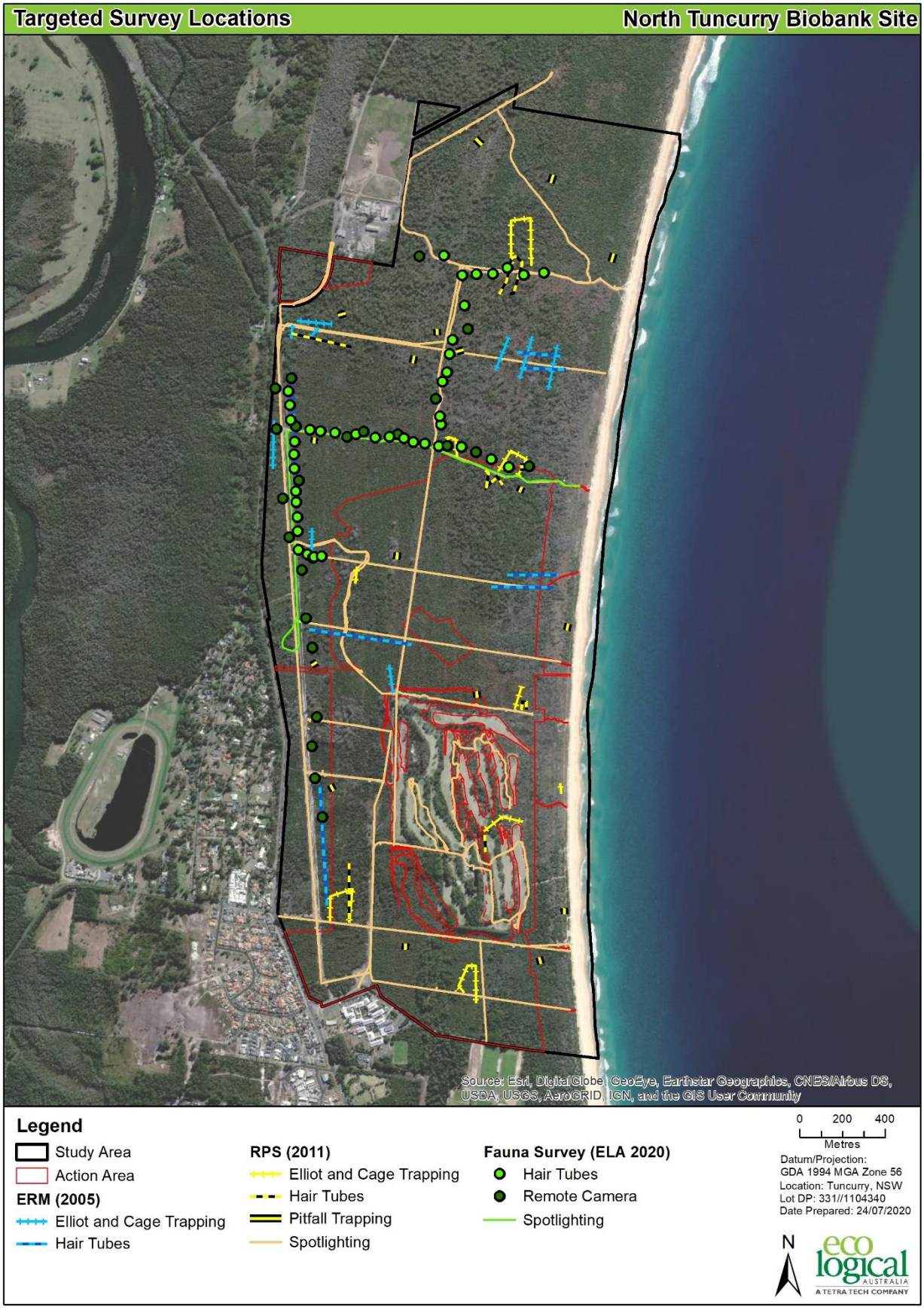


Figure 34: Additional threatened fauna surveys (cameras/hair tubes) following ELA 2020

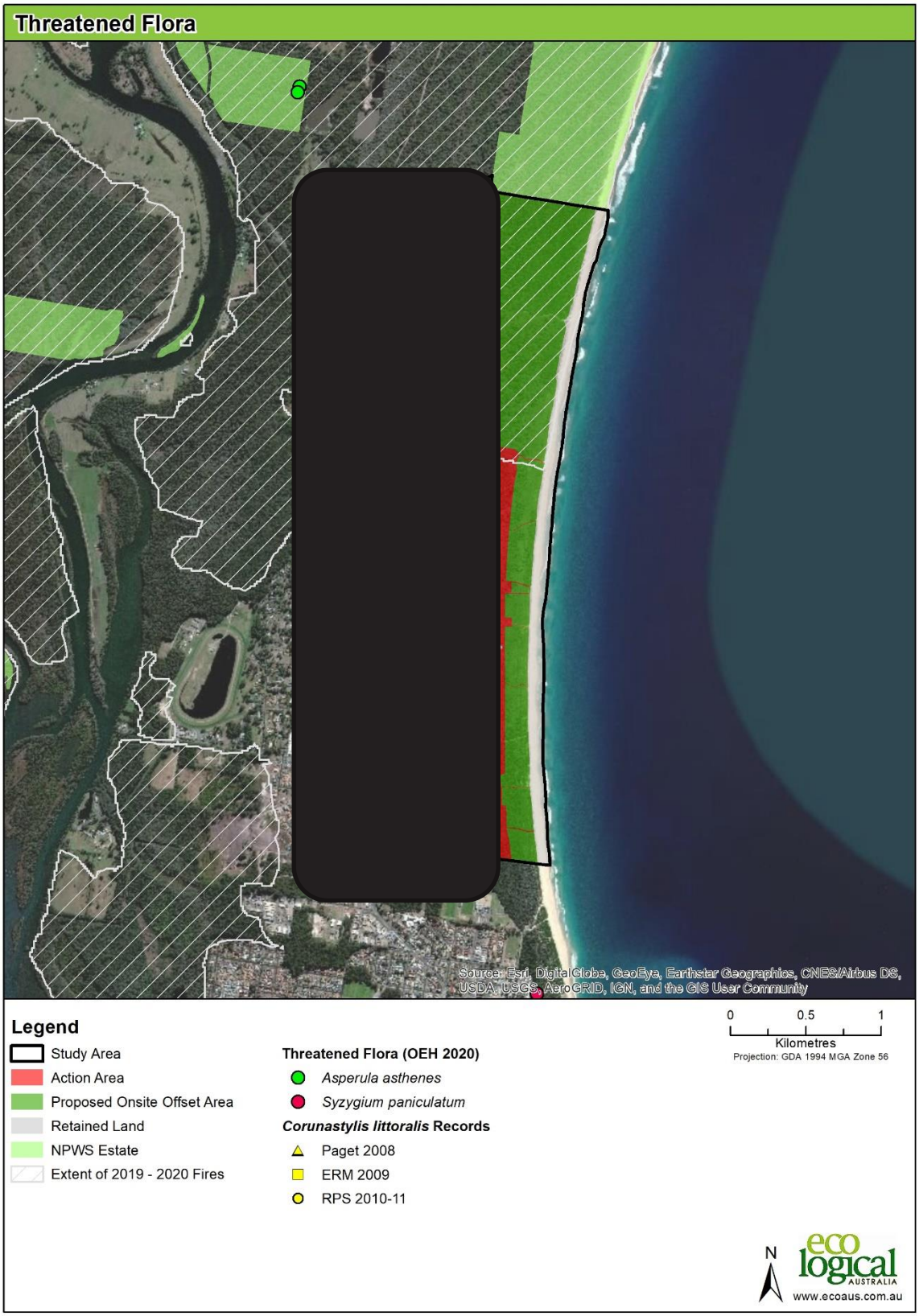


Figure 35: EPBC Act listed threatened flora species recorded within or in the vicinity of the proposed action area and extent of the 2019/20 bushfires

Note: The precise location of endangered orchids have been redacted from the public exhibition version of this document

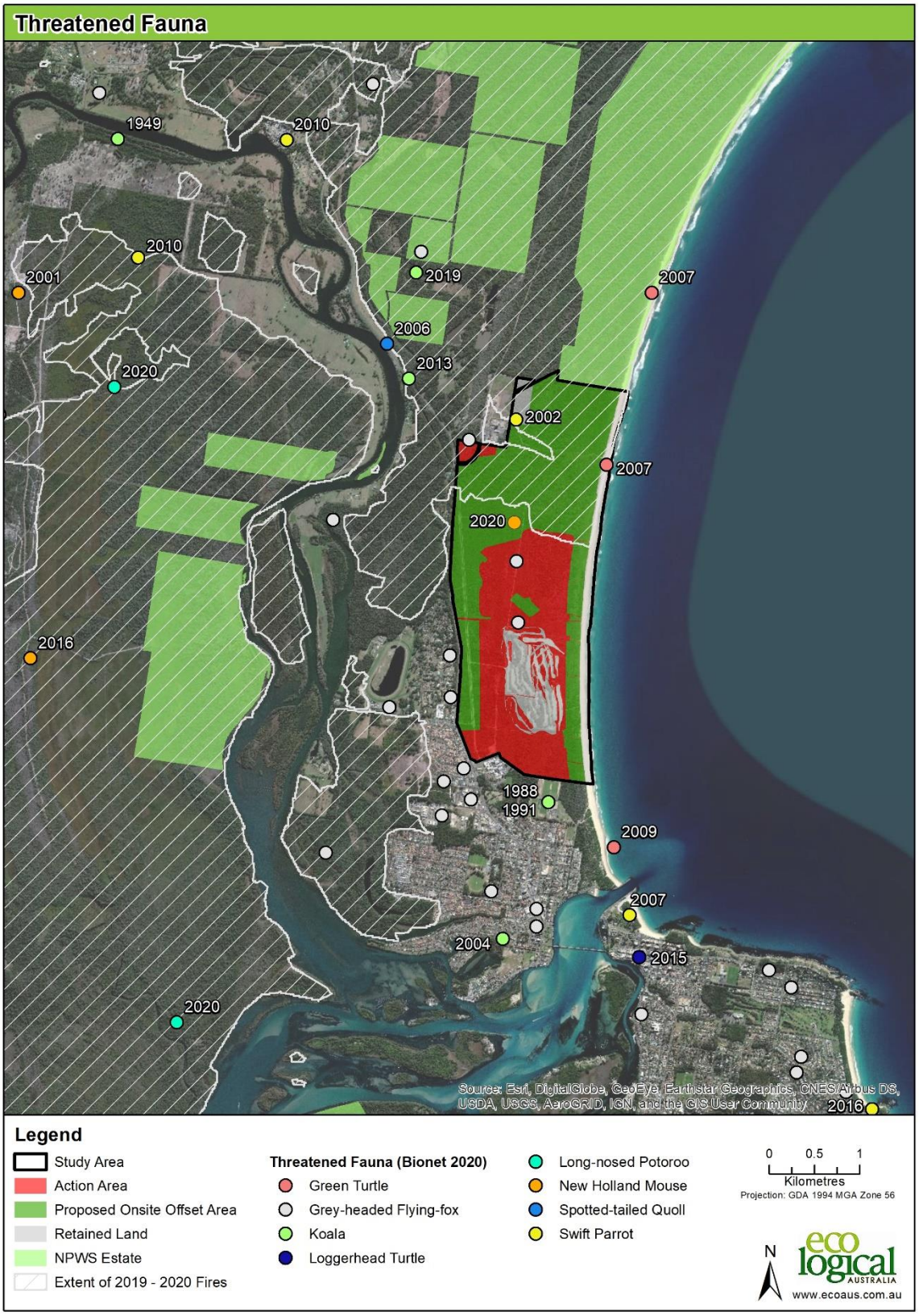


Figure 36: Threatened fauna records within or in the vicinity of the proposed action area and extent of the 2019/20 bushfires study area.

Note: the 2002 Swift Parrot record shown in the north of the study area has incorrect coordinates. The record is labelled as "5km north of Halliday's Point' which is 10 km north of the study area.

5. Description of the national, regional and local distribution and population size of each EPBC Act listed threatened species likely to be present on and in the vicinity of the proposed action

Section 4 (e-g) of the Guidelines for the PER require the PER to include a description of the nature, location and extent of EPBC Act listed threatened species and ecological communities and suitable habitat 'likely' to be present on and in the 'vicinity' of the proposed action area. The description is to include:-

> e) targeted surveys for the presence, distribution and abundance of EPBC Act listed threatened species and ecological communities and/or their habitat (including maps), on and in the vicinity of the site of the proposed action (including, but not limited to the Tuncurry Midge Orchid (*Corunastylis littoralis*); the Leafless Tongue-Orchid (*Cryptostylis hunteriana*); the New Holland Mouse (*Pseudomys novaehollandiae*); and Dwarf Heath Casuarina (*Allocasuarina defungens*)). Surveys must also identify how the site is utilised by each species for breeding, foraging or other key life-cycle stages. Surveys must be conducted by suitably qualified individuals at an appropriate time of year and use appropriate methods (consistent with any relevant, available guidelines). A detailed description of the methodology(s) used, data of the survey results and map(s) must be provided;
>
> f) known records of EPBC Act listed threatened species and populations on and in the vicinity of the site for the proposed action. This must include, but not be limited to, information on known populations of Long-nosed Potoroo (*Potorous tridactylus*) in the region and the identification of the nearest known roosting site for the Grey-headed Flying-fox (*Pteropus poliocephalus*) that is known to support populations of> 30 000 individuals or known to support a continuously occupied camp;
>
> g) a description of the national, regional and local distribution of EPBC Act listed threatened species, and the population size, distribution, abundance and dynamics of each species on and in the vicinity of the site of the proposed action.

This section addresses this requirement. The survey methods, timing and details of the qualified people who undertook the surveys is provided in **Section 4** and **Appendix L** and **H**.

5.1 Tuncurry Midge Orchid – *Corunastylis littoralis*

5.1.1 Conservation status

Corunastylis littoralis, also known as the Tuncurry Midge Orchid (TMO), is a small terrestrial orchid that is endemic to NSW where it is known from three populations in the Foster/Tuncurry district of the NSW North Coast (DSEWPaC 2011).

The TMO is listed as a critically endangered species under both the Commonwealth EPBC Act and the NSW Biodiversity Conservation Act 2016 (BC Act) where it is referred to as *Genoplesium littorale*. The species is referred to throughout this PER as *Corunastylis littoralis* in accordance with the species Commonwealth EPBC Act listing.

5.1.2 Distribution, abundance and dynamics

It has been reported that *Corunastylis littoralis* has been known from the Tuncurry area since approximately 1970-1980 (John Riley *pers. Comm*. in Paget 2008) but was not formally collected until 1992 and described in 2001 by Jones (2001).

It was recorded on Crown land by Paget (2008) between Tuncurry TAFE (at the southern end of the study area) and the Tuncurry Tip (at the northern end of the study area), and Foster Local Aboriginal Land Council owned land where approximately 600 plants (582) were recorded, more than 88% being found south and south-east of the Tuncurry Tip. Searches in similar areas of habitat (and along slashed easements) by Paget and members of the Australian Orchid Society north of the known locations in 2008 (Darawank Nature Reserve and Crowdy Bay National Park) and south (Booti Booti National Park south to Mungo Bush and Tea Gardens) did not record any further plants (Paget 2008).

Since this initial 2008 survey effort, extensive TMO surveys have been undertaken over five (5) flowering seasons (2009-2013) in the study area and broader locality by ERM in March 2009 (ERM 2010) and RPS in 2010 and 2011 (RPS 2011), 2012 (RPS 2012) and 2013 RPS (2013) as summarised in Table 7.

The conservation listing advice (DSEWPaC 2011) states that the TMO is known from three populations in the Foster / Tuncurry district of the NSW North Coast with a total population estimated by RPS (2010) of 1,960 plants. Surveys undertaken since DSEWPaC 2011 have now recorded 2,636 'separate individuals' between 2008 and 2013 (i.e. double counting of individual stems between different seasons and observers has been removed based on only counting plants greater than 10 metres apart (RPS 2011, 2012 & 2013 and **Appendix D6, D7** and **D9**.)

5.1.3 Surveys completed in the study area

Since 2010, further comprehensive targeted surveys across the study area and surrounds were completed by RPS over three flowering periods in 2010 and 2012 (Table 7)**.** The general survey methodology consisted of two ecologists walking parallel transects spaced approximately 10m apart within habitat areas throughout the study area RPS (2011). Habitat areas included power easement and tracks and areas where the species had previously been recorded. When the species was located, additional searches of nearby vegetation was also conducted. During 2011 surveys an attempt to estimate population size inside heath vegetation (away from tracks) was conducted at the North Tuncurry study area. These methods included searching a series of 40 x 40m plots, which were randomly located within the heath vegetation. Each plot was searched by walking parallel transects 2 m apart.

Dates of these targeted surveys and a summary of methodology are presented in Table 7 with detailed survey descriptions documented in Section 2.3 of the *Ecological Inventory Report* for the study area (RPS 2012) which is attached as **Appendix D5.**

Following these surveys, the species is no known from four locations and comprises 2,636 individuals (RPS 2013). Following the 2019/2020 summer wildfires, which burnt the northern part of the study area, a rapid 2-day re-count of previously recorded locations in March 2021 was undertaken to determine the on-going persistence of TMOs in burnt and unburnt areas. The assessment was able to rapidly re-locate 800 plants at 20 locations visited which includes 570 plants in burnt areas.

Table 7: Summary of targeted survey for the Tuncurry Midge Orchid from RPS (2011, 2012 & 2013)

Date	Effort	Reference	Description
Jan-April 2008	11 person days	Paget 2008	Targeted survey of study area during flowering season by Andrew Paget, John Riley and Barry Ralley (& Isaac Mamott)
Jan-April 2008	3.5 person days	Paget 2008	Targeted survey by Andrew Paget & Di Brown north of Tuncurry Study area (Darawank, Bonny Hills and Crowdy Bay
Jan-April 2008	2 person days	Paget 2008	Targeted survey by Andrew Paget & Barry Ralley south of Tuncurry Study area (Booti Booti and Mungo Brush)
19-21 March 2009	3 days	ERM 2010b	Flowering at previously identified reference sites confirmed 19 March 2009 Targeted survey of heathland vegetation types
March 2010 (23, 24, 29, 30 and 31) April 2010 (19, 20, 21, 22, 23, 28) May 2010 (14, 17, 18, 19 and 20)	16 days 32 Person days	RPS 2011	Targeted flora survey for the Tuncurry Midge Orchid. Walking transects and random meanders within potential habitat on the subject site. Focused on disturbed areas, previously recorded areas and under surveyed heath area
February 2011		RPS 2012a	Random meander and targeted flora survey for Tuncurry Midge Orchid, (RPS, 2012a)
April 2011 (11, 12 and 13)	6 person days	RPS 2012	Targeted flora survey for the Tuncurry Midge Orchid. Nine random plots (40 x 40 m) within heath vegetation. Within each plot two ecologists walked parallel transects 2 m apart (RPS, 2012a).
22, 26 & 27 March 2012	3 person days	RPS 2012a	22 Transects
18-22 March 2013 23-24 April 2013	24 person days	RPS 2013	Targeted surveys by Isaac Mamott and Andrew Smith at Tuncurry, South Foster and Minimbah
18 & 19 March 2021	2 person days	This report	Rapid re-assessment following 2019/20 summer wildfires

EPBC draft survey guidelines for Australia's threatened orchids (DoTEE 2013) suggest surveying for TMO in the peak flowering period between February and April, thus most surveys by RPS have been undertaken in the documented peak flowering period (with the exception of those in May 2010).

The summary of this survey effort is that:-

- The TMO is known only from the mid-North Coast area of New South Wales, in the Karuah - Manning subregion of the Hunter-Central Rivers CMA.
- The known extent or distribution of the species is approximately 20km by 8km (North Tuncurry south to Tiona and North Tuncurry west to Minimbah), totalling and extent of 160km^2 (RPS 2012b).
- Four main sub-populations of the species are currently known; North Tuncurry (approximately 2,500 plants), Minimbah Sandbeds (2 sub-populations of approximately 60 plants) and in Booti Booti National Park south of Forster - approximately 90 plants (Figure 37).

- Populations are considered discrete due to topographic (rivers and lakes), geographic (distance between populations) and anthropogenic barriers (townships) that prevent pollinator movement and gene flow between populations.
- Within the study area the species has been recorded from Blackbutt – Smooth-barked Apple open forest and Banksia Dry Shrubland including from within the disturbed areas associated with the powerline corridor, informal tracks which bisect this site and recently burnt areas. The TMO seems to prefer disturbed habitats in general and within heath habitat it appears to prefer wet and / or low heath or disturbed environs (RPS 2012)

Numbers of flowering individuals change over time, based on local climatic conditions, ecology of the TMO and natural mortality and recruitment. Non-flowering individuals are extremely difficult to detect. Counts made during field surveys between 2008 and 2012 form the basis of current knowledge of the species population and distribution and the four consecutive years of targeted survey by Paget (2008), ERM (2009) and RPS (2010 and 2011) have probably accounted for the considerable range of variation that is often present in the number of flowering plants in different seasons in a typical population of a midge orchid.

An analysis of results from TMO population counts undertaken by Paget (2008), ERM (2010) and RPS in 2010-2013 across the known distribution of this species suggest a total known population at the time of these records of approximately 2,636 individuals.

Survey effort has been greatest in the North Tuncurry population and it is not clear if the smaller number of records within the other populations (Minimbah and Tiona sandbeds) are influenced by a reduced survey effort.

The most documented population occurs within the study area at North Tuncurry and on land owned by the Foster Local Aboriginal Land Council and counts between the years 2008 and 2012 have recorded 2, 433 individuals (Figure 38 and Table 8).

Severe wild fires in late 2019 burnt the northern part of the study area (where over 1,800 of the recorded plants had previously been recorded) and the Nabiac Sandbeds (60 plants previously recorded) (**Figures 37** and **38**). A rapid re-assessment of the Tuncurry sub-population in March 2021 was able to relocate over 800 plants in 2 days, 570 of which were from within these intensively burnt areas.

5.1.4 Ecology

TMO is a terrestrial orchid, which occur as underground tubers throughout winter and spring. A single tubular leaf to 25 cm high (Jones 2006) emerges following good rainfall in late summer. The inflorescence stalk emerges from the leaf from March to May supporting 5 to 30 flowers (Jones 2006). Pollination is mediated by flies of the family Chloropidae which are hypothesised to be attracted via 'kleptomyiophily', whereby flowers emit chemicals resembling those released by dying insects which attract kleptoparisitic flies (FloraSearch 2013, Bower *et al*. 2015). Following flowering and seed pod development, where successful pollination has occurred, stems whither and only underground tuber remain.

Jones (2001 and 2006) and Paget (2008) describe the habitat as well-drained, open sand ridge sites in low dense heath dominated by *Ochrosperma lineare* or in sparse shrubland of *Monotoca elliptica,*

Brachyloma daphnoides and/or *Leptospermum spp*., whilst RPS (2012) state that the TMO seems to prefer wet and / or low heath or disturbed environs. Many records are from disturbed habitats on the edge of maintained powerline corridors and 4WD tracks. The species occurrence in dense area of heathland and its relationship with fire is not well understood.

The North Tuncurry study area has been subject to several fires in the past 20 years (both wildfire and arson) and TMO has been recorded in areas of burnt heath <6 months since fire (RPS 2013) and Blackbutt Woodland within 12-15 months of wildfire. The preferred intensity and interval of fire to promote conservation of the species is not known (DSEWPaC 2011)

Species identification issues were raised by (RPS 2012) where they reported that the TMO appears to be co-occurring with *Genoplesium filiforme* and *G. rufum* in some populations outside of the study area. Therefore, there is the potential that some specimens may have been misidentified (and incorrectly counted) within populations outside of the study area. However, FloraSearch (2014) and Bower et al. (2015) undertook taxonomic investigations of TMO in the study area at North Tuncurry in conjunction with a species expert at the Royal Botanic Gardens, Sydney (Dr Peter Weston) and concluded that TMO was likely to be the only species present at the North Tuncurry site.

The TMO appears to be most abundant in slightly disturbed areas (it is most often found alongside tracks and power easements, however counts have focussed on these areas. The species has occasionally been detected away from these features at low densities (RPS 2011). It is likely that the species is still present in the undisturbed areas but may not flower regularly in these areas and is therefore not as detectable (Dr Lachlan Copeland, ELA 2011). This phenomenon is well documented for various other ground orchids (e.g. *Caladenia* and *Prasophyllum*) whereby the individual plants may only flower for a few years following a fire or some other form of disturbance, then will cease to flower for several years until a suitable disturbance opens up the habitat once again, allowing the species to flower (Copeland[1] *pers comm.*). It is poorly known to what extent *Corunastylis* spp. cease to flower in increasingly dense habitats, but assuming that the TMO is absent from dense areas where it is not often observed may be an erroneous assumption. TMO has been recorded in areas of burnt heath (<6 months since fire) albeit, nearby to previous records of the species (RPS 2013). Therefore, habitat for the TMO is potentially more extensive and has been mapped (based on known habitat associations) in **Figure 38.**

[1] Dr Lachlan Copeland, is a nationally recognised orchid expert employed by Eco Logical Australia and who undertook and independent review of the survey methodology and results undertaken by RPS and an assessment of impacts on TMO (Appendix N).

Table 8: Number of locations, individuals and amount of habitat in the study area and surrounding landscape

	Study area	Other populations	Total	% of total in North Tuncurry study area
Number of sites/locations confirmed***	434	77	511	84.93 %
Number of individuals recorded	2,433	203	2,636	92.30 %
Potential habitat (based on vegetation types where TMO has been recorded) (ha)	513.40	4,445.00	4,958	10.34%

*** Independent sites/locations were defined by RPS as sites being more than 10m apart

5.1.5 Conclusion

The North Tuncurry TMO sub-population will be impacted by the proposed action and a detailed impact assessment for this species is included in Section 6 of this PER.

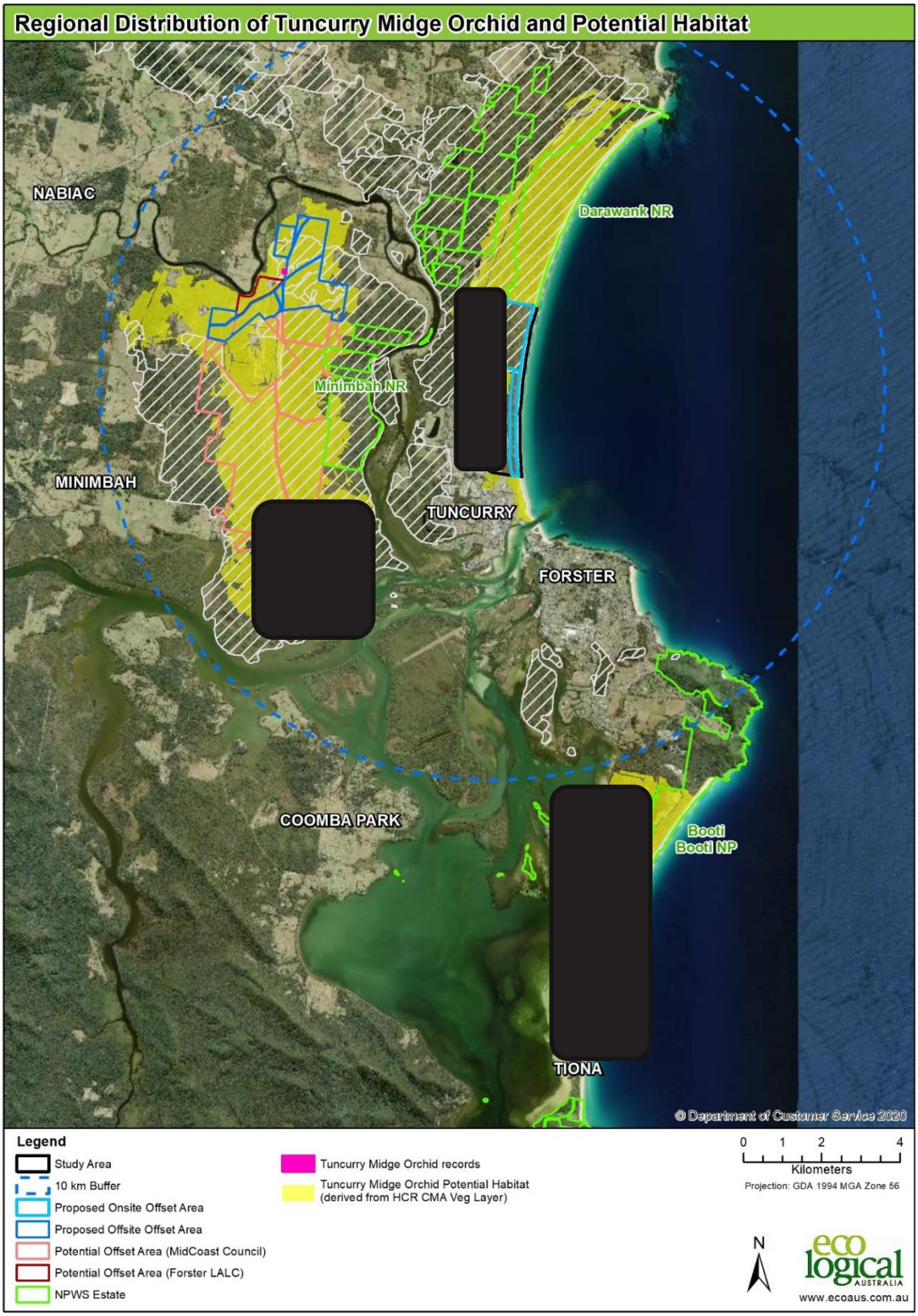


Figure 37: Regional distribution of Tuncurry Midge Orchid, records of the species and potential habitat (Source RPS 2011, 2012, 2013, ELA 2019)

Note: The precise location of endangered orchids have been redacted from the public exhibition version of this document

Figure 38: Distribution of Tuncurry Midge Orchid within the study area, showing the footprint of the proposed action (Source Paget 2008, ERM 2010, RPS 2011, 2012, 2013)

Note: The precise location of endangered orchids have been redacted from the public exhibition version of this document

5.2 Leafless Tongue Orchid – *Cryptostylis hunteriana*

5.2.1 Conservation status

Cryptostylis hunteriana (Leafless Tongue Orchid) is a terrestrial orchid listed as a Vulnerable species under both the Commonwealth EPBC Act and the NSW Biodiversity Conservation Act 2016).

5.2.2 National distribution and abundance

Cryptostylis hunteriana is known to occur in Victoria, NSW and Queensland. In Victoria *C. hunteriana* is found in east Gippsland, between Orbost and Mallacoota. In NSW, it is recorded mainly on coastal and near coastal ranges north to near Forster, with two isolated occurrences inland north-west of Grafton. In Queensland, the species is found from the Tin Can Bay area and along the coast to the Glasshouse Mountains (DEWHA 2008 - Approved Conservation Advice for *Cryptostylis hunteriana* (Leafless Tongue Orchid) 3/7/2008)

5.2.3 Regional and local distribution and abundance

Cryptostylis hunteriana has not been recorded in the study area or within the regional locality. The nearest records to the study areas are between 50-75 km south in the Bulahdelah and Port Stephens area **(Figure 39**). The Bulahdelah population of *C. hunteriana* consists of two populations with 104 and 359 plants and is the largest known population in NSW. The total NSW population size is estimated to be 1,300 to 1,500 plants in 2008 (DEWHA 2008), however, there have been several new records of this species since this date (NSW BioNet).

The NSW occurrences of *C. hunteriana* are predominantly from coastal heathlands, margins of coastal swamps and sedgelands, coastal forest and dry woodland (DEWHA 2008).

5.2.4 Ecology

Little is known about the ecology of the species; as a leafless orchid, *Cryptostylis hunteriana* is reliant on the symbiotic relationship with a microrrhizal fungus found in decaying plant matter. Unlike other species of *Cryptostylis*, it appears that *Cryptostylis hunteriana* has a very poorly developed root system, making it unlikely to spread vegetatively, and restricting re-production and dispersal to seed. Pollination is dependant solely on the ichneumonid wasp, *Lissopimpla excelsa* (Bell 2001).

5.2.5 Surveys completed in the study area

Targeted surveys for *Cryptostylis hunteriana* were undertaken in late October 2005 (ERM 2005), November 2008 (ERM 2010) and December 2010 (RPS 2012) totalling 10 person days (Table 5), which is within the documented peak flowering period (stated as being between November and January by BioNet) for the species.

The species was not recorded during these surveys.

Further, surveys undertaken in January 2008 for the TMO by Paget, John Riley, Barry Ralley and Isaac Mamott, all renowned orchid experts, would have detected the species had it been present.

5.2.6 Conclusion

Whilst *Cryptostylis hunteriana* was identified as a 'potential' species for consideration in the controlled action decision, it has not been recorded in the study area, despite targeted survey, and has not been recorded within 50km of the study area. Accordingly it is not considered further in this PER.

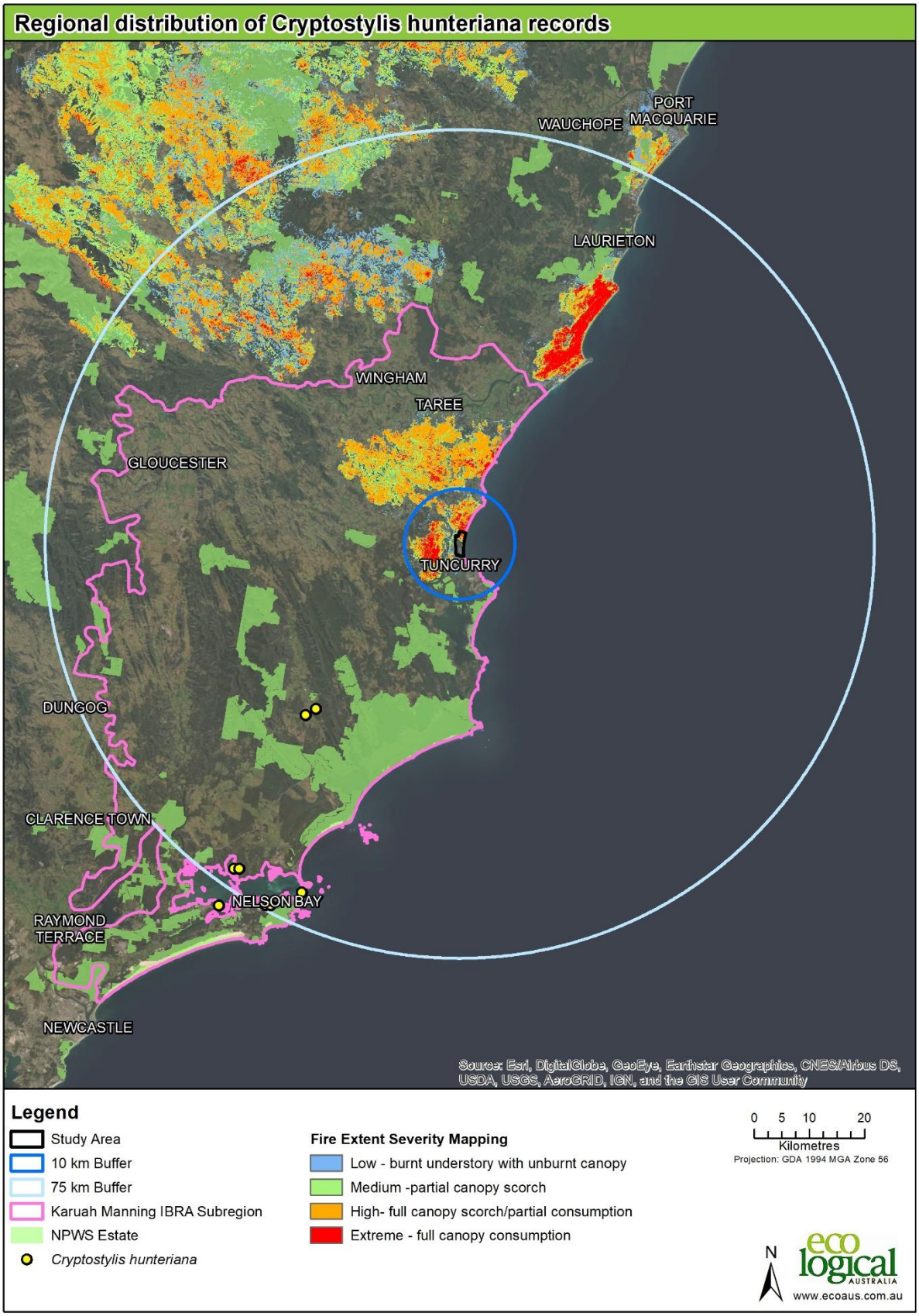


Figure 39: Regional distribution of *Cryptostylis hunteriana* records (Source BioNet 2020)

5.3 Dwarf Heath Casuarina - *Allocasuarina defungens*

5.3.1 Conservation status

Allocasuarina defungens is listed as Endangered under the NSW BC Act 2016 and Commonwealth EPBC Act.

5.3.2 Distribution and abundance

Allocasuarina defungens is confined to the north coast region of NSW, from the Nabiac area, north-west of Forster, to Byron Bay on the NSW north coast (DPIE 2019b). The Species Profile and Threats Database describes *A. defungens* as occurring at 32 sites in six general localities over a geographic range of about 40 km, with 31,000 plants recorded (DotEE 2019a)

Locally two populations of the species have previously been recorded within 5 km of the study area with several vouchered specimens identified by the National Herbarium of NSW on the western side of the Wallamba River and also approximately 5 km to the south on Wallis Island (AVH 2019). All records (DPIE 2019a) in close proximity to the study area occur west of the Wallamba River (with the exception of one erroneous record nearby, described as being recorded at the 'Old Nabiac Aerodrome' which is again located on the western side of the Wallamba River near Nabiac). This area appears to be the local stronghold for the species with more than 20,000 plants and two thirds of the known population found in this area and nearby Wallis Island (DotEE 2019a).

5.3.3 Ecology

Allocasuarina defungens is a shrub with smooth bark growing to 2 m high. The species is clonal and exists in mixed or hybrid stands with *Allocasuarina littoralis* (Black She-Oak). It is found mainly in tall heath vegetation on sand (DPIE 2019b).

5.3.4 Surveys completed in the study area

Allocasuarina defungens is observable year-round and was searched for during all flora field work, (random meanders, vegetation quadrats and targeted surveys for other flora species) (ERM 2005 and 2010a, RPS 2012, ELA 2020 and 2021) as summarised in Table 5 and totalling over 80 person days. **Figures 29 & 30** show the area covered during flora survey and searched for *Allocasuarina defungens.* Despite much of the site being covered by flora surveys (over 500 hours of random meanders) and seemingly suitable habitat being present across much of the study area, the species was not observed during surveys by ERM (2005, 2010), RPS (RPS 2012) or ELA (2014, 2015, 2019, 2020).

Given the above, it appears unlikely that *Allocasuarina defungens* occurs in the study area. In this regard, the proposed action is considered unlikely to have a significant impact on this species and this species is not considered further within this PER.

5.3.5 Conclusion

Whilst *Allocasuarina defungens* was identified as a 'potential' species for consideration in the controlled action decision, it has not been recorded in the study area, despite extensive targeted survey between 2005 and 2020. Accordingly it is not considered further in this PER.

5.4 Nabiac Casuarina - *Allocasuarina simulans*

5.4.1 Conservation status

Allocasuarina simulans is listed as Vulnerable under the Commonwealth EPBC Act 1999 and NSW Biodiversity Conservation Act 2016.

5.4.2 Distribution and abundance

The species is endemic to the mid-north coast of NSW and is restricted to a small area between Booti NP and Nabiac. The majority of specimens are known from an 89 ha section of Booti NP south of Forster (DotEE 2019b). Preserved specimens (60 records) have all been collected from similar areas to *Allocasuarina defungens* from Booti NP south of Forster, through to Wallis Island and east of Nabiac (AVH 2019) with all records in proximity to the study area occurring west of the Wallamba River.

5.4.3 Ecology

Allocasuarina simulans is a shrub 1-3 m in height. It is found mainly in heathland on coastal sands (DPIE, 2019). *Allocasuarina simulans* dominates patches of dry heathland on sandy podzolic soils, on dunes that are exposed to prevailing on-shore winds (DotEE 2019b)

5.4.4 Surveys completed in the study area

Allocasuarina simulans is observable year-round and was searched for during all flora field work, (random meanders, vegetation quadrats and targeted surveys for other flora species) (ERM 2005 and 2010a, RPS 2012, ELA 2020 and 2021) as summarised in Table 5 and totalling over 80 person days. **Figures 29 & 30** show the area covered during flora survey and searched for *Allocasuarina defungens.* Despite much of the site being covered by flora surveys (over 500 hours of random meanders) and seemingly suitable habitat being present across much of the study area, the species was not observed during surveys by ERM (2005;2010), RPS (RPS 2012) or ELA (2014,2015, 2019, 2020).

Given the above, it appears unlikely that *Allocasuarina simulans* occurs in the study area. In this regard, the proposed action is considered unlikely to have a significant impact on this species and this species is not considered further within this PER.

5.4.5 Conclusion

Whilst *Allocasuarina simulans* was identified as a 'potential' species for consideration in the controlled action decision, it has not been recorded in the study area, despite extensive targeted survey between 2005 and 2020. Accordingly it is not considered further in this PER.

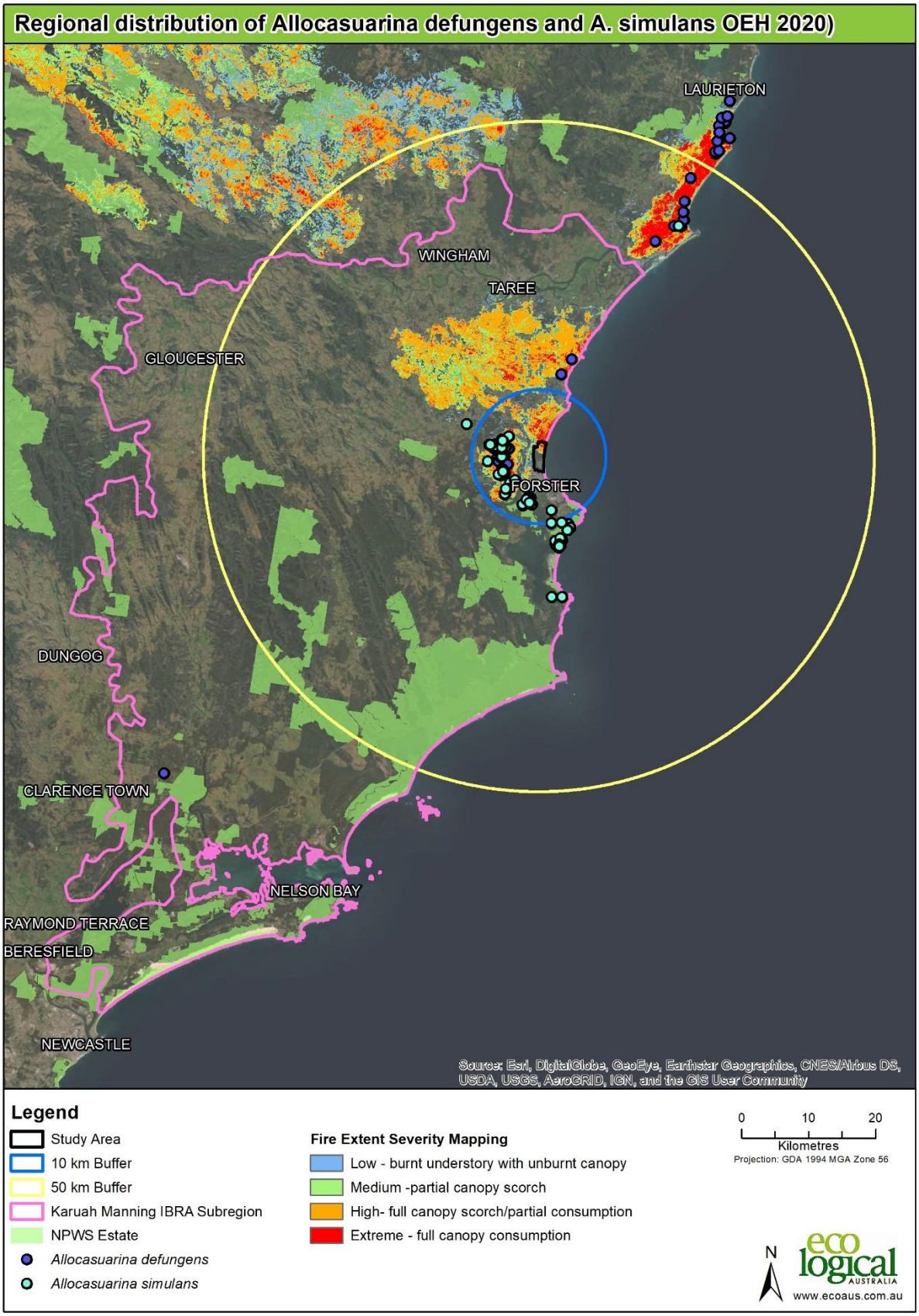


Figure 40: Regional distribution of *Allocasuarina defungens* and *A. simulans* (Source BioNet 2020)

5.5 Regent Honeyeater- *Anthochaera phrygia*

5.5.1 Conservation status

The Regent Honeyeater is listed as Critically Endangered under both the Commonwealth EPBC Act 1999 and NSW Biodiversity Conservation Act 2016.

5.5.2 National distribution and abundance

The species is endemic to mainland south-east Australia. It has a patchy distribution which extends from south east Queensland, through New South Wales and the Australian Capital Territory to central Victoria. However, it is highly mobile, occurring only irregularly in most sites, and in variable numbers, often with long periods with few documented observations anywhere (DotE 2016).

Most records of Regent Honeyeaters come from box-ironbark eucalypt associations, where the species seems to prefer more fertile sites with higher soil water content, including creek flats, broad river valleys and lower slopes. Regent Honeyeaters sometimes occur in coastal forest, especially in stands dominated by *Eucalyptus robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum) and *E. botryoides* (Southern Mahogany). Very rarely they occur in coastal waterside forest dominated by *E. viminalis* (Manna Gum) or coastal scrub and heathland dominated by Banksia spp. and tea-tree (DotE 2016).

There are four known key breeding areas where the species is regularly recorded. These are:

- Bundarra-Barraba district, NSW
- Capertee Valley area, NSW
- Hunter Valley, NSW
- Chiltern area in north-east Victoria.

In 2010, the total population size of the species in Australia was estimated at 350 - 400 mature individuals (DotE 2016). The species is considered a single population across its distribution (DotE 2016).

5.5.3 Regional and local distribution and abundance

Small non-breeding flocks of Regent Honeyeaters are seen irregularly in the North Coast region and are generally seen over the winter feeding on flowering *Eucalyptus robusta* or *Corymbia maculata* (Spotted Gum) (DPIE 2019). Regent Honeyeaters are also infrequently observed in the Karuah Manning IBRA subregion, with 10 records of the species in total (DPI, 2019a). eBird Australia (2019) also shows a low frequency of Regent Honeyeater reports in the area (0-2 % reporting rate), with no previous records of the species within 10 km of the study area (BioNet 2020 and **Figure 36** and **41)**.

The most recent records of the species in proximity to the study area occur ~30 km away at Neranie Bay (near Bungwahl) in July 2019 where at least 12 Regent Honeyeaters were observed feeding in flowering *Eucalyptus robusta* (eBird 2019). A single individual was also observed at Old Bar (20 km North of the study area in July 2018 feeding on *Banksia integrifolia* (Coast Banksia) (eBird 2019).

Potential foraging habitat within the study area is limited with only small isolated patches of *Eucalyptus robusta* within the *Blackbutt – Smooth-barked Apple shrubby open forest*, which may be used in years of profuse flowering.

5.5.4 Surveys completed in the study area

Incidental recordings of diurnal bird species within the study area were made in June and July by RPS (2012) and ELA 2021 in conjunction with other diurnal surveys, habitat assessments and targeted surveys across select areas of the North Tuncurry site during 2010, 2011, 2012, 2014, 2015 and 2020. Habitat assessments included targeted searches for habitat attributes used by threatened species considered as having some potential to occur within the site, including the seasonally occurring Swift Parrot and Regent Honeyeater (RPS 2012).

5.5.5 Conclusion

The Regent Honeyeater has not been recorded in the study area, and there are only limited records in the broader locality. It was not identified as a 'potential' species for consideration in the controlled action decision (**Appendix C**), however, as it has been recorded in the locality, and may use habitat in the study area for foraging from time to time, it has been included for further assessment in this PER on a precautionary basis.

5.6 Swift Parrot – *Lathamus discolor*

5.6.1 Conservation status

Lathamus discolor (Swift Parrot) is listed as Critically Endangered by the Commonwealth EPBC Act 1999 and Endangered under NSW BC Act 2016.

5.6.2 National distribution and abundance

The Swift Parrot breeds in Tasmania (where the breeding population has declined from more than 10,000 pairs to less than 1,000 pairs in 1995) and over-winters on mainland Australia from Victoria to southern Queensland. The numbers of birds that seasonally occupy habitats in NSW are usually considerably less than the known breeding population and represent a portion of the population (DPIE 2000).

5.6.3 Regional and local distribution and abundance

In NSW the Swift Parrot mostly occurs on the coast and south west slopes (DPIE 2020) over the autumn and winter months.

One-hundred and twenty-two (122) records of *Lathamus discolour* (Swift Parrot) occur in the Karuah Manning IBRA subregion with 7 records over the past 20 years (four in 2002 and one in each of 2007, 2008 and 2010) within 10 km of the study area (BioNet 2020 and **Figure 36 and 41**). These records include multiple observations of between 1 and 30 birds foraging in a large flowering Swamp Mahogany in an urban car park between late May and early June 2002 (see **Figure 36**). One record of the species that appears to be from within the study area in May 2002 has incorrect coordinates and is actually from Halliday's Point, some 15km north of the study area. No records are present in the local area on e-bird Australia (2019).

Potential habitat within the study area is primarily the *Blackbutt – Smooth-barked Apple shrubby open forest*. *Eucalyptus pilularis* (Blackbutt) is recorded as being used by Swift Parrot as a foraging resource for lerp (DPIE 2020). There are also occasional *Eucalyptus robusta* within the Blackbutt Forest.

5.6.4 Ecology

The Swift Parrot is small parrot about 25 cm long. The species feeds on both nectar and lerp (a structure of crystallized honeydew produced by larvae of psyllid bugs) and migrates between Tasmania and the south-east mainland.

Major threats to the survival of the Swift Parrot population include the loss and alteration of foraging and nesting habitat through forestry activities, including firewood harvesting, and residential, industrial and agricultural development. Other identified threats include climate change impacts, competition for foraging and nesting resources, nest predation by sugar gliders, mortality from collisions with human-made objects, Psittacine beak and feather disease, and illegal bird capture and trade (Saunders and Tzaros 2011).

Saunders and Tzaros (2011) consider that development of the North Coast region presents an ongoing threat of habitat loss for the Swift Parrot with an increasingly large proportion of the human population (about 86%) residing in coastal areas of Australia.

5.6.5 Surveys completed in the study area

Incidental recordings of diurnal bird species within the study area were made by RPS between 2010-2012 (RPS 2012) and ELA in 2014, 2015 and 2020 (ELA 2020 and 2021) in conjunction with other diurnal surveys, habitat assessments and targeted surveys across select areas of the North Tuncurry site. Habitat assessments included targeted searches for habitat attributes used by threatened species considered as having some potential to occur within the site, including the seasonally occurring Swift Parrot and Regent Honeyeater (RPS 2012). Whilst no specific winter bird surveys targeting Swift Parrot were conducted in the study area, the species was assumed to occur from time to time based on the presence of suitable foraging habitat and records in the locality (RPS 2012).

5.6.6 Conclusion

The Swift Parrot has not been recorded in the study area and there are only limited records (7 records over the past 20 years). The species was not identified as a 'potential' species for consideration in the controlled action decision (**Appendix C**), however, as it has been recorded in the locality and nearby the study area, and may use habitat in the study area for foraging from time to time it has been included for further assessment in this PER.

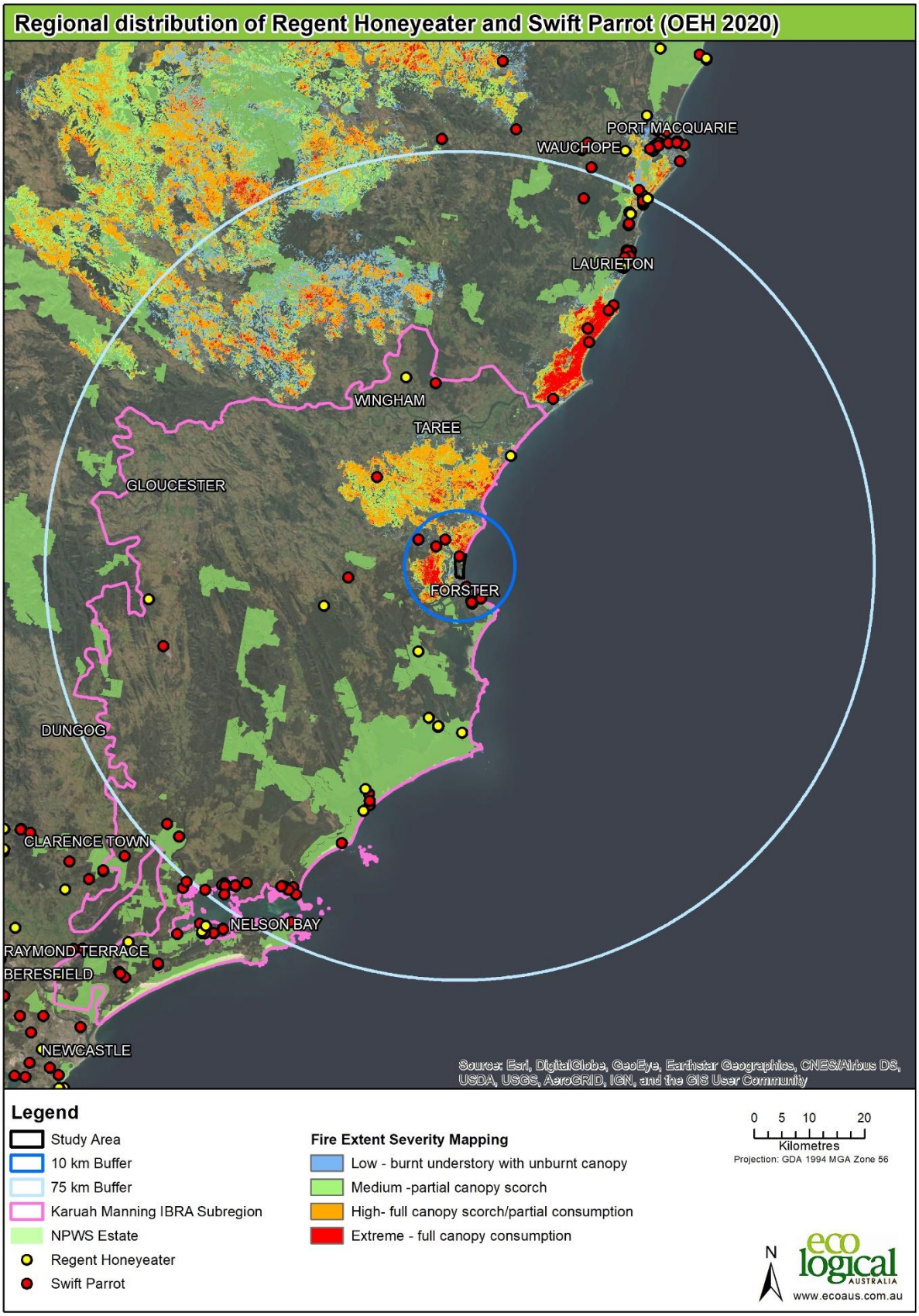


Figure 41: Regional distribution of Regent Honeyeater and Swift Parrot (Source BioNet 2020)

5.7 Spotted-tail Quoll (SE Mainland)– *Dasyurus maculatus*

5.7.1 Conservation status

Dasyurus maculatus (Spotted-tail Quoll) is listed as Endangered by the Commonwealth EPBC Act 1999 and Vulnerable under the NSW BC Act 2016.

5.7.2 National distribution and abundance

The Spotted-tailed Quoll is widely but patchily distributed in eastern Australia, occurring from north-eastern Queensland to Tasmania. The SE mainland population of Spotted-tail Quoll occurs from near Gladstone in south-eastern Queensland, through NSW to western Victoria (DELWP 2016). Except for intensively trapped research sites, limited information exists on the distribution and abundance of the species throughout much of its range, however habitat for the species is known to have been reduced by 50-90% (DELWP 2016).

5.7.3 Regional and local distribution and abundance

There are numerous records of Spotted-tailed Quoll in the Karuah-Manning IBRA subregion, including several records close to the study area (Booti National Park south of Foster and the Nabiac Sandbeds, west of the study area. Further, one previous record of the Spotted-tailed Quoll occurs within vegetation connected to the study area (**Figure 36**). However this record has a reported accuracy of +/- 10 km and was reported as part of community wildlife survey between 2004 and 2006 (DPIE 2019a). All vegetation in the study area could be considered potential habitat for the Spotted-tailed Quoll. However, no Spotted-tailed Quoll were observed or trapped within the study area as part of fauna surveys by ERM (2005, 2010), RPS (2012) or ELA (2020).

5.7.4 Ecology

The Spotted-tail Quoll uses a wide range of habitat types to hunt small/medium sized mammals, birds, reptiles and insects during the night. Hollow-bearing trees, logs, caves, rock outcrops and cliff faces are used as den sites. Home ranges of individual animals are very large. Female home ranges are generally non-overlapping and 88–1515 ha in size, while male home ranges are much larger, from 359–5,512 ha in size, and overlap and encompass multiple female home ranges (DELWP 2016).

5.7.5 Surveys completed in the study area

Table 5 and **Figures 31, 32** and **34** detail the survey effort and survey locations targeting Spotted-tailed Quoll. Despite approximately 35 hours were spent spotlighting (walking and vehicle based) across the site, 72 cage traps baited with chicken, 2,820 hair traps and 984 remote camera trap nights between 2005 and 2020, the species has not been recorded in the study area.

5.7.6 Conclusion

Whilst the Spotted-tailed Quoll has not been recorded in the study area, it was specifically identified as a 'potential' species for consideration in the controlled action decision, and has been recorded in the locality, as such it may use habitat in the study area for foraging and shelter from time to time. Accordingly it has been included for further assessment in this PER.

5.8 Long-nosed Potoroo (SE Mainland) - *Potorous tridactylus*

5.8.1 Conservation status

The Long-nosed Potoroo is listed as Vulnerable by the Commonwealth EPBC Act 1999 and Vulnerable under the NSW BC Act 2016.

5.8.2 National distribution and abundance

The Long-nosed Potoroo occurs on the mainland from Victoria to Southern Queensland, in scattered populations where suitable habitat exists. Population information is limited and cannot be estimated reliably (Department of the Environment 2019d).

5.8.3 Regional and local distribution and abundance

Two-hundred and twenty seven (227) records of the species have been documented in the Karuah Manning IBRA subregion (DPIE 2019).

The Long-nosed Potoroo was detected approximately 5 km from the current study area on the western side of the Wallamba River by ELA in 2016 as part of offset investigations for the current proposal. This species was detected using baited remote cameras within *Scribbly Gum, Wallum Banksia, Prickly leaved Paperbark heathy coastal woodland*. No other records of the species occur within 10 km of the study area, with the nearest record near Taree and Khappinghat Nature Reserve (~ 22 km north of the study area) (BioNet 2020). No other information is available in regards to local abundance of the species.

5.8.4 Surveys completed in the study area

Table 5 and **Figures 31, 32** and **34** detail the survey effort and survey locations targeting the Long-nosed Potoroo. Despite approximately 35 hours were spent spotlighting (walking and vehicle based) across the site, 72 cage traps baited with universal bait (Peanut butter, oats and honey), 2,820 hair traps and 984 remote camera trap nights between 2005 and 2020, the species has not been recorded in the study area or in the vicinity of the study area.

5.8.5 Conclusion

Whilst the Long-nosed Potoroo has not been recorded in the study area or within the vicinity of the study area, it was specifically identified as a 'potential' species for consideration in the controlled action decision, and the PER guidelines required the PER to include information on known populations in the region (Karuah-Manning IBRA subregion) as described above.

Given the lack of records in any areas of suitable habitat connected to the study areas, it is not considered a candidate species and has not been included for further assessment in this PER.

5.9 New Holland Mouse – Pseudomys novaehollandiae

5.9.1 Conservation status

Pseudomys novaehollandiae (New Holland Mouse) is listed as Vulnerable by the Commonwealth EPBC Act 1999. The species is not listed under the NSW BC Act 2016.

5.9.2 National distribution and abundance

The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, NSW and Queensland. Across the New Holland Mouse's range, the total population size of mature individuals is estimated to be less than 10,000 individuals (DotEE 2019). Including sites in which the species has not been confirmed between 1999 and 2009, the estimated extent of occurrence of the New Holland Mouse is estimated to be around 108,000 km2 and the area of occupancy is estimated to be around 680 km2 (DotEE 2019). The New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes.

5.9.3 Regional and local distribution and abundance

One-hundred and sixty-nine (169) records of the species have been documented in the Karuah Manning IBRA subregion (BioNet 2020). Locally the species has previously been recorded on several occasions west of the Wallamba River near Nabiac and also within Booti National Park, south of Forster, Wallingat and Myall Lakes National Parks.

New Holland Mouse populations are variable with peaks in abundance during early to mid-stages of vegetation succession typically induced by fire (DPIE 2019).

All vegetation within the study area is considered potential habitat for the New Holland Mouse.

5.9.4 Ecology

The New Holland Mouse is a small native rodent that lives predominately in shared burrows. Soil type may be an important indicator of suitability of habitat for the New Holland Mouse, with deeper top soils and softer substrates being preferred for digging burrows. The species is nocturnal and has a diet of largely seeds, relying on areas with high floristic diversity, especially leguminous perennials. The New Holland Mouse is known to inhabit open heathlands, open woodlands with heathland understorey and vegetated sand dunes.

5.9.5 Surveys completed in the study area

Table 5 and **Figures 31, 32** and **34** detail the survey effort and survey locations targeting the New Holland Mouse. The species has only been recorded once in 2020 (ELA 2020) after 2,820 hair traps and 984 remote camera trap nights between 2005 and 2020.

5.9.6 Conclusion

The New Holland Mouse was specifically identified as a 'potential' species for consideration in the controlled action decision, and has been recorded in the study area where parts of its habitat will be impacted. Accordingly it has been included for further assessment in this PER.

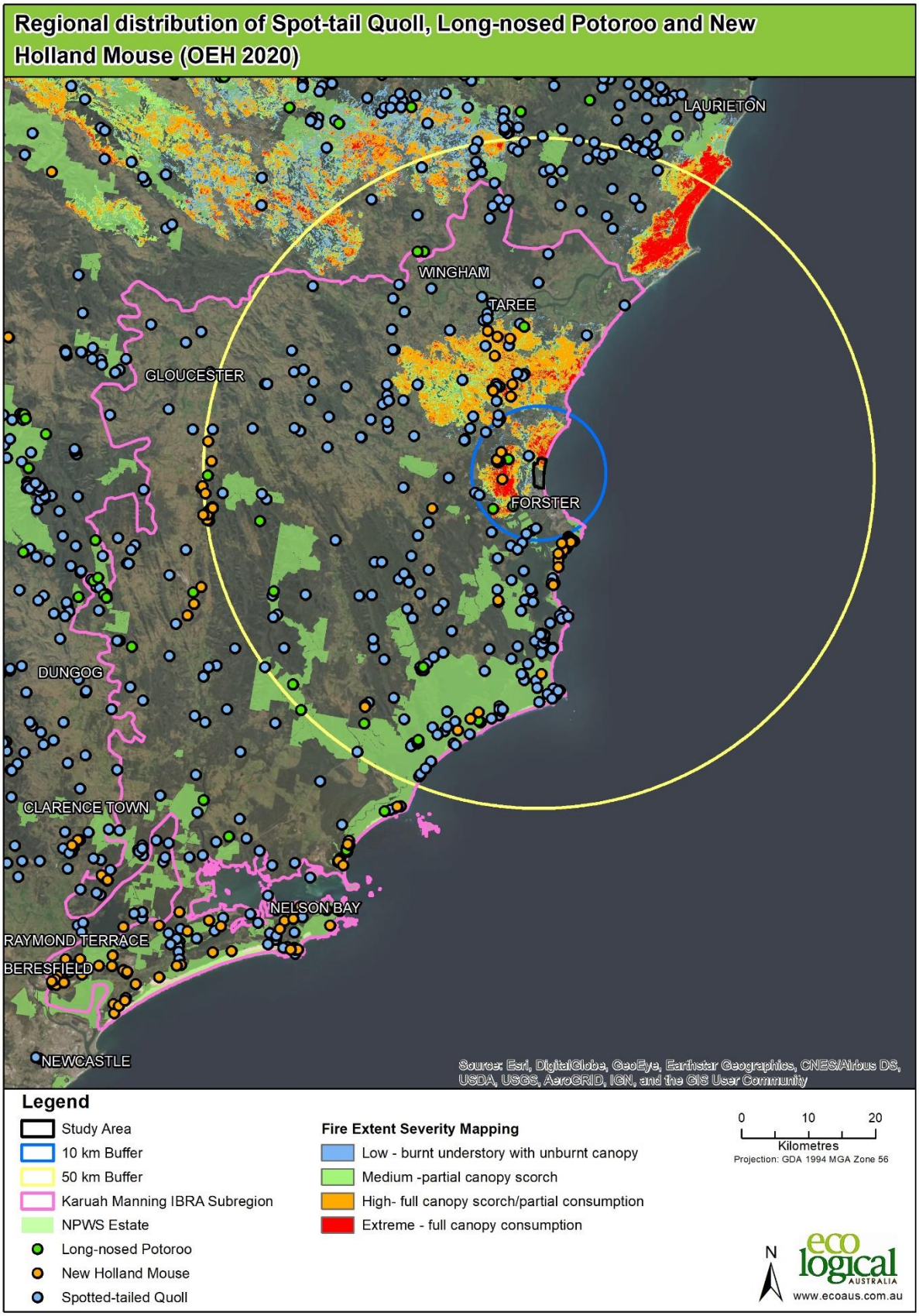


Figure 42: Regional distribution of Spot-tail Quoll, Long-nosed Potoroo and New Holland Mouse (Source BioNet 2020)

5.10 Grey-headed Flying-fox – *Pteropus poliocephalus*

5.10.1 Conservation status

The Grey-headed Flying-fox (GHFF) is listed as a Vulnerable species under the NSW TSC Act and Commonwealth EPBC Act.

5.10.2 National distribution and abundance

The GHFF is endemic to Australia, with a distribution ranging from Bundaberg in Queensland, to Adelaide in South Australia. They are usually found on the coastal lowlands and slopes of south-eastern Australia below altitudes of 200 m (DotEE 2017). Areas of repeated occupation extend from the coast, inland to the tablelands and western slopes of northern New South Wales and the tablelands of southern Queensland (DotEE 2017).

An estimate of national population size, based on eleven counts between 1998 and 2005 is between 320,000 and 435, 000 individuals (DotEE 2019).

5.10.3 Regional and local distribution and abundance

The nearest mapped camp is located approximately 9 km from the study area at Cape Hawke near Forster. This camp is considered nationally important and publicly available monitoring data between 2012 and 2019 suggest this camp is regularly occupied with numbers fluctuating between Flying-fox Category 1 (1-499 individuals - November 2017) and Flying-fox Category 5 (16,000 – 49,999 individuals - May 2019) (DotEE 2019).

Several other documented camps are present in the region and have been occupied recently (2018-2019) and are within potential foraging distance of the study area (**Figure 43**). These are:

- **Wootton** (~20 km from study area)- Flying-fox Category 5 (16,000 – 49,999 individuals) when last monitored in May 2018
- **Smith's Lake** (~26 km from study area) – intermittently occupied with Flying-fox Category 3 (2500 - 9,999) individuals recorded in August 2019.
- **Wingham** (Nationally Important) (~32 km from study area) – permanently occupied with more than 50,000 individuals (Flying-fox Category 6) recorded during several monitoring events between 2012 and 2019.

Several other small camps have previously been recorded in the area but appear to be infrequently occupied or are no longer used.

5.10.4 Ecology

The GHFF is an important pollinator and seed disperser and may travel up to 40 km in a night to important feeding areas (more often 20 km) DotEE (2017). GHFF's eat fruit (particularly figs) and also nectar and pollen, especially from gum trees (Australian Museum 2019).

Young Grey-headed Flying-foxes are usually born in September to October and are carried by the mother for the first three weeks. As they grow larger and become too heavy to carry on feeding expeditions, they are left behind in special 'creches' in the maternity camp. After about three months the young are able to fly and by five to six months of age they begin to feed independently (Australian Museum 2019).

5.10.5 Surveys completed

Grey-headed Flying-foxes have been regularly observed flying over the study area and foraging within the study area. They are likely to use, from time to time, all habitats present within the study area, including coastal heathlands when Banksias are in flower.

5.10.6 Conclusion

The Grey-headed Flying-fox was specifically identified as a 'potential' species for consideration in the controlled action decision, and has been recorded in the study area where parts of its habitat will be impacted. Accordingly it has been included for further assessment in this PER.

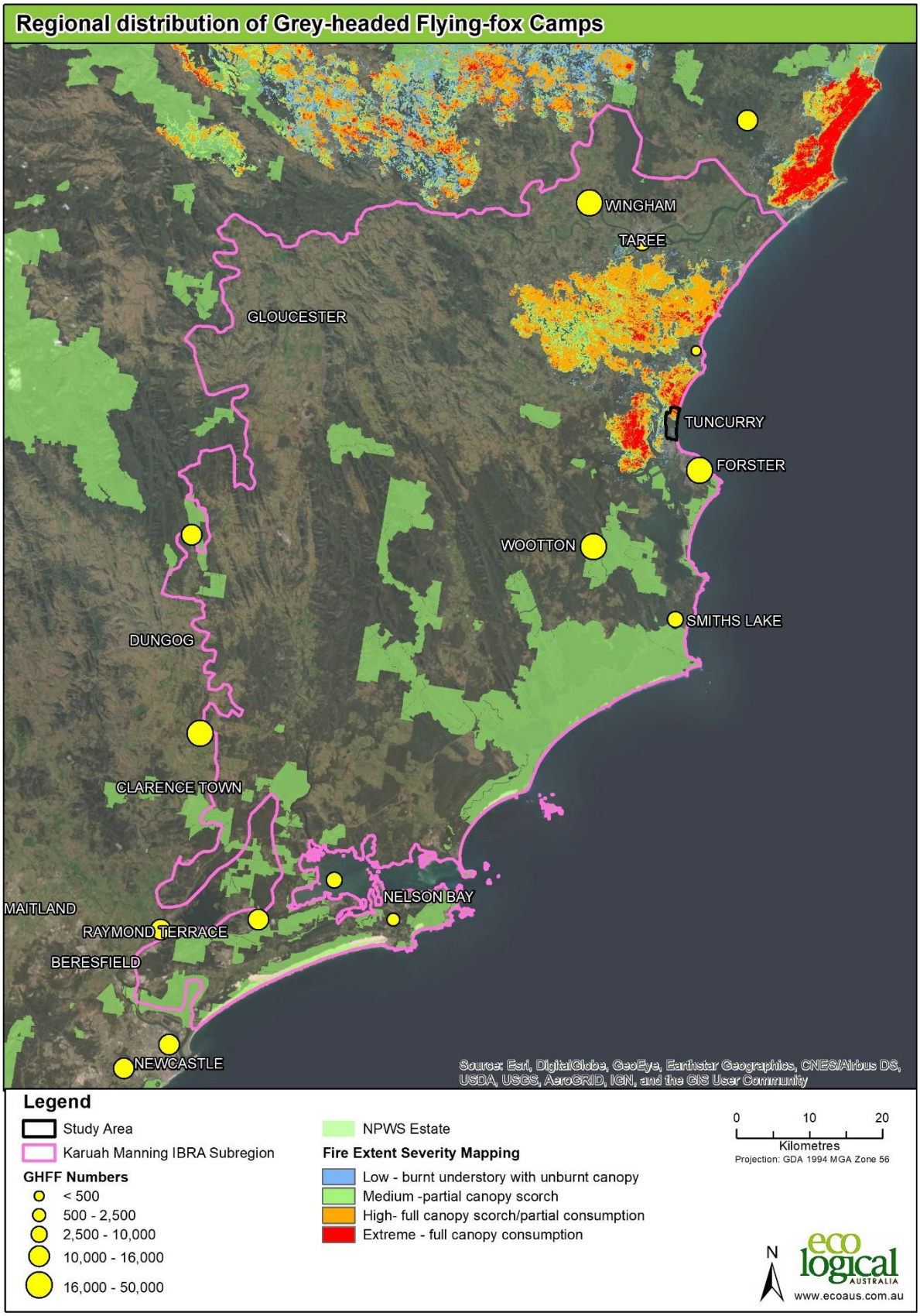


Figure 43: Regional distribution of GHFF camps (Source DotEE Flying-fox monitoring database)

5.11 Green Turtle

5.11.1 Conservation status

The Green Turtle (*Chelonia mydas*) is listed as a Vulnerable species under the NSW BC Act and Commonwealth EPBC Act.

5.11.2 Ecology

The Green Turtle is a large sea-turtle (up to one metre in length) that is widely distributed in tropical and sub-tropical seas where it is typically found in seaweed rich coral reefs and inshore seagrass pastures.

In Australia, there are seven regional populations of green turtles that nest in different areas; the southern Great Barrier Reef, the northern Great Barrier Reef, the Coral Sea, the Gulf of Carpentaria, Western Australia's north-west shelf, the Ashmore and Cartier Reefs and Scott Reef.

The southern Great Barrier Reef population has major rookeries on the Islands of the Capricorn Bunker Group and minor breeding aggregations on mainland beaches from Bustard Head to Bundaberg. Nesting occurs between mid-late October and late March-early April with a peak in late December-early January.

In the northern Great Barrier Reef major breeding aggregations occur on Islands of the outer edge of the reef, including Raine Island and nearby cays. Minor rookeries for this population also occur on the mainland and inner and outer shelf islands and cays from Cape Grenville north and in Torres Strait. Nesting can occur year round, but most nesting occurs from October to March with a peak in late December-early January.

Green turtles nesting in the northern Great Barrier Reef migrate from feeding grounds in Indonesia, Papua New Guinea, Vanuatu, New Caledonia and across northern Australia from Melville Island in the Northern Territory to Moreton Bay in south-east Queensland.

The Gulf of Carpentaria has two main nesting areas, the Wellesley Island Group, with major rookeries at Bountiful, Pisonia and Rocky Islands, and the Eastern Arnhem Land, Groote Eylandt and Sir Edward Pellew Islands area. Nesting occurs year round, with a mid-year peak in nesting activity.

The north west shelf has widely spread nesting sites from the Ningaloo coast to the Lacepede Islands. Major nesting sites include the Lacepede Islands, Browse Island, North West Cape, Barrow Island and the Montebello Islands. Nesting activity occurs in November to March, but may occur year round in the more northern sites.

Green turtles nesting along the Western Australian coast migrate from feeding grounds in Indonesia, Queensland, Northern Territory and as far south as Shark Bay in Western Australia.

5.11.3 National distribution and abundance

Within Australia, Green Turtles are found from Shark Bay in Western Australia, around the northern Australia coast, throughout the Great Barrier Reef and as far south as Moreton Bay in Southern Queensland. Whilst it is usually found in tropical waters around Australia it also occurs in coastal waters of NSW where it has been observed on the north and central costs and occasionally the south coast.

5.11.4 Regional and local distribution and abundance

BioNet includes a number of observations of Green Turtles along the NSW coastline, where they have been observed on the north and central costs and occasionally the south coast. Dead animals are occasional found washed up on beaches and rare sighting of animals coming ashore attempting to nest have been made, including at Nine Mile Beach, adjacent to the study area in 2011.

5.11.5 Surveys completed

Systematic surveys for the species have not been undertaken.

5.11.6 Conclusion

The Green Turtle was not specifically identified as a 'potential' species for consideration in the controlled action decision, however as it has been recorded attempting to nest in open ocean beaches in the study area where parts of its habitat will be indirectly impacted by increased recreational activities resulting from the development, it has been included for further assessment in this PER.

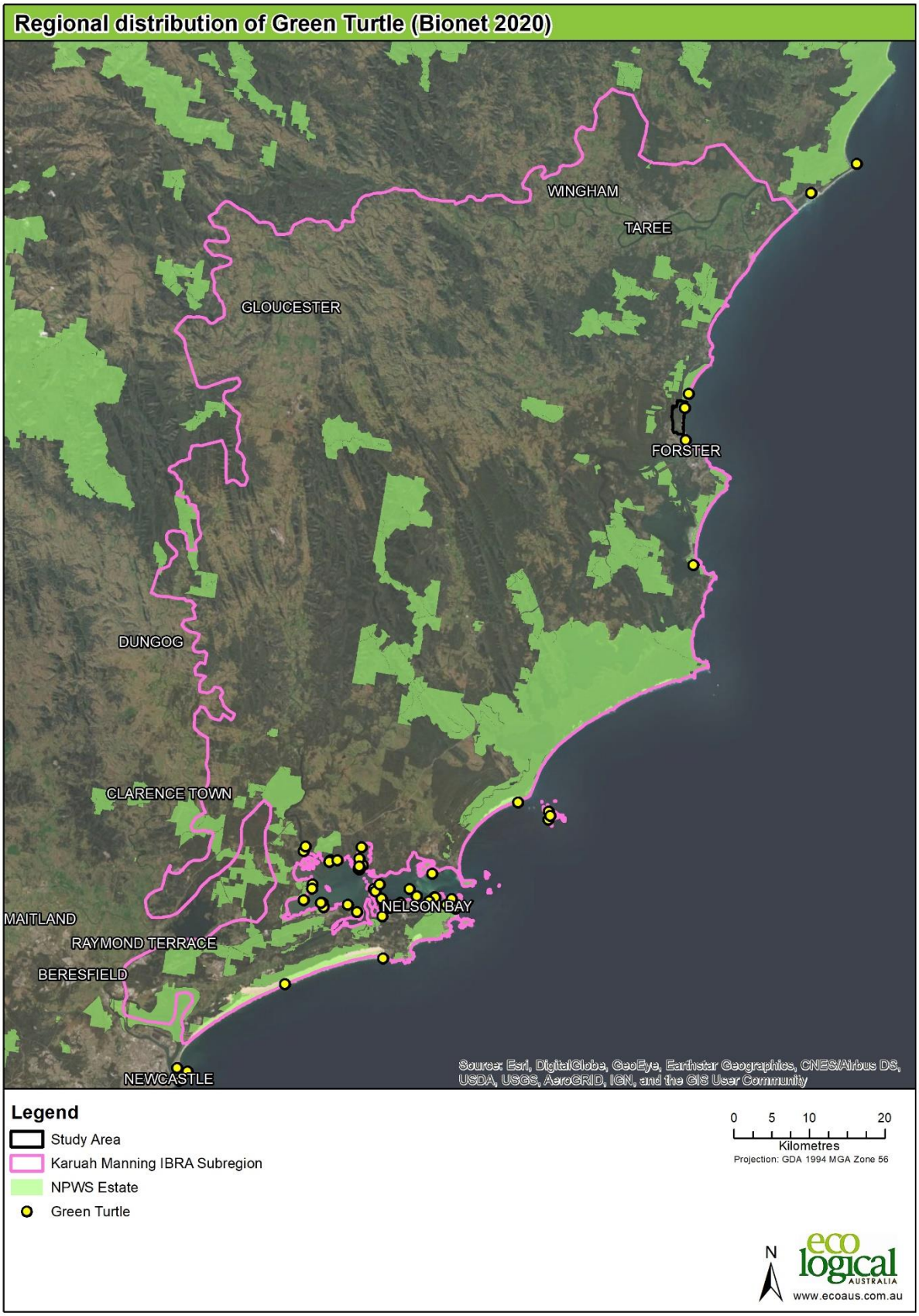


Figure 44: Regional distribution of Green Turtle (Source BioNet 2020)

6. Assessment of impacts to relevant Matters of National Environmental Significance

Section 5 of the Guidelines for the PER for the North Tuncurry Mixed Use Development issued on 4 July 2011 require the PER to include a description of the potential relevant impacts (direct, indirect and cumulative) and consequential impacts of the proposed action on each relevant listed threatened species 'likely' to occur in the 'vicinity' of the action area or be impacted by the action. The assessment of impacts must include:-

- A detailed description and assessment of the nature and extent of potential short, medium and long term impacts including impacts before, during and after construction and operation
- An analysis of the significance of impacts on relevant EPBC Act listed threatened species and ecological communities at a local, regional and national scale
- A statement of whether any impacts are likely to be unknown, unpredictable or irreversible
- Any technical data and other information used or needed to make a detailed assessment of the impacts; and
- Any expected positive and negative social and economic impacts of the proposal

This section addresses this requirement.

6.1 Technical data and other information used to make assessment of impacts

The technical data used to make an assessment of impacts includes the results of surveys undertaken in the study area between 2005 and 2020 (as described in Section 4 and 5 of this PER) and other published ecological information on the relevant species i.e. species recovery plans, EPBC conservation listing advice, SPRAT profiles (as referenced in Section 10 of this PER).

6.2 Expected positive and negative social and economic impacts of the proposal

A range of social planning, community needs, housing and economic studies have been undertaken throughout the site planning process to inform the design and delivery of the North Tuncurry Urban Release Area (Elton Consulting 2019). The proposed planning controls (Ethos Urban 2019) for the site are anticipated to result in approximately 4,000 people being accommodated within the Site. The projected population will be large enough to support a centre with a neighbourhood supermarket and shops, local neighbourhood community facilities and services, and new surf lifesaving club facilities. The technical reports accompanying the Study conclude that the social infrastructure and retail components of the NTURA will be sufficient to cater for the needs of the projected population and will complement rather than compete with facilities provided in established centres within Tuncurry-Forster.

6.3 Relevant Impacts to MNES

Following the investigations of the threatened species present or likely to be present in or within the vicinity of the study area (Section 4 and 5 of this PER), this PER has determined the following MNES as being relevant matters to include a description of the potential impacts of the proposed action.

- Tuncurry Midge Orchid
- Swift Parrot
- Regent Honeyeater
- New Holland Mouse
- Spotted-tailed Quoll
- Grey-headed Flying-fox
- Green Turtle

The proposed action will permanently clear 201.67 ha of existing native vegetation within the study area by developing approximately 2,100 residential dwellings, 13.2 ha of business/employment lands, a remodelled Forster-Tuncurry Golf Course, a village centre with Golf Club, Community Centre, retail shops and cafes and modern surf club over an approximate 35 year period.

The action is anticipated or has potential to impact the following MNES through the following processes:

Table 9: Summary of relevant impacts to MNES

{	Potential activity/ impact	MNES affected
Construction		
	Direct mortality or clearing of a species habitat	All MNES
	Fragmentation of a population, community or habitat resulting from the action	None
	Direct or indirect disruption of breeding, foraging or other key life-cycle stages	All MNES within development footprint
	Indirect impacts (Increased activity and disturbance to fauna - noise, activity, lighting etc.)	Regent Honeyeater, Spot-tailed Quoll, Swift Parrot, New Holland Mouse, Grey-headed Flying-fox
	Indirect impacts (introduction and spread of exotic species or disease and /or pollution	Potential impacts to all MNES unless appropriately managed and mitigated (refer to Section 7)
	Indirect impacts (alteration to surface and ground water hydrology and run-off	All MNES
	Indirect impacts (alteration to landuse, nutrients, sedimentation	Tuncurry Midge Orchid
	Accidental Damage to habitat (Machinery access outside of construction area)	Tuncurry Midge Orchid unless appropriately managed and mitigated (refer to Section 7)
Operation (occupation of residential and industrial buildings)		
	Increased roads and vehicle impacts	Spot-tailed Quoll, New Holland Mouse, Grey-headed Flying-fox unless appropriately managed and mitigated (refer to Section 7)
	Increased incidence of rubbish and garden waste dumping	Tuncurry Midge Orchid unless appropriately managed and mitigated (refer to Section 7)
	Increased off-road driving, dirt and trail bike riding (erosion, creation of new tracks and trails, direct impacts to TMO)	Tuncurry Midge Orchid (direct impacts), indirect impacts to remaining MNES) unless appropriately managed and mitigated (refer to Section 7)
	Altered fire regimes (e.g. increases in fire from arson, accidental fire & hazard reduction burns to protect new residences/buildings)	Tuncurry Midge Orchid (direct impacts), indirect impacts to remaining MNES through habitat changes unless appropriately managed and mitigated (refer to Section 7)

In addition, the cumulative effects of the 2019/2020 bushfires that burnt 30,735 ha (or 8.75%) of the rainforest, wet and dry sclerophyll forest and heathlands in the Karuah-Manning IBRA subregion (as

shown in Table 10 and **Figure 21**), and 180 ha (or 33% of the 545 ha) of vegetation in the study area (**Figure 22**), have been considered in the impact assessment.

Section 7 of this PER provides a description of the proposed safeguards, mitigation measures and offsets to avoid, minimise and mitigate these potential impacts.

Table 10: Area and vegetation burnt in the Karuah-Manning IBR Subregion

Vegetation Class	Low	Medium	High	Extreme	TOTAL BURNT	Unburnt	TOTAL
Northern Warm Temperate Rainforests	13	2	3	0	18	6,026	6,045
Dry Rainforests	4	7	6	0	17	2,886	2,903
Subtropical Rainforests	136	781	801	31	1,749	21,804	23,553
Littoral Rainforests	19	24	37	4	83	1,505	1,587
North Coast Wet Sclerophyll Forests	82	1,038	1,500	123	2,744	100,745	103,489
Northern Hinterland Wet Sclerophyll Forests	561	4,271	11,869	809	17,511	62,431	79,942
Northern Escarpment Wet Sclerophyll Forests	0	0	0	0	0	234	234
Northern Tableland Wet Sclerophyll Forests	0	0	0	0	0	2	2
Coastal Dune Dry Sclerophyll Forests	104	352	817	178	1,451	37,721	39,171
South Coast Sands Dry Sclerophyll Forests	0	0	0	0	0	935	935
Hunter-Macleay Dry Sclerophyll Forests	17	23	74	2	116	30,006	30,123
Sydney Sand Flats Dry Sclerophyll Forests	6	14	72	37	128	1,063	1,192
Sydney Coastal Dry Sclerophyll Forests	2	4	18	2	26	5,089	5,116
Northern Gorge Dry Sclerophyll Forests	0	0	0	0	0	898	898
New England Dry Sclerophyll Forests	0	0	0	0	0	290	290
Northern Escarpment Dry Sclerophyll Forests	0	0	0	0	0	53	53
Inland Rocky Hill Woodlands	0	0	0	0	0	2	2
Wallum Sand Heaths	96	155	993	1,687	2,930	10,624	13,555
Coastal Headland Heaths	0	0	0	0	0	308	308
Northern Montane Heaths	0	0	0	0	0	48	48
Coastal Swamp Forests	367	889	1,710	350	3,316	15,865	19,181
Coastal Floodplain Wetlands	40	43	164	63	310	10,093	10,404
Eastern Riverine Forests	9	4	9	0	23	1,690	1,713
Coastal Heath Swamps	0	0	6	6	13	869	882
Coastal Freshwater Lagoons	2	3	11	2	18	947	966
Mangrove Swamps	63	10	17	1	91	5,031	5,122
Saltmarshes	74	28	75	14	191	3,356	3,547
No equivalent	0	0	0	0	0	24	24
Sub-total Vegetation	**1,596**	**7,649**	**18,182**	**3,308**	**30,735**	**320,547**	**351,282**
Proportion extent vegetation burnt/unburnt	**0.45%**	**2.18%**	**5.18%**	**0.94%**	**8.75%**	**91.25%**	**100.00%**

6.4 Tuncurry Midge Orchid – *Corunastylis littoralis*

6.4.1 Nature and extent of potential short, medium and long-term impacts before, during and after construction and operation

Direct impacts

The proposed action will directly impact 25 of the 434 locations where TMO has been recorded in the study area, comprising 63 of 2,433 known individuals, which represents 2.59% of the total number of individuals known in the study area and 2.39% of all known TMO's across the four known sub-populations (2,636 individuals) (Table 11 and **Figure 45**).

Within the study area, 513.40 ha of potential habitat (or area occupied) has been determined as shown in **Figure 45** and some 4,445 ha of potential habitat has been identified in the locality as shown in **Figure 37**. Accordingly, the area of potential habitat to be directly impacted by the proposed action (201.36 ha) represents 39.22% of habitat within the study area and 4.06% of the potential habitat in the region.

Potential isolation and fragmentation of the remaining North Tuncurry population of the TMO has been avoided through locating the proposed development to the south of the study area away from the majority of TMO records and contiguous with existing development in Tuncurry and maintaining connectivity of the TMOs along the southern edge of the study area (adjacent to the Lakes Way) with the plants in the northern part of the study area by the proposed North Tuncurry Biobank site and retained powerline maintenance corridor. The proposed retention, in perpetuity conservation and active management of these connected areas of habitat is expected to maintain critical pollinator access throughout the retained population in the study area and no direct disruption to key life-cycle stages are anticipated (FloraSearch 2013 & 2014) including the proposed 4.08 ha TMO Orchid Reserve that protects 74 individual plants, that will retain pollinator corridors to other areas (FloraSearch 2018 and **Figure 46**).

Impacts of 2019/2020 Wildfires

Within the Karuah-Manning IBRA Subregion, the 2019/20 wildfires burnt 30,735 ha to varying degrees (or 8.75% of the 351, 282 ha of native vegetation in the region (refer to **Figure 21**). These fires burnt known locations of TMO at Nabiac-Minimbah as well as 158 ha of proposed conservation lands in the northern parts of the study area, but did not affect records in the Booti Booti National Park (**Figure 37**).

A rapid 2-day re-count of previously recorded locations in the study area was undertaken in March 2021 to determine the on-going persistence of TMOs in burnt and unburnt areas. The assessment was able to rapidly re-locate 800 plants at 20 locations visited which includes 570 plants in burnt areas.

Table 11: Number of TMO individuals impacted by the proposed action in the study area and region

	Within North Tuncurry Study Area									Outside Study Area		Total	
	Development			Conservation			Retained						
TMO Records and Habitat	TMO	% within Study Area	% of total	TMO	% within Study Area	% of total	TMO	% within Study Area	% of total	TMO	% of total	within Study Area	All ar
Number of sites/locations confirmed	25	5.76%	4.89%	272	62.67%	53.23%	137	31.57%	26.81%	77	15.07%	434	511
Number of individuals recorded	63	2.59%	2.39%	1,511	62.10%	57.32%	859	35.31%	32.59%	203	7.70%	2,433	2,636
Confirmed habitat (includes 30m buffer around existing records) (ha)	3.36	12.83%	9.18%	17.36	66.28%	47.44%	5.47	20.89%	14.95%	10.40	28.42%	26.19	36.59
Potential habitat (Area of Occupancy where TMO has been recorded) (ha)	201.36	39.22%	4.06%	282.53	55.03%	5.70%	29.51	5.75%	0.60%	4445.00	89.65%	513.40	4958

Number of sites/locations confirmed – refers to the number of locations were TMO has been recorded, noting that are some locations, multiple plants were recorded i.e. the 2,433 TMOs have been recorded at 434 locations within the BCAA.

Number of individuals recorded – refers to the count of individual plants

Potential habitat includes all vegetation types and track edges where TMO has been recorded. Within the BCAA, this excludes only Coast Banksia – Coast Wattle dune scrub other than a small area in the north of the BCAA where high numbers of TMO were recorded on the margin of regenerating Blackbutt open forest and Coast Banksia scrub

Indirect impacts

Indirect impacts from the proposed action include risks to the remaining North Tuncurry population of TMO in retained areas (Powerline corridor and Foster LALC land) and land proposed as offset areas). While direct impacts are of often quantifiable and somewhat predictable in extent and scale, indirect impacts are less certain. Potential indirect impacts are described below:

Potential impacts from future residents and use of retained lands

A substantial number of new residential lots are proposed over the next 25 years (approx. 2,100). This increase in human population, in the absence of active management and mitigation, is likely to place increased pressure on the surrounding environment and the remaining TMO habitat through increased incidences of rubbish and garden waste dumping and environmental weeds.

Parks and gardens, garden waste and site disturbance have the potential to introduce new weeds and increase the density of existing weeds in the study area. *Lantana camara* (Lantana) and *Chrysanthemoides monilifera* (Bitou bush) (weeds of national significance), are present at the site along with several environmental weed species and exotic grasses. Weed invasion has potential secondary impacts in that attempts to control weeds (e.g. spraying of herbicide) can also adversely affect TMO.

The retained land and proposed conservation areas will be permanently fenced and sign posted as shown in **Figure 47** to prevent and minimise waste dumping. Further the habitat areas will be actively managed for conservation in accordance with a Biobank site Management Plan (**Appendix D14**), that includes active weed control.

Trailbike and off -road driving

All existing 4WD tracks will be fenced and signposted as part of the management of the North Tuncurry Biobank site with vehicle access permitted for authorised management vehicles only, except designated access to Nine Mie Beach along the 'Southern Boundary Trail' (see **Figure 47**). This will result in a significant reduction in the current level of damage caused by 4WDs, trail bikes and associated impacts to vegetation, erosion, rubbish dumping and weed invasion.

Consultation has also occurred with Essential Energy regarding the ongoing management and maintenance of the powerline corridor to ensure that their ongoing maintenance program is sympathetic to the habitat needs of TMO which may include the on-going slashing of heath vegetation and/or other management practices such as regeneration burns (as informed by the TMO Research Program).

Changes to existing fire regimes to provide Bushfire Asset Protection Zones

All required Bushfire Asset Protection Zones (APZs) have been incorporated into the development footprint.

Whilst the optimal fire regime for conservation of TMO is currently unknown, several documented unintentional patch burns have occurred in the study area over the last twenty years. RPS 2013 documented finding TMO in areas recently affected by wildfire (<6 months) and other threatened

Genoplesium spp. have responded well after the 2019/2020 bushfires (Dr Lachlan Copeland pers. Comm.).

The proponent will establish a TMO Research Fund that will investigate the role of fire in the ecology of TMO with the results informing management of the North Tuncurry TMO population and other locations (Refer to **Section 7**).

Mowing and slashing outside of intended impact area (during and after construction)

All Construction works will be subject to a Construction Environmental Management Plan (CEMP), see **Section 7**). The retained land and proposed conservation areas will be permanently fenced and sign posted as shown in **Figure 47** to prevent any mowing or slashing outside of intended impact areas post construction.

Full details of the mitigation measures proposed for the action are documented in **Section 7** of this PER) and the Biobank/Biodiversity Stewardship site Management Plan (**Appendix D14**).

6.4.2 Analysis of significance of impacts at a local, regional and national scale

The key issue arising from the proposed action is whether the TMO habitat areas proposed for retention (and conservation) on the subject site are adequate for the North Tuncurry TMO population to persist in the future and meet its life cycle requirements. Reductions in population size and habitat often increase the risk of extinction through disease, predation, natural disasters, human disturbance, genetics and demographic factors.

Despite extensive additional survey work undertaken as part of this assessment, the full distribution of TMO is likely still not fully known as there has been little targeted survey work outside of the study area and the locality of the study area.

The proposed action was referred under the EPBC Act on 10 May 2011 due to the likelihood of significant impacts on the TMO as a result of the proposed action. Since this referral a number of new 'locations' of TMO have bene recorded, and the total number of plants has increased, the design and location of the development has been altered several times to avoid the majority of records of Tuncurry Midge Orchid in the study area and increase the proportion of known individuals and habitat to be protected in managed conservation areas.

A revised assessment of significance for the TMO using the *Matters of National Environmental Significance -significant impact guidelines* (DotE 2013) is included below in Table 12.

Despite a reduction in the direct impact to the known individuals from 125 in the referred action to 63 individuals in the final footprint, the proposed action will result in the loss of 201.36 ha of potential habitat. With reference to the criteria in the *EPBC Act Significant Guidelines 1.1,* the proposed action is therefore likely to represent a significant impact to the TMO and offsets are proposed consistent with the EPBC Act Offset Policy (DSEWPC 2012), see Section 7.

Table 12: Assessment of significance for Tuncurry Midge Orchid

EPBC Significant Impact Criteria – Critically endangered and endangered species	
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of a population	Unlikely The proposed action will directly remove 63 records of the TMO which represents 2.39% of the total number of individuals previously counted (2,636) and 2.59% of the known North Tuncurry population of TMO. 201.36 ha of potential habitat for the TMO will also be removed. 1,511 individuals of TMO will be permanently protected within a dedicated on-site conservation and a further 859 individuals will be retained within other lands. It is likely that the abundance of TMOs at North Tuncurry and elsewhere will increase as a result of the proposed focussed research, leading to informed management of retained lands and conservation areas.
reduce the area of occupancy of the species	Yes The proposed action plans to remove 63 records of the TMO within the development footprint which represents 201.36 ha or 39.22 % of the potential habitat in the study area. However, the area of occupancy (i.e. where the TMO has actually been recorded) 3.36 ha will not be substantially reduced (12.83%) through proposed retention (and conservation) of TMO adjacent to the proposed development area and within an orchid reserve in the north of the development.
fragment an existing population into two or more populations	No Potential isolation and fragmentation of the North Tuncurry population of the TMO has been avoided through locating the proposed development to the south of the study area away from the majority of TMO records and contiguous with existing development in Tuncurry. The proposed retention and rehabilitation (pollinator corridors to orchid reserve) of connected areas of habitat surrounding the retained TMO, is expected to enable pollinator access throughout the population in the study area.
adversely affect habitat critical to the survival of a species	Yes The proposed action will permanently remove 201.36 ha of potential habitat for the Tuncurry Midge Orchid, which represents 39.22%of the potential TMO habitat in the study area and 4.06% of potential habitat in the region.
disrupt the breeding cycle of a population	Unlikely The proposal is considered unlikely to disrupt the breeding cycle of the retained North Tuncurry TMO population following development, due to retention of pollinator corridors and retention of 87.41% of previous recorded individuals (2127 individuals).
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Yes The proposed action will directly remove 201.36 ha of potential habitat for the Tuncurry Midge Orchid. Potential indirect impacts to the remaining North Tuncurry population of TMO may result from or may be exacerbated by the proposed action include: • Increased incidences of rubbish, garden waste dumping and environmental weeds • Trailbike and off -road driving

EPBC Significant Impact Criteria – Critically endangered and endangered species	
	• Changes to existing fire regimes • Mowing and slashing outside of intended impact area However, these potential impacts will be mitigated by a comprehensive range of measures including implementation of a CEMP and fully funded, in perpetuity Biobank Site Management Plan.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No Indirect impacts arising from the proposed action have the potential to assist the establishment of invasive species. Parks and gardens with non-indigenous flora, garden waste and site disturbance have the potential to introduce new weeds and increase the density of existing weeds in the study area. *Lantana camara* (Lantana) and *Chrysanthemoides monilifera* (Bitou bush) (weeds of national significance), are present at the site already, along with several other environmental weed species. However, these potential impacts will be mitigated by a comprehensive range of measures including implementation of a CEMP and fully funded, in perpetuity Biobank Site Management Plan.
introduce disease that may cause the species to decline, or	Unlikely The proposed action is considered unlikely to introduce diseases that will cause the TMO to decline.
interfere with the recovery of the species.	No. The proposed action conflicts with several priority actions to conserve the species that are listed in the Approved Conservation Advice for the Tuncurry Midge Orchid (DotE 2011). However, the mitigation measures and offsets associated with the proposal will also contribute to these priority actions including the formal protection of two of the four sub-populations, provision of funding to undertake monitoring and priory research to aid in the management of the species.
Conclusion	Given the above, the proposal is likely to lead to a Significant impact to the species and offsets will be required.

6.4.3 Statement of whether any impacts are likely to be unknown, unpredictable or irreversible

The proposed development footprint is permanent, therefore impacts to biodiversity values within the development footprint will be permanent and irreversible. When assessing ecological impacts, there are always 'unknowns' associated with assessments of species presence, abundance and distribution within study areas associated with the duration, seasonality and intensity of survey effort, annual and seasonal variations of species presence and abundance related to drought, wet years, fires etc, which could potentially lead to unpredictable outcomes.

Despite the above, the ecology of the TMO is currently poorly understood. However, this assessment has been based on repeated surveys and census of the local population between 1998 and 2021 and thus a sound base of knowledge from which to make informed impact assessments from.

The loss of 63 individuals, whilst permanent, is not irreversible as there are large areas of suitable habitat in the study area that appear to not support TMO or support TMO at very low densities (RPS 2012 and ELA 2011). Given the ecology of other Genoplesium and orchid species, and the disturbance history of

the study area (pine plantations, mineral sands extraction) it is likely that fire and the density of shrubs and ground cover species will play a major role in the distribution and abundance of TMO in the study area. Landcom (see **Section 7**) has committed to a 5 year, TMO Research and Monitoring Fund to continue annual monitoring, continue an ex-situ propagation trial and pollinator research program and undertake experimental manipulation of habitat (slashing and fire) within the conservation area (North Tuncurry Biobank Site) and retained lands (powerline maintenance corridor which provides habitat for 181 TMOs) to determine the response of TMO to disturbance and inform appropriate long term management regimes within the North Tuncurry Biobank site and other populations of TMO at Booti Booti National Park and Nabiac.

Further, the North Tuncurry Biobank site will be permanently protected and actively managed for conservation with $4.5M in funds provided for on-going management, monitoring, annual reporting and audit.

It is likely that with this focussed research and informed management, the area occupied and abundance of TMOs at North Tuncurry and elsewhere, including species with similar seral habitat requirements (e.g. New Holland Mouse) will increase.

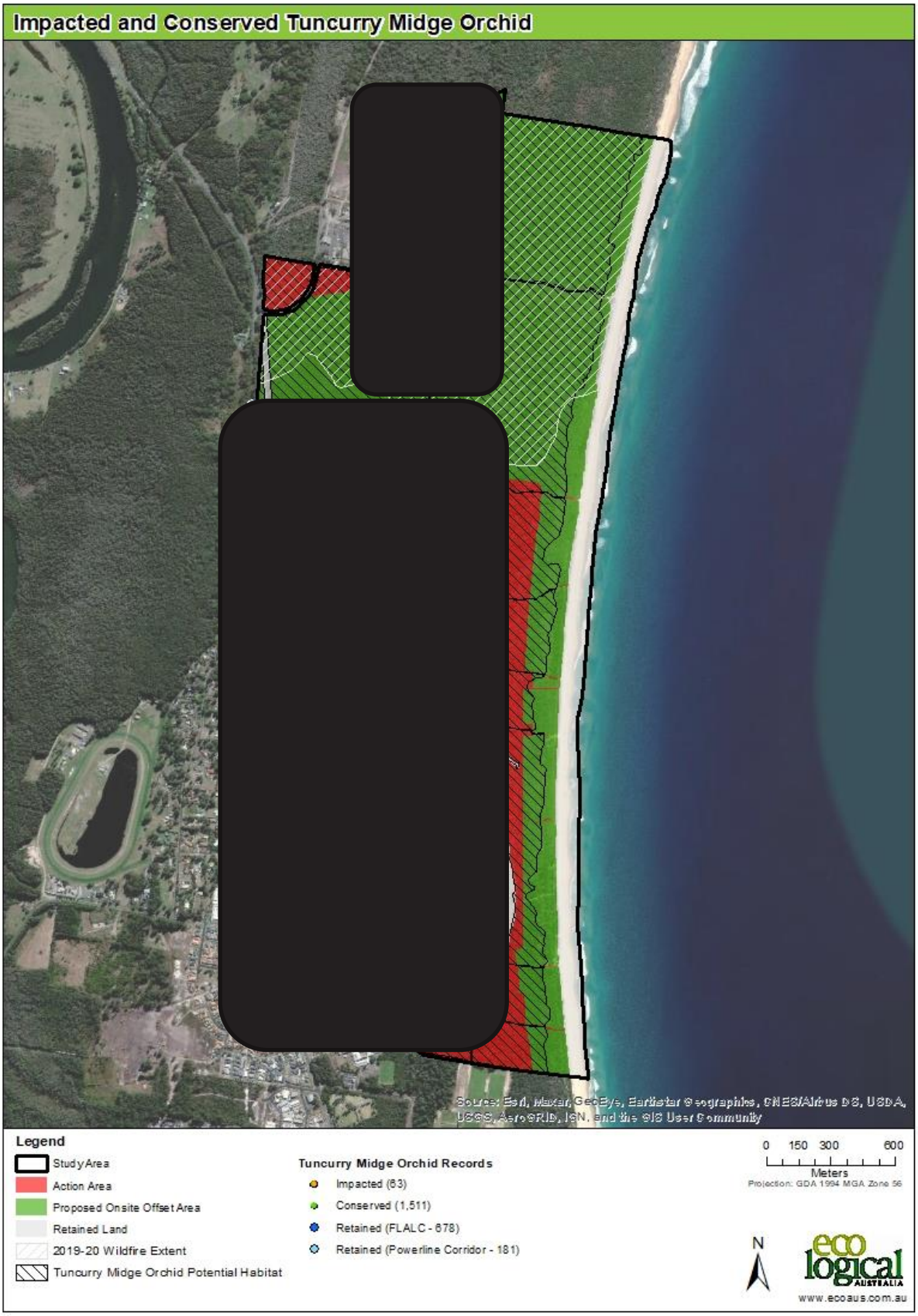


Figure 45: Impacts and offsets for TMO individuals and potential habitat

Note: The precise location of endangered orchids have been redacted from the public exhibition version of this document

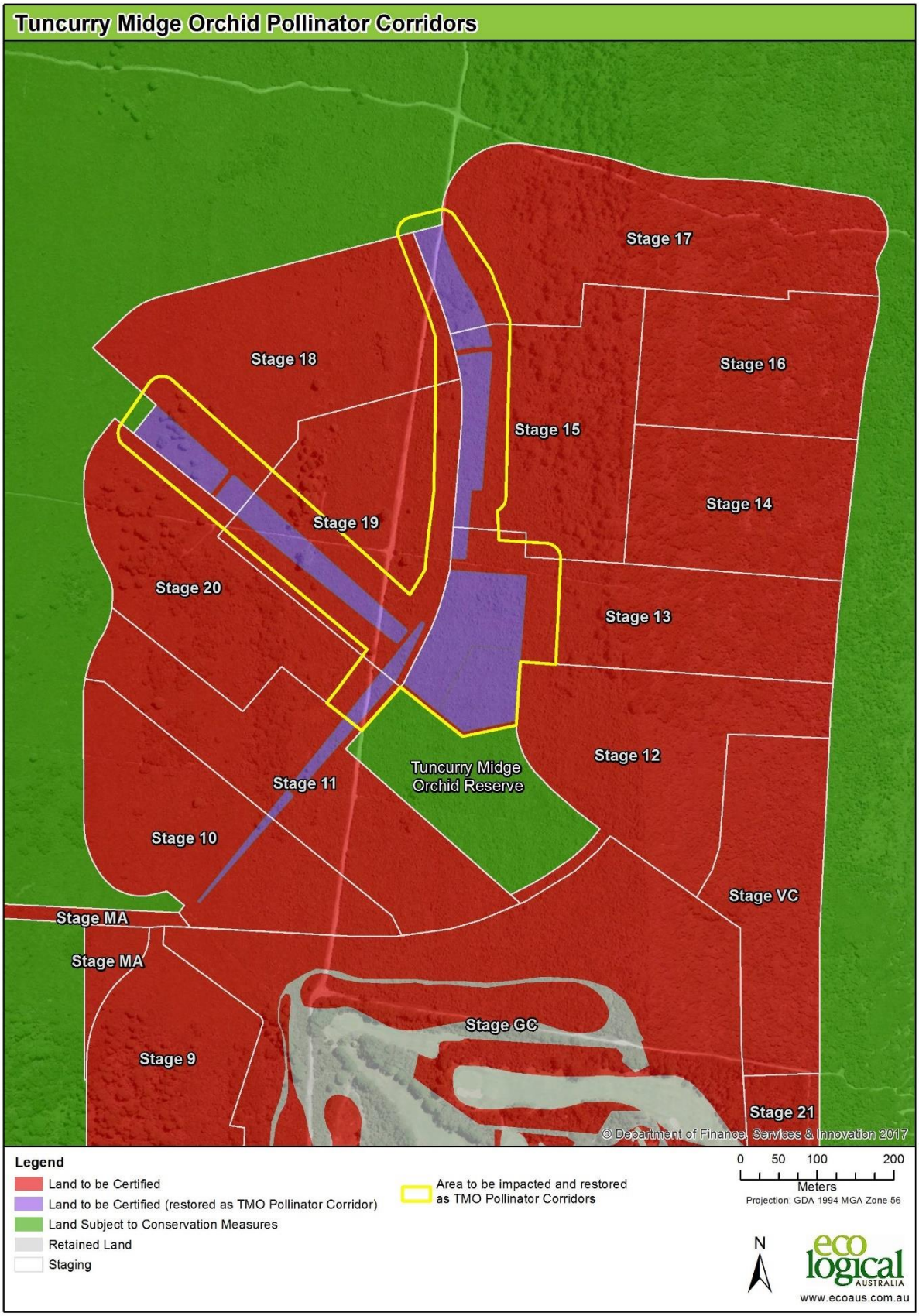


Figure 46: TMO Orchid Reserve and pollinator corridors

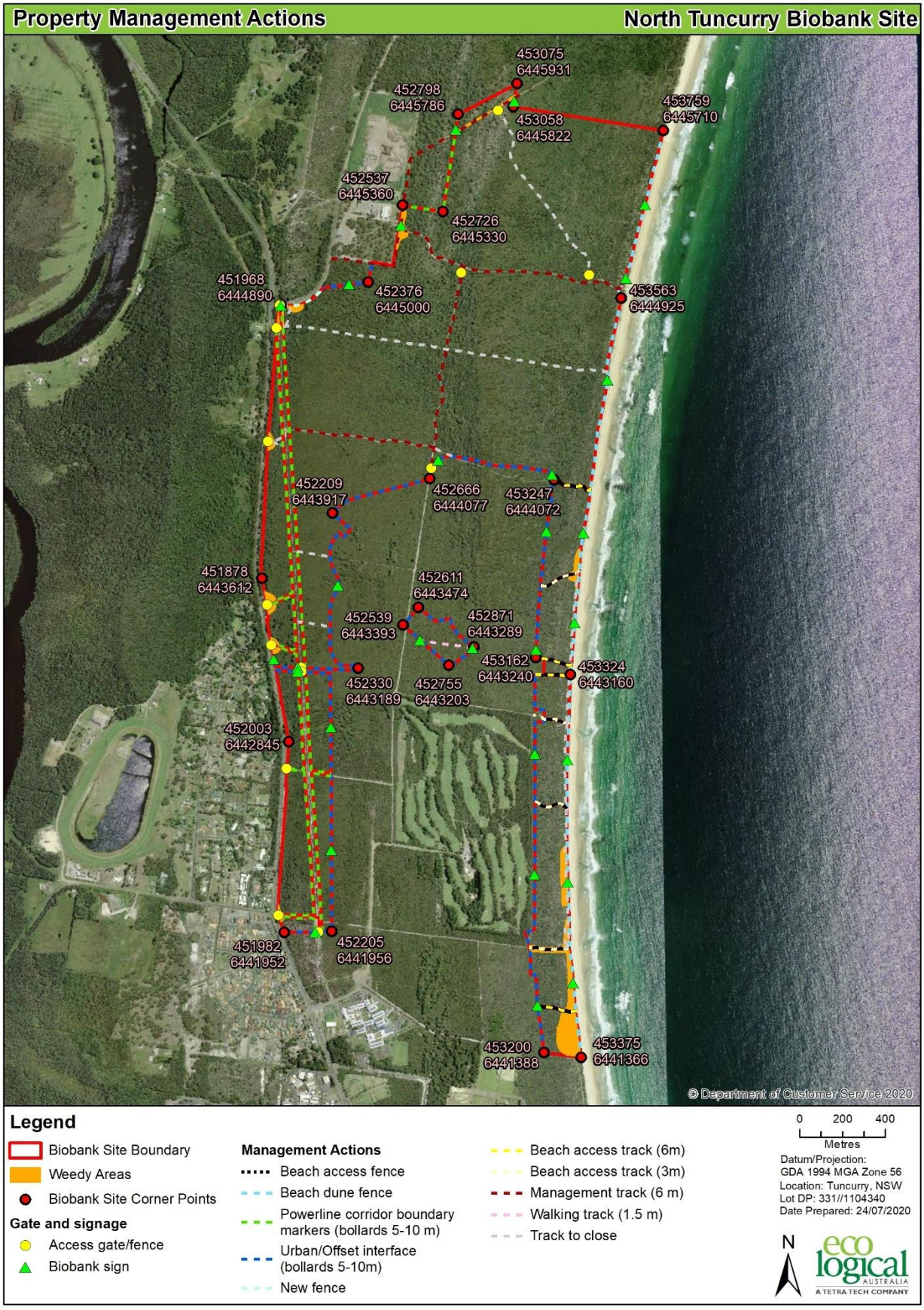


Figure 47: Management of conserved and retained TMO habitat

6.5 Regent Honeyeater- *Anthochaera phrygia*

6.5.1 Nature and extent of potential short, medium and long-term impacts before, during and after construction and operation

***Direct* impacts**

The National Recovery Plan (CoA 2016) states that habitat for the Regent Honeyeater includes "*wet lowland coastal forest dominated (emphasis added) by Swamp Mahogany (Eucalyptus robusta) and Spotted Gum*" and that "*any breeding or foraging habitat in areas where the species is likely to occur is habitat critical to the survival of the species*".

The proposed action will remove 30.61 ha of Blackbutt - Smooth-barked Apple shrubby open forest, which includes some/limited Swamp Mahogany (Eucalyptus robusta) trees (**Figure 48**), which has the potential to be infrequent seasonal foraging habitat for the Regent Honeyeater, although it is noted that the vegetation type is not 'dominated' by Swamp Mahogany, is not located near any 'Key breeding or foraging areas' identified in the National Recovery. It is thus considered that the habitat values in the study area are very limited and at best represent low quality habitat for the Regent Honeyeater, which is supported by the lack of records within 20km of the study area.

Impacts of 2019/2020 Wildfires

Within the Karuah-Manning IBRA Subregion, the 2019/20 wildfires burnt 30,735 ha to varying degrees (or 8.75% of the 351, 282 ha of native vegetation in the region (refer to **Figure 21**). Of this area, around 1,720 ha of potential foraging habitat in Dry Sclerophyll Forest types was burnt (see Table 10) whilst over 76,000 ha of Dry Sclerophyll Forest was unaffected. There are no recognised key breeding areas in the region.

Table 13: Impacts on potential foraging habitat for Regent Honeyeater

Vegetation type	Habitat Quality	Impact (ha)	Retained in study area (ha)	Conserved in Study Area	% of foraging habitat to be removed in study area
Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern North Coast	Low***	30.61	7.84	64.65	29.69%
Total		**30.61**	**7.84**	**64.65**	**29.69%**

***It is noted that there are limited numbers of the preferred coastal browse species *Eucalyptus robusta* (Swamp Mahogany) in the study area.

Indirect impacts

- Habitat changes related to altered fire regimes or weed invasion
- Increased abundance of aggressive honeyeaters due to open spaces and garden plantings

6.5.2 Analysis of significance of impacts at a local, regional and national scale

An assessment of significance has been undertaken for the Regent Honeyeater using the *Matters of National Environmental Significance -significant impact guidelines* (DotE 2013) (Table 14). It was concluded that the proposed action is unlikely to have a significant impact on the Regent Honeyeater due to the low quality of the foraging habitat, lack of records in the locality, the study area not being identified as a key breeding or foraging area for the species in the recovery plan and the locality and region being infrequently used by Regent Honeyeater. The habitat on site is not generally associated with 'typical' Regent Honeyeater habitat and does not contain an abundance of any 'key tree' species listed in the National Recovery Plan for the Regent Honeyeater(DoE 2016). Accordingly, the loss of 30.61 ha of potential, low quality habitat is not expected to lead to a long-term decrease in the size of the Regent Honeyeater population . Accordingly offsets for this species are not proposed, however, should the DAWE consider that impacts are likely to be significant, the offsets proposed for other MNES in Section 7 will provide 'like for like' potential habitat for this species. Section 7 also includes a calculation of the additional off-site offset area needed to meet a formal offset requirement for the species.

Table 14: Assessment of significance for the Regent Honeyeater

EPBC Significant Impact Criteria – critically endangered and endangered species	
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of a population	Unlikely The proposed action is considered unlikely to lead to a long-term decrease in the size of the Regent Honeyeater population due to: • The wider region is infrequently used by Regent Honeyeater • The habitat to be removed has been identified as 'low quality' potential foraging habitat as it does not included any Spotted Gum and only a low abundance of Swamp Mahogany. • A significant area of potential habitat will remain in the study area (72.49) with 64.65 ha of this to be protected in an on-site offset area adjacent to other protected areas (Darawank Nature Reserve) that includes large areas of more suitable habitat.
reduce the area of occupancy of the species	Unlikely The 'area of occupancy' will not be reduced as there are no records of the species using habitats in the study area, however, there will be a loss of 30.61 ha of potential foraging habitat. Significant areas of potential habitat will be retained adjacent to the proposed development area and are protected in the adjoining Darawank Nature Reserve to the north of the study area.
fragment an existing population into two or more populations	Unlikely Regent Honeyeater is capable of wide-ranging nomadic movements and is considered to be one single national population. Barriers to the movement of Regent Honeyeater are not likely to be created by the proposed action.
adversely affect habitat critical to the survival of a species	Yes The National Recovery Plan for the Regent Honeyeater (DoE 2016) has defined the location of the proposed action as an area where the Regent Honeyeater is 'likely to occur' if suitable habitat is present. As the study area includes a 'Key 'foraging species (Swamp Mahogany) by this definition the study area contains 'habitat critical to the survival' of the Regent Honeyeater.

EPBC Significant Impact Criteria – critically endangered and endangered species	
	Small areas of potential Regent Honeyeater foraging habitat will be loss within 30.61 ha of Blackbutt forest. However, blackbutt forest is not usually associated with Regent Honeyeater as the vegetation type is not dominated by Swamp Mahogany (it is not a wet lowland coastal forest dominated by Swamp Mahogany), the location of the proposed action is not located near any 'Key breeding or foraging areas' that are identified in the National Recovery Plan (DoE 2016) and there are only a few records of the Regent Honeyeater in the region.
disrupt the breeding cycle of a population	Unlikely The proposed action is considered unlikely to disrupt the breeding cycle of the Regent Honeyeater. The location of the proposed action is not a breeding site for the Regent Honeyeater and is not located near any documented 'Key breeding areas' or 'other breeding areas' as identified in the National Recovery Plan for the Regent Honeyeater (DoE 2016).
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely The potential foraging habitat to be removed is low quality habitat that is unlikely to be so important to the Regent Honeyeater such that its removal would cause the species to decline further.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Unlikely Indirect impacts arising from the proposed action have the potential to assist the establishment of invasive species unless appropriately managed. Parks and gardens with non-indigenous flora, garden waste and site disturbance have the potential to introduce new weeds and increase the density of existing weeds in the study area. *Lantana camara* (Lantana) and *Chrysanthemoides monilifera* (Bitou bush) (weeds of national significance), are present at the site already, along with several other environmental weed species. A CEMP and Offset area management plan will be prepared and implemented (see Section 7) that will mitigate these potential impacts.
introduce disease that may cause the species to decline, or	Unlikely The proposed action is considered unlikely to introduce diseases that will cause the Regent Honeyeater to decline.
interfere with the recovery of the species.	Unlikely The proposed action conflicts with one of the objectives of the National Recovery Plan for the Regent Honeyeater (DoE 2016), to 'improve the extent and quality of habitat for the Regent Honeyeater'. However, proposed offsets associated with the proposal will formally conserve and enhance the quality of similar habitat for the Regent Honeyeater within the study area.
Conclusion	Given the above, the proposal is not likely to lead to a Significant impact to the species.

6.5.3 Statement of whether any impacts are likely to be unknown, unpredictable or irreversible

The proposed development footprint is permanent, therefore impacts to biodiversity values within the development footprint will be permanent and irreversible. When assessing ecological impacts, there are always 'unknowns' associated with assessments of species presence, abundance and distribution within study areas associated with the duration, seasonality and intensity of survey effort, annual and seasonal variations of species presence and abundance related to drought, wet years, fires etc, which could

potentially lead to unpredictable outcomes. However, this assessment has been based on repeated surveys of the study area by a range of expert ecologists between 2005 and 2021 covering a number of years, seasons and thus provides a sound base of knowledge from which to make informed impact assessment decisions from.

Given the above, and the fact that the Regent Honeyeater has not been recorded in the study area, and that the study areas has not been identified as an important habitat area after over 20 years of annual surveys and monitoring under the National Recovery Program annual monitoring program, it is concluded that the impacts to areas of potential habitat within the study area are likely to be 'minor' and therefore not significant.

Figure 48: Impacts and offsets for potential Regent Honeyeater habitat

6.6 Swift Parrot – *Lathamus discolor*

6.6.1 Nature and extent of potential short, medium and long-term impacts before, during and after construction and operation

Direct impacts

The proposed action will remove 55.23 ha of Blackbutt - Smooth-barked Apple shrubby open forest which has potential to be used as seasonal foraging habitat for the Swift Parrot (Table 15). The Blackbutt - Smooth-barked Apple shrubby open forest includes Blackbutt (*Eucalyptus pilularis*) and some Swamp Mahogany (*E. robusta*) trees which has the potential to be infrequent seasonal foraging habitat for the Swift Parrot in the locality (**Figure 48**).

Of the 55.23 ha of potential foraging habitat impacted, 24.62 ha (or 44.6%) are isolated small patches dominated by shrubby regrowth and pine remnants and provided very marginal foraging resources.

Impacts of 2019/2020 Wildfires

Within the Karuah-Manning IBRA Subregion, the 2019/20 wildfires burnt 30,735 ha to varying degrees (or 8.75% of the 351, 282 ha of native vegetation in the region (refer to **Figure 21**). Of this area, around 1,720 ha of potential foraging habitat in Dry Sclerophyll Forest types was burnt (see Table 10) whilst over 76,000 ha of Dry Sclerophyll Forest was unaffected. There are no recognised key foraging areas in the region.

Table 15: Impacts on potential foraging habitat for the Swift Parrot

Vegetation type	Habitat Quality	Impact (ha)	Retained in study area (ha)	Conserved in Study Area	% of foraging habitat to be removed in study area
Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern North Coast	Moderate	30.61	7.84	64.65	29.69%
	Low	24.62	0.2	5.05	82.42%
Total		**55.23**	**8.04**	**69.70**	**41.76%**

Indirect impacts

Possible indirect impacts to the Swift Parrot and its habitat include changes to habitat surrounding the proposed action from altered fire regimes or weed invasion as a result of increased human presence and proximity to new residential areas. The adjacent habitat areas will all be registered as a Biobank site and subject to in perpetuity conservation management that will reduce the effects of these potential indirect impacts.

6.6.2 Analysis of significance of impacts at a local, regional and national scale

An assessment of significance has been undertaken for the Swift Parrot using the *Matters of National Environmental Significance -significant impact guidelines* (DotE 2013). The assessment of significance for the proposed action in regard to Swift Parrot is difficult due to the annual movements of Swift Parrots in response to highly variable climatic conditions. Although it is acknowledged that the proposed action

involves removing potential habitat for the Swift Parrot and will contribute to the ongoing loss of habitat for the species, It was determined that the proposed action is unlikely to have a significant impact (or impact on habitat 'critical to the survival' of Swift Parrots as defined by the National Recovery Plan (Saunders and Tzaros 2011) due to

- the lack of regular observations of the species in the locality and accordingly the area not being identified as an 'important habitat' area for the species in the National Recovery Plan, or
- not being identified as a regular over-wintering foraging area in over 20 years of annual surveys and monitoring in association with the National Recovery Program's monitoring program, or
- not being an area frequented by large numbers of birds for extended periods; and
- due to the area of potential habitat to be retained in the study area and amount of potential habitat available in the region (Over 90,000 ha of Coastal Dry Sclerophyll Forest and Swamp Forest providing preferred Blackbutt, Spotted Gum and Swamp Mahogany foraging resources in the Karuah – Manning IBRA subregion (Table 10).

However, should the DAWE consider that impacts are likely to be significant, the offsets proposed for other MNES in Section 7 will provide 'like for like' potential habitat for this species. Section 7 also includes a calculation of the additional off-site offset area needed to meet a formal offset requirement for the species.

Table 16: Assessment of significance for the Swift Parrot

EPBC Significant Impact Criteria – critically endangered and endangered species	
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of a population	Unlikely The proposed action is considered unlikely to lead to a long-term decrease in the size of the Swift Parrot population due to the proportion of potential habitat that will remain in the study area (77.74 ha) and the area of suitable foraging habitat present within the region (>90,000 ha of Coastal Dry Sclerophyll Forest and Swamp Forest providing preferred Blackbutt, Spotted Gum and Swamp Mahogany foraging resources) of which around 15,000 ha is securely protected in National Parks and other conservation areas (Table 10).
reduce the area of occupancy of the species	Minor reduction The area of occupancy for the Swift Parrot will not be significantly reduced as substantial areas of potential habitat will be retained in and adjacent to the proposed development area including the adjoining Darawank Nature Reserve to the north.
fragment an existing population into two or more populations	No The Swift Parrot is capable of wide-ranging nomadic movements and is one single national population. Barriers to the movement of Swift Parrot are not likely to be created by the proposed action.
adversely affect habitat critical to the survival of a species	Unlikely The site does not meet the criteria listed in the National Recovery Plan as 'habitat critical for survival' of the Swift Parrot. Habitats that are of particular importance for conservation management of the Swift Parrot are areas that are used for nesting (Tasmania only), used by large numbers of birds for extended periods of

EPBC Significant Impact Criteria – critically endangered and endangered species	
	time and/or are used repeatedly between seasons or for prolonged periods of time (Saunders and Tzaros, 2011). There have only been 7 previous records of Swift Parrot within 10 km of the study area recorded in the past 20 years with several records from the nearby Wallamba River Caravan Park and within the town of Forster to the south of the study area (where between 1 and 30 birds were reported foraging in a large Swamp Mahogany in the supermarket carpark in 2002).
disrupt the breeding cycle of a population	No The proposed action is considered unlikely to disrupt the breeding cycle of the Swift Parrot. The Swift Parrot nests in Tasmania and migrates to the woodlands and forests of the SE mainland over the autumn and winter.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely Large areas (> 90,000 ha) of potential foraging habitat for the Swift Parrot is mapped in the Karuah-Manning IBRA subregion of which approximately 15,000 ha is protected within dedicated conservation reserves. While the proposal is part of a cumulative impact of habitat removal throughout the species distribution, it is considered unlikely that the proposed habitat removal would cause the species to decline in the region.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Potential Indirect impacts arising from the proposed action have the potential to assist the establishment of invasive species (unless appropriately managed). Parks and gardens with non-indigenous flora, garden waste and site disturbance have the potential to introduce new weeds and increase the density of existing weeds in the study area and degrade the quality of Swift Parrot habitat in the area. *Lantana camara* (Lantana) and *Chrysanthemoides monilifera* (Bitou bush) (weeds of national significance), are present at the site already, along with several other environmental weed species. A CEMP and Offset area management plan will be prepared and implemented (see Section 7) that will mitigate these potential impacts.
introduce disease that may cause the species to decline, or	No The proposed action is considered unlikely to introduce diseases that will cause the Swift Parrot to decline
interfere with the recovery of the species.	Yes The proposed action involves removing potential foraging habitat for the Swift Parrot and will contribute to the ongoing loss of habitat for the species in the region. However, proposed offsets associated with the proposal will formally conserve and enhance similar habitat for the species within the study area.
Conclusion	Given the above, the proposal is not likely to lead to a Significant impact to the species.

6.6.3 Statement of whether any impacts are likely to be unknown, unpredictable or irreversible

The proposed development footprint is permanent, therefore impacts to biodiversity values within the development footprint will be permanent and irreversible. When assessing ecological impacts, there are always 'unknowns' associated with assessments of species presence, abundance and distribution within study areas associated with the duration, seasonality and intensity of survey effort, annual and seasonal

variations of species presence and abundance related to drought, wet years, fires etc, which could potentially lead to unpredictable outcomes. However, this assessment has been based on repeated surveys of the study area by a range of expert ecologists between 2005 and 2021 covering a number of years, seasons and thus provides a sound base of knowledge from which to make informed impact assessment decisions from.

Given the above, and the fact that the Swift Parrot has not been recorded in the study area, and that the study areas has not been identified as an important habitat area after over 20 years of annual surveys and monitoring under the National Recovery Program, it is concluded that the impacts to areas of potential habitat within the study area are likely to be minor and not significant.

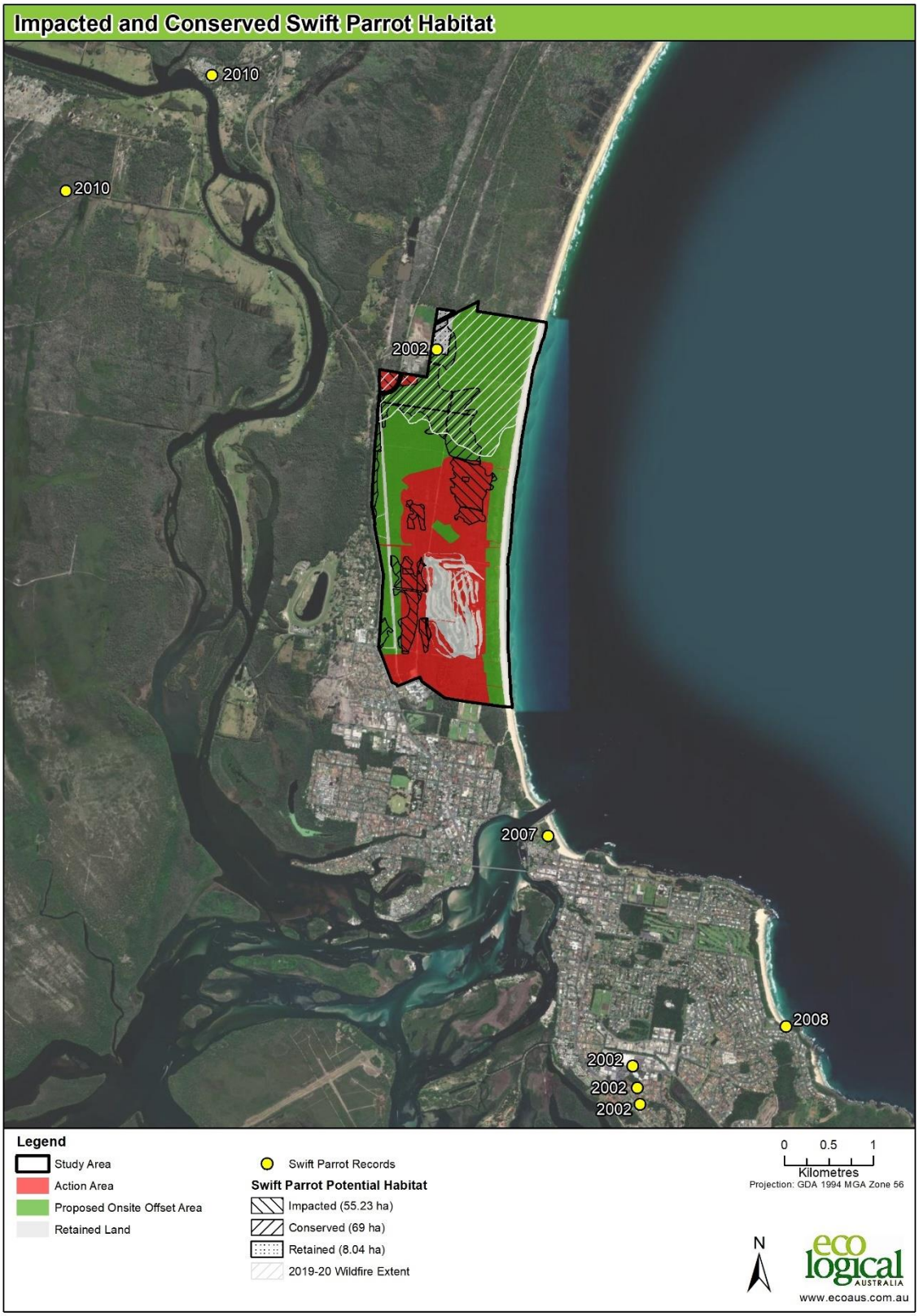


Figure 49: Impacts and offsets for potential Swift Parrot habitat

Note the 2002 Swift parrot record that is shown in the north of the study area has incorrect coordinates and is actually from Hallidays Point, 10km to the north.

6.7 Spotted-tail Quoll (SE Mainland)– *Dasyurus maculatus maculatus*

6.7.1 Nature and extent of potential short, medium and long-term impacts before, during and after construction and operation

Direct Impacts

The Spotted-tail Quoll has been 'assumed' to be present in the study area from time to time, with 201.36 ha of potential habitat to be impacted by the proposed action, as there are records of the species from within a few kilometres of the study area and the species occupies very large home ranges (**Figure 49**). Based on the home range estimates mentioned in Section 5.7.4, the study area may represent at least part of a Spotted-tail Quoll's home range with potential for several Spotted-tail Quolls to utilise the subject site from time to time.

Indirect impacts that may impact Spotted-tail Quoll as a result of the proposed action (unless appropriately managed) include:

- Inappropriate fire regimes may alter habitat for the Spotted-tail Quoll within the study area
- Increased predation and disturbance from domestic dogs through wandering into conservation areas, unleashed dog walking, creation of unofficial walking/bike riding and 4wd tracks and trails by the public and new residents of residential areas.

Impacts of 2019/2020 Wildfires

Within the Karuah-Manning IBRA Subregion, the 2019/20 wildfires burnt 30,735 ha to varying degrees (or 8.75% of the 351, 282 ha of native vegetation in the region (refer to **Figure 21**). Over 320,000 ha of potential habitat was unaffected of which over 81,000 ha is in gazetted National Parks and Nature reserves (including the adjacent Darawank Nature Reserve).

Table 17: Impacts on foraging habitat for Spotted-tail Quoll

Vegetation type	Foraging Quality	Impact (ha)	Retained in study area (ha)	Conserved in Study Area (ha)	% of foraging habitat to be removed in study area
Banksia dry shrubland on coastal sands of the North Coast	Low to Moderate	108.67	17.91	81.28	51.3%
Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern North Coast	High	55.23	8.04	69.70	41.5%
Coast Banksia - Coast Wattle dune scrub, Sydney Basin and South East Corner	Low	37.45	3.57	127.57	22.2%
Total		**201.36**	**29.51**	**278.55**	**39.22%**

6.7.2 Analysis of significance of impacts at a local, regional and national scale

An assessment of significance has been undertaken for the Spotted-tail Quoll using the *Matters of National Environmental Significance - significant impact guidelines* (DotE 2013). It was determined that the proposed action is unlikely to have a significant impact on local populations of the Spotted-tail Quoll (Table 18) because:-

- the species has not been recorded in the study areas despite extensive survey over an extended period of time,
- the area has not been identified as an 'important population' in the National Recovery Plan (DELWP 2016); and
- large areas of potential habitat (278 ha) will be protected in the study area and/or are already secured adjacent to the study area in existing conservation areas that protect 1,000's of hectares of habitat.

However, should the DAWE consider that impacts are likely to be significant, the offsets proposed for other MNES in Section 7 will provide 'like for like' potential habitat for this species. Section 7 also includes a calculation of the additional off-site offset area needed to meet a formal offset requirement for the species.

Table 18: Assessment of significance for the Spotted-tail Quoll

EPBC Act Significant Impact Criteria – critically endangered and endangered species	
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of a population	Unlikely The proposed action is would only potentially lead to a small long-term decrease in the area of potential habitat for the local Spotted-tail Quoll population as the study atra only represents a proportion of the home range of the species.
reduce the area of occupancy of the species	No The area of occupancy will not be reduced as the species has not been confirmed present in the study area despite extensive surveys. Large areas of potential habitat will be retained and conserved adjacent to the proposed development area and in the adjoining Darawank Nature Reserve to the north of the study area.
fragment an existing population into two or more populations	Unlikely An existing population has not been confirmed in the study areas. Regardless, barriers to the movement of Spotted-tail Quoll are not likely to be created by the proposed action as the development adjoins existing residential areas in Tuncurry and corridors of vegetation are retained to the east and west of the proposal.
adversely affect habitat critical to the survival of a species	No Habitat that is critical to the survival of the Spotted-tailed Quoll includes 'large patches' of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey (DELWP 2016). The study area only includes a relatively small area of forest with adequate denning resources (55 ha of Blackbutt Forest) and large areas of coastal heath, 146 ha (with limited denning resources). Further, the recovery plan does not identify the locality as one containing important populations of the species.

EPBC Act Significant Impact Criteria – critically endangered and endangered species	
disrupt the breeding cycle of a population	Potential The proposed action could potentially displace several individual Quolls as it is likely that several suitable logs, burrows and tree hollows for dens occur in the subject site.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely The proposed action could potentially cause the displacement and possible decline of several individual quolls that may use the subject site.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Potential - Indirect impacts such as weed invasion and domestic pet ownership have the potential to have additional impacts on the Spotted tail Quoll, outside of the direct impact of the proposed habitat removal, if not managed appropriately. A CEMP and Offset area management plan will be prepared and implemented (see Section 7) that will mitigate these potential impacts.
introduce disease that may cause the species to decline, or	Unlikely The proposed action is considered unlikely to introduce diseases that will cause the Spotted-tail Quoll to decline
interfere with the recovery of the species.	Unlikely The proposal does not interfere with recovery actions listed in the National Recovery Plan for the Spotted-tail Quoll (DELWP 2016). Proposed offsets associated with the proposal will formally conserve similar habitat for the species within the study area
Conclusion	Given the above, the proposal is not likely to lead to a Significant impact to the species.

6.7.3 Statement of whether any impacts are likely to be unknown, unpredictable or irreversible

The proposed development footprint is permanent, therefore impacts to biodiversity values within the development footprint will be permanent and irreversible. When assessing ecological impacts, there are always 'unknowns' associated with assessments of species presence, abundance and distribution within study areas associated with the duration, seasonality and intensity of survey effort, annual and seasonal variations of species presence and abundance related to drought, wet years, fires etc, which could potentially lead to unpredictable outcomes. However, this assessment has been based on repeated surveys of the study area by a range of expert ecologists between 2005 and 2021 covering a number of years, seasons and thus provides a sound base of knowledge from which to make informed impact assessment decisions from.

Given the above, and the fact that the Spotted-tail Quoll has not been recorded in the study area, it is concluded that the impacts to areas of potential habitat within the study area are likely to be minor and not significant to local and regional populations.

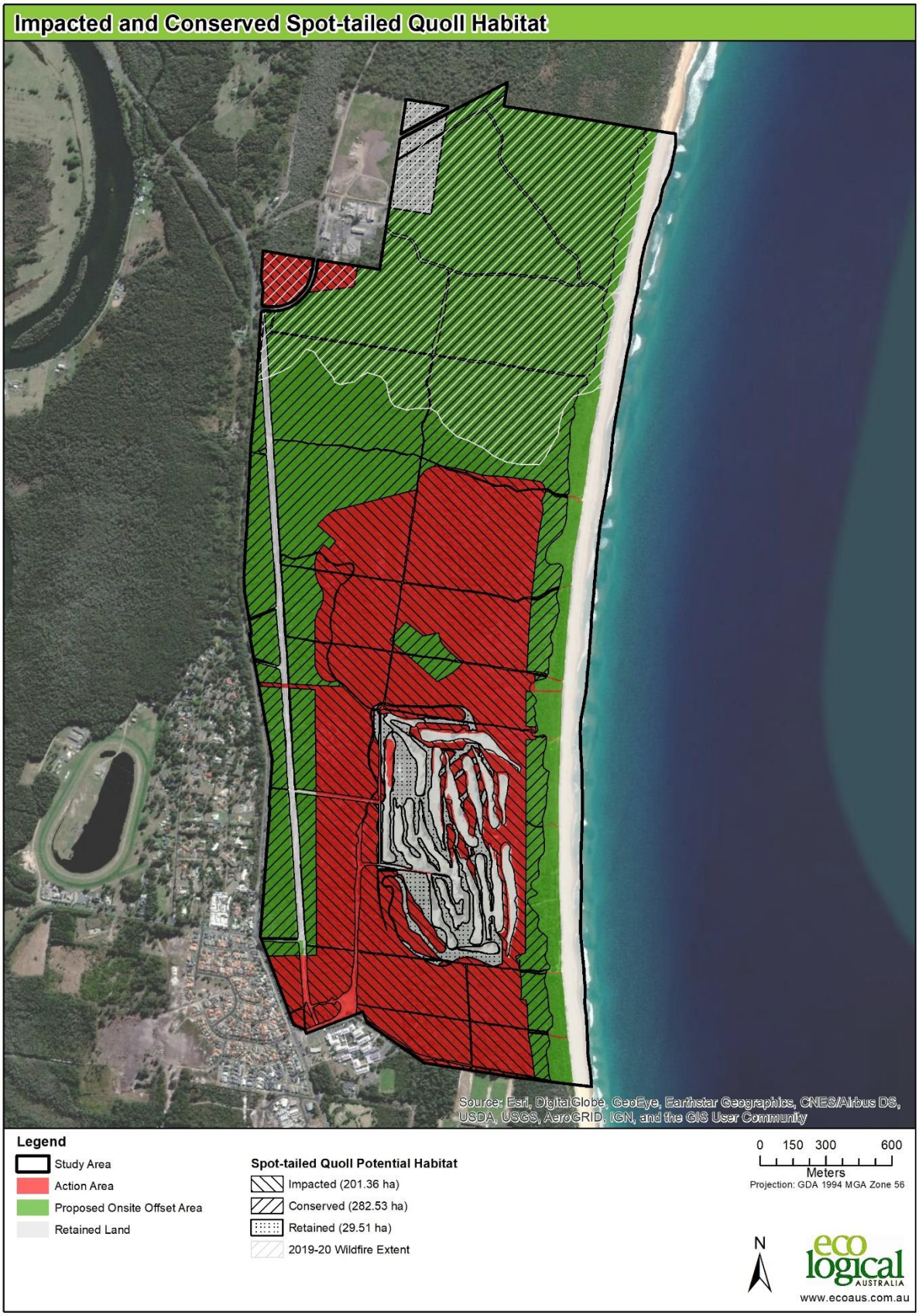


Figure 50: Impacts and offsets for Spotted-tail Quoll habitat

6.8 New Holland Mouse – Pseudomys novaehollandiae

6.8.1 Nature and extent of potential short, medium and long-term impacts before, during and after construction and operation

Direct Impacts

The proposed action will permanently remove 201.36 ha of known habitat for the New Holland Mouse, consisting of Banksia dry shrubland on coastal sands, Blackbutt -Smooth-barked Apple shrubby open forest and Coast Banksia - Coast Wattle dune scrub (**Figure 50**).

Impacts of 2019/2020 Wildfires

Within the Karuah-Manning IBRA Subregion, the 2019/20 wildfires burnt 30,735 ha of native vegetation to varying degrees (or 8.75% of the 351, 282 ha of native vegetation in the region (refer to **Figure 21**). Of this area, around 4,650 ha of potential habitat in Dry Sclerophyll Forest types, Shrublands and heathlands was burnt (see Table 10) whilst over 87,000 ha of potential habitat was unaffected.

Table 19: Impacts on foraging habitat for New Holland Mouse

Vegetation type	Foraging Quality	Impact (ha)	Retained in study area (ha)	Conserved in Study Area (ha)	% of foraging habitat to be removed in study area
Banksia dry shrubland on coastal sands of the North Coast	Moderate - High	108.67	17.91	81.28	51.3%
Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern North Coast	Moderate	55.23	8.04	69.70	41.5%
Coast Banksia - Coast Wattle dune scrub, Sydney Basin and South East Corner	Low	37.45	3.57	127.57	22.2%
Total		**201.36**	**29.51**	**278.55**	**39.22%**

Indirect Impacts

Potential indirect impacts to the New Holland Mouse as a result of the proposed action include changes to potential habitat through an increase in environmental weeds in the study area and altered fire regimes and possible predation by domestic and escaped feral cats.

6.8.2 Analysis of significance of impacts at a local, regional and national scale

An assessment of significance has been undertaken for the New Holland Mouse using the *Matters of National Environmental Significance - significant impact guidelines* (DotE 2013) It was concluded that the proposed action is unlikely to have a significant impact on the New Holland Mouse due to the following factors:

- No 'important populations' of New Holland Mouse are documented as occurring in the study area or region, the population in the study area is not known as a key source population or

documented as necessary for maintaining genetic diversity and the population is not at the edge of the species range.

- A large area of suitable habitat will be retained and conserved on-site as part of a dedicated offset area for other MNES
- Extensive areas of suitable habitat occur within the locality and region, including several within dedicated conservation areas adjacent to the study area (Darawank Nature Reserve) and nearby (Booti Booti National Park, Myall Lakes National Park and west of the Wallamba River near Nabiac) (see Figure 42).

However, should the DAWE consider that impacts are likely to be significant, the offsets proposed for other MNES in Section 7 will provide 'like for like' potential habitat for this species. Section 7 also includes a calculation of the additional off-site offset area needed to meet a formal offset requirement for the species.

Table 20: Assessment of significance for the New Holland Mouse

EPBC Act Significant Impact Criteria – Vulnerable species	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of an 'important population of a species	No An important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are key source populations either for breeding or dispersal, populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species range (DotE 2013). There is no adopted recovery plan for the New Holland Mouse, and the population in the study area has not been identified as a key source population or documented as necessary for maintaining genetic diversity. The species has a disjunct population between Tasmania and Southern Queensland and the population in the study area is not at the limit of the species range. Therefore the population in the study area is not considered an important population.
reduce the area of occupancy of an important population	No The population in the study area is not recognised as an important population and thus the proposal will not reduce the area of occupancy of an important population (it will however reduce the area of habitat available for a local population).
fragment an existing important population into two or more populations	No The habitat for the population in the study area will not be fragmented. Offset areas will retain connectivity between habitat areas and adjacent existing conservation areas (Darawank Nature Reserve).
adversely affect habitat critical to the survival of a species.	No

EPBC Act Significant Impact Criteria – Vulnerable species	
	Habitat critical to the survival of the New Holland Mouse is not identified in a recovery plan or listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act. The subject site is not considered critical to the survival of the New Holland Mouse.
disrupt the breeding cycle of an important population	No The breeding cycle of the population in the study area will not be disrupted by the proposal.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Potential - Likely The proposed action will remove 201.36 ha of habitat for the New Holland Mouse, consisting of Banksia dry shrubland on coastal sands, Blackbutt -Smooth-barked Apple shrubby open forest and Coast Banksia - Coast Wattle dune scrub. This is likely to lead to a decline in the species in the study area. However, extensive areas of habitat, adjacent to existing conserved habitat, are proposed as offsets as part of the proposal that will be managed for conservation and improve the quality of habitat for New Holland Mouse (i.e. extensive weed and feral control and implementation of appropriate fire regimes)
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Potential The proposed action and associated residential areas are likely to increase the presence of domestic and feral cats in proximity to the development which may have ongoing impacts to New Holland Mouse throughout the retained habitat within the subject site. Indirect impacts such as weed invasion may also be exacerbated by the proposed action however will be managed as part of the offset area.
introduce disease that may cause the species to decline	Unlikely The proposed action is unlikely to introduce disease that may cause the decline of the New-Holland Mouse.
interfere substantially with the recovery of the species.	Unlikely The proposed action is unlikely to interfere substantially with the actions required for the future recovery of the New Holland Mouse.
Conclusion	The proposed action is unlikely to have a significant impact on the New Holland Mouse.

6.8.3 Statement of whether any impacts are likely to be unknown, unpredictable or irreversible

The proposed development footprint is permanent, therefore impacts to biodiversity values within the development footprint will be permanent and irreversible. When assessing ecological impacts, there are always 'unknowns' associated with assessments of species presence, abundance and distribution within study areas associated with the duration, seasonality and intensity of survey effort, annual and seasonal variations of species presence and abundance related to drought, wet years, fires etc, which could potentially lead to unpredictable outcomes. However, this assessment has been based on repeated surveys of the study area by a range of expert ecologists between 2005 and 2021 covering a number of

years, seasons and thus provides a sound base of knowledge from which to make informed impact assessment decisions from.

The New Holland Mouse was only recorded in the study area in 2020 after numerous previous surveys failed to detect the species. It is likely that the species has been present in the study area and locality in low abundance and therefore does not represent an important population. Extensive areas of suitable habitat will be retained within the study areas and actively managed for conservation which will enhance the quality of habitat and likely increase the abundance of New Holland Mouse through the establishment of appropriate fire regimes. It is concluded that the impacts to areas of potential habitat within the study area are likely to be minor and not significant to local and regional populations.

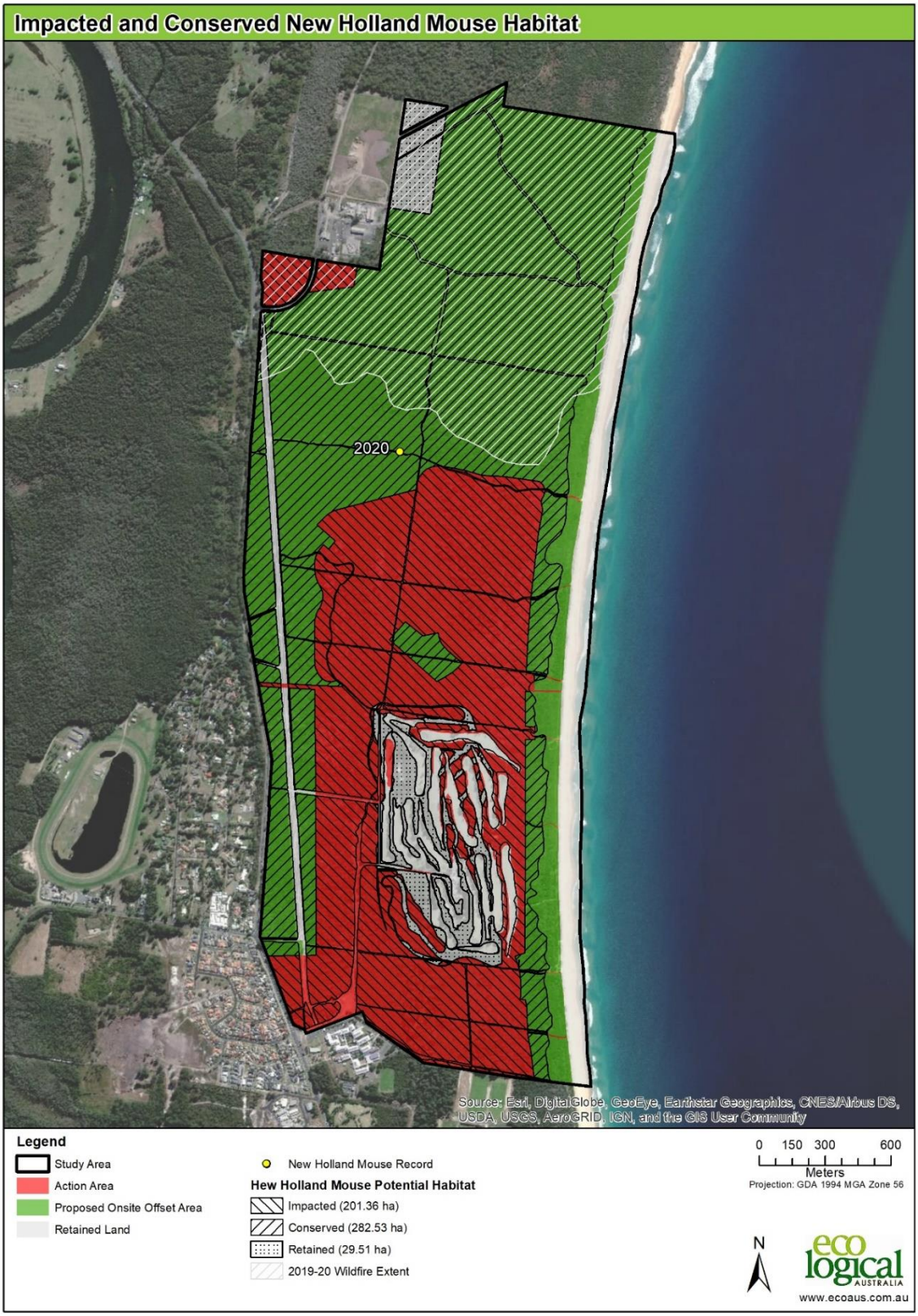


Figure 51: Impacts and offsets for New Holland Mouse habitat

6.9 Grey-headed Flying-fox – *Pteropus poliocephalus*

6.9.1 Nature and extent of potential short, medium and long-term impacts before, during and after construction and operation

The Grey-headed Flying-fox (GHFF) is known to forage in the study area. No GHFF camps were observed or have previously been mapped in the study area. Two GHFF camps considered to be nationally important are located approximately 9 km from the study area at Cape Hawke and approximately 32 km at Wingham (Figure 43). As a nationally important camp is located within 20 km of the study area, the population is considered to be an *'important population'* for the purposes of assessment using the *Matters of National Environmental Significance -significant impact guidelines* (DotE 2013 and DAWE 2021).

Habitat for the GHFF is considered to include all vegetation types in the study area except for those relatively small areas dominated by *Pinus* sp., cleared golf course areas and beach. Loss of foraging habitat is considered the primary threat to the GHFF (DAWE 2021). Known foraging resources within the study area that are likely to be used regularly by the local GHFF population as *Banksia serrata* (Old-man Banksia), the similar *B. aemula* (Wallum Banksia), B. *integrifolia* (Coast Banksia) and *Eucalyptus pilularis* (Blackbutt) (Eby & Law, 2008) and together dominate a large portion of the study area. *Banksia integrifolia* and *Eucalyptus pilularis* are thought to be significant food plants for the GHFF and flower over winter and spring when food shortages are known to occur for many GHFF populations (Eby & Law 2008). In addition to direct mortality, food shortages potentially affect the success of pregnancy and rearing of young (DAWE 2021). The proximity of the study area to a nationally important camp also makes its regular use by the species more likely.

The adopted national recovery plan for the Grey-headed Flying-fox (DAWE 2021) states that:

> Where important winter and spring flowering vegetation communities are present, they are considered 'habitat critical to the survival' of the Grey-headed Flying-fox (Important winter and spring vegetation communities are those that contain *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora citriodora, C. eximia, C. maculata, Grevillea robusta, Melaleuca quinquenervia* or *Syncarpia glomulifera* (Eby and Law 2008; Eby 2016; Eby et al., 2019).

The recovery plan also states that:-

> Habitat critical to the survival of the Grey-headed Flying-fox may also be vegetation communities not containing the above tree species but which:
>
> - contain native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May)
> - contain native species used for foraging and occur within 20 km of a nationally important camp as identified on the Department's interactive flying-fox web viewer, or
> - contain native and or exotic species used for roosting at the site of a nationally important Grey-Headed Flying-Fox camp1 as identified on the Department's interactive flying-fox web viewer.

Based on these criteria, foraging habitat for the GHFF that meets the recovery plans definition of '*habitat critical to the survival of the species*' occurs on site and should be the focus of protection and revegetation initiatives aimed to support the species.

Direct impacts

The proposal will directly impact 201.36 ha of foraging habitat '*critical to the survival of the species*' in as shown in Table 21.

Impacts of 2019/2020 Wildfires

Within the Karuah-Manning IBRA Subregion, the 2019/20 wildfires burnt 30,735 ha of native vegetation to varying degrees (or 8.75% of the 351, 282 ha of native vegetation in the region (refer to **Figure 21**). Of the 30,735 ha of burnt areas, 30,422 ha is considered foraging habitat for GHFF, whilst over 310,000 ha of habitat was unaffected) (see Table 10).

Figure 51 shows the habitat present on the site in context of known camps and areas of habitat in the locality.

Table 21: Impacts on foraging habitat for Grey-headed Flying-fox

Vegetation type	Foraging Quality	Impact (ha)	Retained in study area (ha)	Conserved in Study Area (ha)	% of foraging habitat to be removed in study area
Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern North Coast	Moderate to High	55.23	8.04	69.70	41.5%
Coast Banksia - Coast Wattle dune scrub, Sydney Basin and South East Corner	Low to Moderate	37.45	3.57	127.57	22.2%
Banksia dry shrubland on coastal sands of the North Coast	Low	108.67	17.91	85.26	51.3%
Total		**201.36**	**29.51**	**282.53**	**39.22%**

Indirect impacts

Potential indirect impacts to the GHFF as a result of the proposed action are:

- Habitat changes related to altered fire regimes or weed invasion (unless appropriately managed)
- Increased mortality due to entrapment in backyard fruit tree netting or collision with power lines and vehicles

6.9.2 Analysis of significance of impacts at a local, regional and national scale

A significant impact assessment has been completed for the Vulnerable Grey-headed Flying-fox using the *Matters of National Environmental Significance -significant impact guidelines* (Commonwealth of Australia 2013) (Table 22). It was concluded that the proposal has the potential to have a significant

impact on an 'important population' of the Grey-headed Flying-fox due to the extent and quality of foraging habitat proposed to be removed and proximity to a nationally important flying-fox camp.

On a national level the proposed action is unlikely to have a significant impact on the GHFF, due to the scale of the proposed impacts and amount of alternative habitat present.

Table 22: Significant Impact Assessment for the Grey-headed Flying-fox

Criteria	Response
An action is likely to have a significant impact on an vulnerable species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of an important population of a species	Potential - The population that occupies the study area are likely to be an important population due to the presence of a nationally important GHFF camp within 20km of the study site. The removal of 201.36 ha of foraging habitat within close proximity to a nationally important camp could potentially lead to a long-term decrease in the size of the population, albeit a minor decrease given the extent of habitat available in the region (i.e. the loss of 200ha of foraging habitat represents 0.05% of the available habitat in the region (340,000 ha of which 80,000 ha is in dedicated conservation areas). Extensive areas of native vegetation and GHFF habitat occur within 20km radius (regular foraging distance of a GHFF) of the Cape Hawke camp, including Booti Booti and Wallingat National Parks and Darawank Nature reserve.
reduce the area of occupancy of an important population	Yes but very minor – the area of occupancy extends beyond the study area. The loss of 201.36 ha of foraging habitat is a very minor impact on the area of occupancy of the species that extends from north Qld to western Victoria.
fragment an existing important population into two or more populations	No - The proposal is unlikely to fragment an existing population of this mobile species
adversely affect 'habitat critical to the survival of a species'.	Yes The proposal will permanently remove 201.36 ha of foraging habitat considered critical to the survival of the GHFF, 9km from a nationally important camp.
disrupt the breeding cycle of an important population	Unlikely The study area is not a breeding site/camp for the GHFF, however, loss of foraging habitat close to an important camp could potentially impact the breeding cycle / success of the camp for breeding (DAWE 20210, although given the extent of available habitat within 20km of the Cape Hawke Camp, the impact is likely to be minor.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Yes but minor The proposed action may cause a decline in the local population of GHFF, however given the amount of alternative habitat in the region, this decline is expected to be small in scale.

Criteria	Response
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Unlikely The proposed action is unlikely to result in the establishment of an invasive species that are harmful to the Grey-headed Flying-fox.
introduce disease that may cause the species to decline	The proposed action is unlikely to introduce disease for the GHFF
interfere substantially with the recovery of the species	Unlikely The proposed action is unlikely to substantially interfere with the national recovery of the GHFF.
Conclusion	Yes the proposed action has the potential to have a significant impact on the GHFF.

6.9.3 Statement of whether any impacts are likely to be unknown, unpredictable or irreversible

The proposed development footprint is permanent, therefore impacts to biodiversity values within the development footprint will be permanent and irreversible. When assessing ecological impacts, there are always 'unknowns' associated with assessments of species presence, abundance and distribution within study areas associated with the duration, seasonality and intensity of survey effort, annual and seasonal variations of species presence and abundance related to drought, wet years, fires etc, which could potentially lead to unpredictable outcomes. However, this assessment has been based on repeated surveys of the study area by a range of expert ecologists between 2005 and 2021 covering a number of years, seasons and thus provides a sound base of knowledge from which to make informed impact assessment decisions from.

Given the above, and the fact that the Grey-headed Flying-fox has been recorded in the study area and the study area is within 20km of a nationally important camp, it is concluded that the impacts ae not likely to be unknown or unpredictable, and whilst irreversible, are likely to be minor.

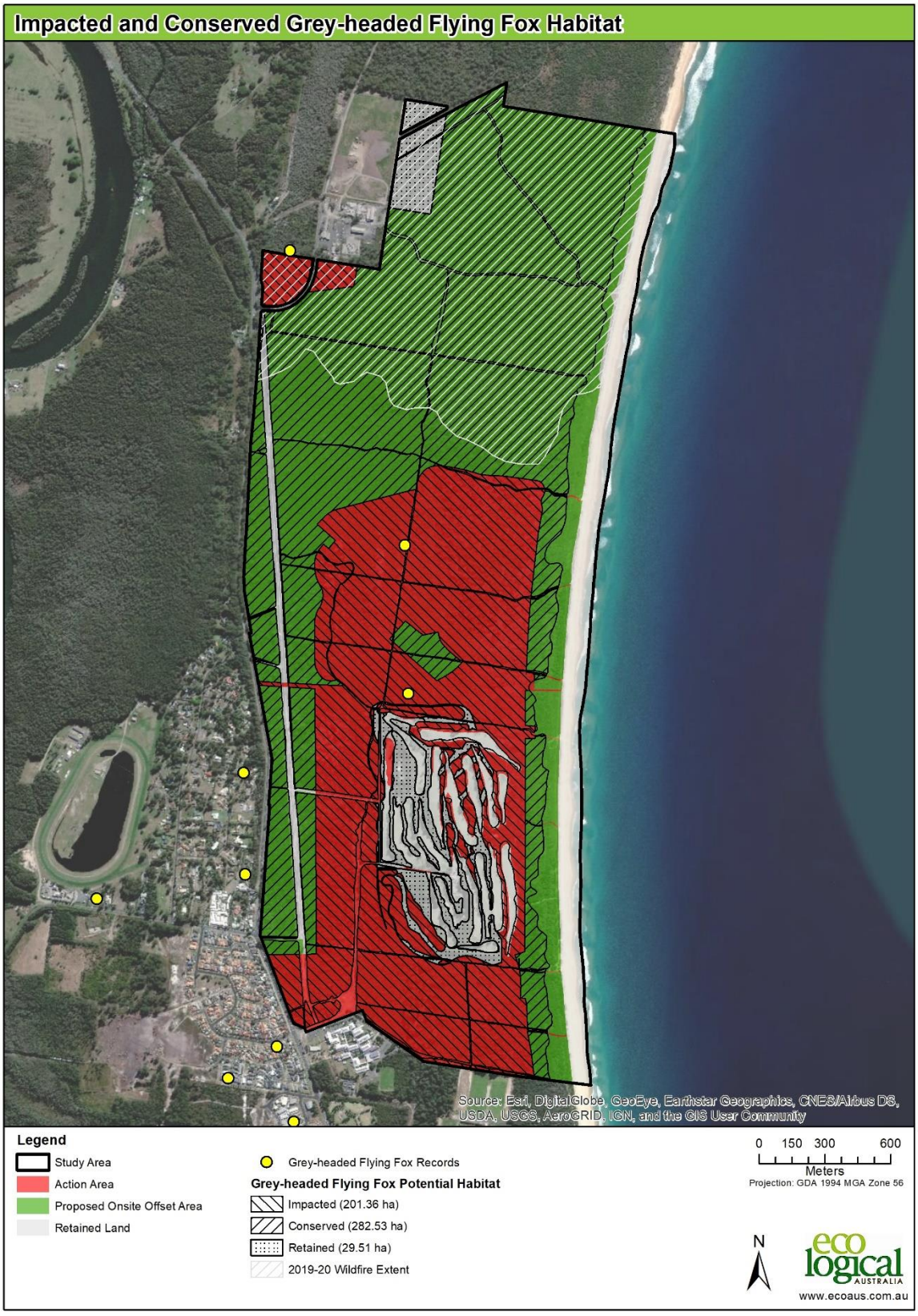


Figure 52: Impacts and offsets for Grey-headed Flying-fox habitat

6.10 Green Turtle

6.10.1 Nature and extent of potential short, medium and long-term impacts before, during and after construction and operation

BioNet includes three records of the Green Turtle from Nine Mile Beach (two in May 2007 and one in 2009) adjacent to the study area. These records were all of dead animals found on the beach and likely representing vagrant animals from further north. However, a single Green Turtle was recorded nesting on Nine Mile Beach, east of the proposed development in November 2011. There have been no further records since 2011.

The species does not normally nest on NSW islands or mainland beaches. The recorded breeding event is extremely unusual and is considered an anomaly. However, sighting of turtles in NSW waters are increasing and are likely related to warming ocean temperatures.

The study area is not recognised as an important nesting site and the occasional individuals observed in NSW water are not regarded as constituting an important population.

Direct Impacts

There will be no direct impacts to Green Turtles from the proposal.

The 2019/2000 bushfires have not impacted any turtle breeding habitat

Indirect Impacts

Potential indirect impacts to Green Turtles may result if there are future attempts to nest on beaches adjacent to the study area from:

- Increased human activity on beaches associated with the residential development and construction of a new surf club
- Increased activity of fishers and 4WD vehicle access to beaches adjacent to the study area (unless appropriately managed, see Section 7)
- Increased disturbance by domestic animals accessing beaches (dogs) during nesting attempts

6.10.2 Analysis of significance of impacts at a local, regional and national scale

A significant impact assessment has been completed for the Green Turtle using the *Matters of National Environmental Significance -significant impact guidelines* (DotE 2013) (**Figure 44)**). It was concluded that the proposal is unlikely to have a significant impact on the Green Turtle due to their being no direct impacts to turtles foraging behaviour/activities, unlikely to be regular nesting attempts and if nesting was attempted, their being a range of proposed mitigation measures to manage indirect impacts (refer to Section 7 and the proposed Nine Mile Beach Green Turtle and Pied Oyster Catcher nesting monitoring program).

Table 23: Significant Impact Assessment for the Green Turtle

EPBC Act Significant Impact Criteria – Vulnerable species	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
lead to a long-term decrease in the size of an important population of a species	No An important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are key source populations either for breeding or dispersal, populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species range (DotE 2013). The occasional records of Green Turtles at Nine Mile Beach do not represent an important population and are not a key source population for breeding or dispersal.
reduce the area of occupancy of an important population	No The population in the study area is not recognised as an important population and thus the proposal will not reduce the area of occupancy of an important population
fragment an existing important population into two or more populations	No No habitat will be directly impacted or fragmented.
adversely affect habitat critical to the survival of a species.	No The National Recovery Plan for Marine Turtles (CoA 2017) has not identified any habitat critical to the survival of the Green Turtle.
disrupt the breeding cycle of an important population	No The only breeding attempt by a Green Turtle in the study area does not represent a breeding cycle of an important population.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No. No habitat will be impacted.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	No The proposed action and associated residential areas are unlikely to result in an increase in invasive species harmful to the Green Turtle.
introduce disease that may cause the species to decline	No The proposed action is unlikely to introduce disease that may cause the decline of the Green Turtle
interfere substantially with the recovery of the species.	No The proposed action is unlikely to interfere substantially with the actions required for the future recovery of the species.
Conclusion	The proposed action is unlikely to have a significant impact on the Green Turtle.

6.10.3 Statement of whether any impacts are likely to be unknown, unpredictable or irreversible

The proposed development footprint is permanent, therefore impacts to biodiversity values within the development footprint will be permanent and irreversible. When assessing ecological impacts, there are always 'unknowns' associated with assessments of species presence, abundance and distribution within study areas associated with the duration, seasonality and intensity of survey effort, annual and seasonal variations of species presence and abundance related to drought, wet years, fires etc, which could potentially lead to unpredictable outcomes. However, this assessment has been based on repeated surveys of the study area by a range of expert ecologists between 2005 and 2021 covering a number of years, seasons and thus provides a sound base of knowledge from which to make informed impact assessment decisions from.

Given the above, and the fact that the Green Turtle has only been observed occasionally in the study area as a highly unusual nesting attempt, it is concluded that the impacts to areas of potential habitat within the study area are likely to be minor and not significant to local and regional populations.

7. Proposed Safeguards, Avoidance and Mitigation Measures and Offsets

Section 6 of the Guidelines for the PER require the PER to provide information on mitigation measures, with a particular focus on matters protected under Part 3 of the EPBC Act. Specific measures intended to avoid or minimise relevant impacts must be provided and substantiated, based on best available practices, and must include the following elements:

a) a consolidated list of mitigation measures that will be undertaken by the proponent

b) for each mitigation measure, detail of:

i. which impact it addresses for which EPBC Act listed threatened species and ecological communities;

ii. assessment of the expected or predicted effectiveness of the measure including proposed management and zoning for relevant mitigation measures such as conservation areas. Supporting evidence should be provided where available;

iii. detail of parties responsible for implementation and where relevant, for ongoing funding and maintenance;

iv. any statutory or policy basis for the mitigation measures; and

v. the anticipated cost of the mitigation measures.

c) A detailed Environmental Management Plan (EMP) that sets out the framework for short- and long-term mitigation, monitoring, and ongoing management of the relevant impacts of the action, including any provisions for independent environmental auditing.

The EMP needs to address the construction. operation and monitoring phases separately. For each potential impact, the EMP must state the environmental objectives, performance criteria, monitoring, reporting, corrective action, responsibility and timing for implementation. The EMP needs to provide sufficient detail to be auditable and to be used as an operational document. The EMP may be comprised of a number of documents but must include an overarching plan.

The EMP should include a comprehensive water quality risk management and monitoring plan that is informed by the National Water Quality Management Strategy and other relevant policy and guidance available. The EMP may also include an Erosion and Sedimentation Management Plan, Acid Sulfate Soil Management Plan, Stormwater and Wastewater Management Plan, Wildlife Impact Management Plan, Vegetation and Rehabilitation Management Plan, or a Monitoring Program.

The EMP should also describe contingencies for events such as heavy or prolonged rainfall, failure of treatment systems, climate change etc. and planning to mitigate the consequences of events that may occur together to manage the cumulative risk to matters of NES.

The EMP should make reference to scientific literature and other relevant guidance or best-practice standards documented and available. A reference list should be included in the EMP.

d) the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.

e) In the event that impacts cannot be avoided or mitigated, the PER must describe any offset/s proposed to compensate for residual impacts, for relevant EPBC Act listed threatened species and ecological communities, including:

- a description of the proposed offset measure/s, such as how, when and where the offset will be delivered and managed;
- detail of how the offset/s compensate for the impact on each relevant EPBC Act listed threatened species and ecological communities resulting from the action;
- a description of how the offset/s will ensure the protection, conservation and management of the relevant EPBC Act listed threatened species and ecological communities, in perpetuity;
- description of how the offset/s are consistent with relevant Commonwealth policies or advice on offsets under the EPBC Act;
- the cost (financial and other) of the offset/s.

This Section addresses these requirements.

7.1 Mitigation Measures

A range of safeguards and mitigation measures will accompany the proposed residential development. The goal of these actions is to firstly avoid and minimise the direct impact of the development to the maximum extent possible during the planning phase and secondly to ensure that indirect impacts do not eventuate during the construction and operational phase, so all proposed offset areas and adjacent conservation areas are adequately protected and managed alongside the mixed use development.

7.1.1 Preparation and Implementation of a Construction Environmental Management Plan

Landcom and the Crown Lands, now part of the DPIE, or any future developer/developers who becomes subject to the Biodiversity Certification Agreement, will prepare and implement a Construction Environment Management Plan (CEMP), in accordance with the Department of the Environment Environmental Management Plan Guidelines (DotE 2014), which will guide the development of the certified land, including restoration of the TMO orchid pollinator corridors, to ensure that all direct and indirect impacts (e.g. APZs, utilities, access, stormwater run-off) are contained within the development footprint and appropriate mitigation measures are put in place to minimise indirect impacts to threatened fauna.

The CEMP will include objectives, potential environmental risks, environmental management activities, controls and performance targets, monitoring, corrective actions, environmental roles and responsibilities, environmental training and reporting.

Table 24 provides a summary of the specific measures to reduce impacts to biodiversity values within the study area and which will be included in the detailed CEMP:-

- Temporary and permanent protective fencing will be erected around all areas identified for conservation prior to clearing activities to minimise any inadvertent damage and to prevent any threatened fauna from entering operational areas (see Figure 47)
- Bulk earth works in the vicinity of the proposed TMO Orchid Park and associated pollinator corridors associated with development stages 10, 11, 13, 15, 17, 18, 19 and 20 will be undertaken between years 5-10 after commencement of construction to allow regeneration of any disturbed habitat in the proposed pollinator corridors prior to the clearing/development of these stages to allow continuity of habitat connectivity (see Figure 46)
- Pre-clearance surveys of threatened fauna, will be undertaken in accordance with a fauna pre-clearance protocol prior to any clearing of vegetation
- Protocols for clearing vegetation and adaptive reuse of vegetative material for restoration and habitat augmentation in areas identified for restoration activity will be prepared and implemented
- Retention of hollow-bearing trees where possible and practical
- A fauna de-watering plan for any dams that are removed
- A lighting plan that diverts lights away from sensitive areas.
- Measures to minimise vehicle access to conservation areas outside of the proposed action
- Measures to minimise vehicle and dog access to Nine Mile Beach.

7.1.2 Avoidance and mitigation - design of the proposed action

Landcom has undertaken extensive consultation with the former NSW OEH, DPE (both now part of the DPIE), DAWE and MCC since 2005 with the preparation of a Preliminary Environmental Assessment Report (Landcom 2011), an Ecological Inventory and Constraints Analysis (RPS 2012) and a State Significant Site study offset strategy (ELA 2015) to develop a Master Plan for the site that recognises and considers the ecological constraints of the site, avoids the areas of highest conservation value, including areas with the highest number of recorded TMO, and protects and manages areas that are able to maintain viable populations of TMO and other MNES.

The Master Plan for the proposed development has been revised numerous times in order to avoid and minimise impacts to the TMO and other MNES. Landcom NSW has also sought the independent opinion of two recognised experts in TMO (Dr Lachlan Copeland and Dr Colin Bower) and has funded studies into the ecology of the species to inform the minimum protected areas required to maintain viable populations of TMO and its pollinators (see ELA 2011 and FloraSearch 2013, 2014 & 2018 in **Appendix D8, D11-D13**).

The final Master Plan has sought to minimise impacts to the TMO (and other relevant MNES) through:

- avoiding the largest known populations of the TMO located in the north and west of the Study area;
- the inclusion of an additional 4.08 ha TMO Reserve that will be managed to protect a concentration of 74 plants that reduces the impacts from 137 individuals (>5% of know

individuals within the study area) to 63 individuals (or 3% of the known records within the study area)
- avoidance of a key regional fauna corridor linking the study areas with retained habitat to the wets of the study area

As a result of the avoidance and impact minimisation measures incorporated into the planning of the action, the final areas of impact to MNES are as follows:-

- 63 individual TMO plants at 25 locations of the 2,433 plants recorded at 434 locations in the study area (or 2.59% of the 2,433 known individuals within the study area)
- 201.36 ha of New Holland Mouse habitat
- 201.36 ha of moderate quality Grey-headed Flying-fox foraging habitat
- 55.23 ha of low to moderate quality potential / occasional foraging habitat for the Swift Parrot
- 30.61 ha of low quality potential / occasional foraging habitat for the Regent Honeyeater
- 201.36 ha of potential foraging habitat for the Spotted-tailed Quoll
- Potential indirect impacts to occasional Green Turtle nesting sites

The calculation of all direct impacts have been based on a worst case scenario – i.e. on the assumption of complete loss of all biodiversity values including where these losses are likely to be only partial e.g. within Asset Protection Zones that have been incorporated into the development footprint.

Activities within the development areas have the potential to indirectly impact avoided or retained native vegetation over both the short and the long term. These potential impacts, often referred to as 'indirect' and/or 'edge effects', may include:

- the introduction of weeds and exotic species
- the spread of litter and rubbish
- introduction of domestic animals (cats and dogs)
- increased disturbance from pedestrian access
- runoff from construction containing nutrients, sediments and other pollutants
- inappropriate water, sewer and stormwater management leading to erosion
- recreational use of open space adjacent to offset areas
- recreational use of offset areas

The precinct and lot layout of the development has been designed to avoid and/or minimise to the maximum extent possible indirect impacts to remaining vegetation including that contained in proposed conservation areas including the use of outer perimeter roads around the entire development. As such, there will be no residential blocks directly adjacent to protected bushland areas. This has been designed to:

- remove the likelihood of illegal encroachment into native vegetation by future residents, thus removing the chance of degradation through illegal clearing, weed invasion, garden escapes, fires and predation by domestic animals; and
- allows for the required Bushfire Asset Protection Zones (APZs) to be absorbed (i.e. overlap with) the perimeter roads and the dwelling setback within the individual lots. Therefore, no clearing

or modification of vegetation will be required to create or maintain APZ's for the proposed development in offset or other retained areas.

7.1.2.1 Pre-construction measures

Fencing and signage will be installed along the perimeter of all conservation areas and areas of retained vegetation during nearby construction with the objectives of controlling entry to the area and to protect the habitat. The fence will be vehicle proof.

Erosion and sediment control measures will be implemented during the construction phase in accordance with the requirements of MidCoast Council and the guidelines set out by Landcom (the "Blue Book" 2004).

The erosion and sediment controls will include the following measures where appropriate:

- construction of temporary diversion drains or provision of staked straw bales on the high side of the disturbed areas to direct upstream runoff around the areas.
- the use of silt fencing on the downstream side of the area of works to retain soils.
- provision of a stabilised site access at appropriate points where construction vehicles will enter and leave the site to reduce the likelihood of vehicles tracking soil materials onto public roads.
- topsoil stockpile located adjacent to the areas of disturbance and to have an earth bank on the upslope side to divert runoff around the stockpile with a sediment fence located 1 to 2 metres downslope of the stockpile.
- rock wrapped in geofabric or straw bales will be installed in or around any stormwater drainage inlet.

The CEMP will include requirements for ensuring the required controls are in place prior to construction, marking/fencing vegetation for retention and pre-clearance ecological surveys.

Fencing conservation areas

Fencing will be installed along the perimeter of all conservation areas and other retained vegetation. Signage will be provided to increase community awareness of the importance of the conservation areas. Gates will be included within the fence-lines to allow operational/management access and emergency services access as indicated in the Biodiversity Stewardship Site (BSS) Management Plan (ELA 2020).

To allow for appropriate vehicle access for management purposes, including emergency access, fire trails will have locked gates.

Fencing will be monitored as part of the BSS reporting requirements to ensure their integrity remains intact. The fence lines will be regularly checked for weeds, particularly prior to any mowing to ensure propagules are not dispersed into the conservation areas, with any weeds surrounding these areas to be removed during regular landscaping.

Vegetation and habitat clearance

A Fauna Management Plan (FMP) will be included in the CEMP based on the following principles.

- Vegetation clearance will be undertaken in a manner which is sensitive to the ecological values of the area. Strict clearing limits will be established and delineated to ensure that no over clearing occurs.
- Hollow bearing trees (HBTs) will be cleared in a progressive manner in accordance with a hollow bearing tree clearance protocol to minimise potential impacts to hollow dependant fauna. A suitably qualified ecologist will be on site during any vegetation clearance in ecologically sensitive areas (including areas containing MNES) as well as during the clearance of HBTs.

The pre-clearing protocol will include:

- threatened fauna searches immediately prior to tree removal;
- protocols for hollow-bearing tree removal;
- addition of fallen logs to conservation areas
- supervision by an ecologist;

Woody weed material will be relocated to offset areas to supplement habitat features for fauna as described in the BSS Assessment Report (ELA 2020). Surplus material will be mulched on site, piled into unobtrusive piles or disposed of at a facility licensed to receive green waste. All weed propagules especially noxious will be bagged and disposed of as directed by legislation at a facility licensed to receive green waste. All weed waste without propagules will be composted onsite in small unobtrusive piles.

Dead timber and hollows from the development areas will also be salvaged and relocated to conservation areas as described in the BSS Assessment Report (ELA 2020).

Weed and pest management

Weeds and control of pests including rabbits and foxes will be managed and reported on as part of the BSS Agreement Management Plans.

7.1.2.2 Construction and Operational controls

Litter/sediment control

Local drainage from the urban areas will be filtered (using bioretention swales or nested wetlands or a combination of both) prior to discharge to water detention basins. This will allow for protection of the storages from gross pollutants and for the easy interception and collection of this pollutant material. The filtering system will remove nutrients and other pollutants to the agreed standards.

Lighting controls

The potential for added light impacts will be addressed through a range of control measures on the lighting to be used within the residential area, including;

- ensuring the development complies with the Australian Standard 4282 – Control of the obtrusive effects of outdoor lighting, which provides recommended limits for lighting.
- incorporating a lighting strategy which prescribes limits on lights for various areas, such as;
    - Post top overhead street lighting to be used facing down with minimal spill into adjacent areas, in particular, offset areas.
    - Lighting to be set on timers where appropriate, and/or set on sensor switches.

- Position and directional lighting to be located near the conservation area where deemed necessary but oriented away from the conservation area and back into the development where suitable.

Waste management controls

All reasonable steps will be taken by the developer to remove waste deposited by others within the study area during the development stages. Construction waste management measures will be developed prior to construction as a component of the CEMP.

To deter any waste dumping within conservation areas in the longer term, fencing and signage will be installed along the permitter of existing vegetation remnants and the surrounds of the conservation areas (as shown in **Figure 47**) and regular inspections will be undertaken as part of the BSS site management regime.

Integrated Water Cycle Management Strategy

Inappropriate water, sewer and stormwater management presents potential risks to the integrity of the conservation areas. Water sensitive urban design (WSUD) features will be incorporated in the development. An integrated water cycle management strategy is included as Appendix P within Appendix H and includes:

- Vegetated swales incorporated into general streetscape
- Vegetated filter strips located within open areas/parks adjacent and upslope of riparian corridors
- Gross Pollutant Traps strategically located at outlet of stormwater drainage systems
- Bio-retention (filtration) system located at the outlet of stormwater drainage system and off-line from existing waterways (and outside riparian zones where practicable)
- Rehabilitated natural drainage channels incorporating stormwater treatment measures

7.1.3 Parties responsible for implementation

CLWB will ensure that all mitigation measures are undertaken until the completion of the development. CLWB will also be responsible for the management and annual reporting requirements of the BSS unless agreement is reached with another body/party to accept transfer of the BSS. The new land owner, would then be legally responsible under the Biobanking Agreement for the implementation and reporting of the implementation of the Biobank Agreement and associated management plans.

A Project Ecologist will be engaged for the duration of the on-site works. The Project Ecologist will ensure that all conditions relating to the biodiversity management of the site are fully implemented and complied with including:-

- Vegetation not authorised to be removed shall be protected during construction to ensure the natural vegetation and topography is not unnecessarily disturbed.

- Exclusion fencing will be installed prior to site works commencing, exclusion fencing will delineate the limit of areas impacted by the works and provide protection for trees being retained within the works areas.
- Erosion and sedimentation controls will be in place prior to the commencement of site works and maintained throughout construction activities until the site is suitably revegetated.
- Earthworks will be minimised and generally limited to the foot print area of the drainage structure.
- Stockpiling is to be located within the development areas and not within buffer zones.
- The design performance requirements and maintenance strategies of the drainage structure will ensure that there is no increase in water quantity exiting the structure relative to predevelopment conditions and there is no diminishing of water quality exiting the drainage structure relative to pre development conditions.
- Areas requiring ecological restoration / rehabilitation will be actively regenerated via bush regeneration principles and, where needed, planted with a diversity of plant species from the existing vegetation community. Works will be in keeping with Best Practice Guidelines of OEH and the Commonwealth.
- The project ecologists will recommend and approve plant species selections and ensure the timing of material collection will result in the required plants being available at the time of on-ground restoration works.

As a result of the above measures, no accidental clearing or damage to retained vegetation is expected or stormwater run-off entering conservation areas or if accidents occur, they are able to be rapidly detected and rectified. Further, the CEMP will include measures to ensure that any impacts during the construction phase of the bio-retention basins is confined to the development footprint and will not extend into proposed conservation areas.

In addition, specific measures for MNES include:-

7.1.3.1 TMO Reserve

A proposed 4.08 ha TMO Reserve will be managed for the conservation of TMO and incorporate pollinator corridors that link the reserve to surrounding bushland proposed for conservation (**Figure 46**).

As the overall development will require areas to be 'cut and filled', including the proposed TMO pollinator corridors (which will also serve a drainage function) it is proposed to commence earthworks around the proposed TMO pollinator corridors and a 20m buffer (within development Stages 11-13, 15 and 17-20) between years 5-10 after commencement of construction. The pollinator corridors will then be restored as part of a proposed Vegetation Management Plan and Construction Environment Management Plan and will be well established prior to the development of the remaining parts of these Stages.

The pollinator corridors will be fully rehabilitated to the original vegetation types (Banksia Dry Shrubland), classified as Community Land – Natural Area under the Local Government Act 1993 and subject to the preparation and implementation of a Plan of Management to protect and maintain their value as pollinator corridors, in perpetuity. An opinion of the efficacy of the works in relation to the restoration of these areas and continued functioning as TMO pollinator corridors is provided by Dr Colin

Bower of FloraSearch 2018. Dr Bower states that "*provided the rehabilitated parts of the corridors provide near continuous heathland vegetation, they are considered likely to be effective for pollinator movement into the Orchid Reserve*".

Dr Bower concluded that:-

- The population of the Tuncurry Midge Orchid in the 4.08 hectare Orchid Reserve within the proposed North Tuncurry development is considered likely to persist in the long term provided the reserve is appropriately managed.
- It is considered likely that rehabilitation of 50% the 'finger drain corridors', prior to the development of the surrounding lands, would provide suitable habitat for movement of midge orchid pollinators between the conservation lands and the Orchid Reserve (Whilst Dr Bower refers to 50% of the corridors being revegetated, 100% of the corridors will be revegetated, however, parts of the inner 50% may be a slightly wetter form of Banksia Dry Shrubland due to the battering of the corridors and their function as finger drains. The current Banksia Dry Shrubland exhibits these minor differences with a 2-3m height variation across the site).
- Further, Dr Bower also considered that generalist chloropids are likely to colonise vegetation within backyards of the future residential development and that these may provide supplementary pollination of the Tuncurry Midge Orchid in the Orchid Reserve following a catastrophe such as a reserve-wide fire and thus providing in perpetuity functioning of the TMO Park.
-

7.1.3.2 TMO Research and Monitoring Program

In addition to the 317.62 ha land proposed for an on-site conservation areas, the Crown Lands Division of NSW DPI (CLWB) will commit $250,000 of funding over a 5 year period, to develop a long term research and monitoring program for the TMO consistent with, where available, any priorities outlined in any Conservation Strategies or Species Recovery Plans.

The TMO Research and Monitoring Fund will be established in the first year of the project and a committee formed to oversee, prioritise and report on findings. The committee will invite representatives from DPIE, DAWE, MCC and a relevant university.

This research monitoring program will include elements of:

- A commitment to continue seasonal survey for the TMO in the Tuncurry area to better inform the distribution, abundance and habitat preferences of the species.

- Continue the funding of an ex-situ propagation trial and pollinator research program with the Royal Botanic Gardens and relevant TMO experts which commenced in 2012.

- Jointly Fund an Industry / University Research Scholarship to undertake experimental manipulation of habitat (slashing and fire) to determine the response of the TMO to disturbance and inform appropriate management regimes within National Parks Estate and offset areas.

- Establish a statistically sound long-term monitoring program (in conjunction with offset area monitoring requirements) of key populations.

7.1.3.3 Management of Essential Energy Powerline Maintenance Corridor

CLWB will continue to liaise with Essential Energy, informed by the TMO Research Program, regarding the ongoing management and maintenance of the powerline corridor that traverses the western section of the Biobank site and provides habitat for TMO. This will ensure that the powerline maintenance program is sympathetic to the habitat needs of TMO. This may include the on-going slashing of heathland vegetation and/or other management practices such as regeneration burning of habitat areas (as informed by the TMO Research Program).

7.1.3.4 Green Turtle and Pied Oystercatcher nesting on Nine Mile Beach

CLWB, in conjunction with existing shorebird recovery programs, will establish a nesting monitoring program along Nine Mile Beach adjacent to the BCAA and erect temporary fencing, where and when necessary, to minimise disturbance if nesting activity is detected. CLWB will commit **$250,000** of funding over a 10 year period, commencing from the first year after project approval to establish this monitoring program.

CLWB will work with MCC to develop policies to restrict and minimise vehicle and domestic dog (other than in winter) access to Nine Mile Beach adjacent to the study area.

Table 24: Summary of risks, mitigation measures, management objectives, effectiveness, responsible party and costs included in the CEMP

Impact Addressed	MNES addressed	Risk	Mitigation Measure	Management Objective	Likely Effectiveness	Party Responsible	Corrective Actions	Performance Measures	Estimated Cost
Accidental Damage to retained habitat (Machinery access outside of construction area)	Tuncurry Midge Orchid	High	CEMP Induction programs, Env Constraints Map and temporary fencing/signage	To ensure that no clearing occurs beyond the approved footprint	High	Action Holder	Repairs to fence (as/if required). Restoration of damaged vegetation/habitat.	Staff induction & training records Daily, weekly inspection of Biobank site fencing Incident reports	Development Cost
Direct mortality to MNES	STQ, NHM	Medium	Pre-clearance surveys	To ensure that no clearing occurs beyond the approved footprint	Moderate-High	Action Holder	Repairs to fence (as/if required). Restoration of damaged vegetation/habitat.	Staff induction & training records Daily, weekly inspection of Biobank site fencing Incident reports	Development Cost
Indirect impacts (Increased activity and disturbance to fauna - noise, activity, lighting etc.)	Spot-tailed Quoll, Swift Parrot, New Holland Mouse, Grey-headed Flying-fox	Low	Work involving the use of machinery of any description will only be carried out from 7.00am to 6.00pm, Monday to Friday, 8.00am to 5.00pm Saturday, with no work to be carried out on Sundays or Public Holidays as required by Council conditions of approval. All plant and equipment to be maintained and operated as per manufacturer's specifications and to be inspected prior to work. Any faulty plant or equipment is be stood down until repaired Lighting to comply with Australian Standard 4282 – Control of the obtrusive effects of outdoor lighting Position and direct lights away from conservation zones; Biodiversity Stewardship sites and outside site boundaries	To avoid potential indirect impacts to fauna from construction noise, lighting directed into offset areas	High	Action Holder	Any faulty plant or equipment is be stood down until repaired Promptly respond to complaints and modify practices Adjust angle of lights	Pre-start checklists Maintenance log books Incident reports Random Checks Checking of position and angle of lights installation of street lighting	Development Cost
Indirect impacts (introduction and spread of exotic species or disease and /or pollution	All MNES	High	Prior to entering and leaving the site, all vehicles and equipment involved in clearing and weed removal works must be cleaned to remove soil and plant material (Refer to Hygiene Protocol – in CEMP) . During vegetation clearing and weed removal, weed species must be stockpiled separately and disposed of at an appropriate waste disposal facility. Management of BSA site	To prevent the introduction and spread of invasive weeds to offset areas To prevent the introduction of soil pathogens to offset areas	Moderate-High	Action Holder	Weed control and monitoring of offset areas	Pre-start checklists Daily checks of vehicles Weekly inspection records Incident reports BSA site monitoring and annual reports	BSA Site Mgt $4.5 M
Indirect impacts (alteration to surface and ground water hydrology and run-off	All MNES	High	Implementation of Erosion and Sediment Control Plan (ESCP) in CEMP	To prevent erosion and sedimentation impacting offset areas	High	Action Holder	Repair to sediment control fences Restoration of damaged vegetation/habitat	Post rainfall site inspections Weekly inspections Erosion and sediment control fences	Development Cost
Predation of displaced fauna by Red Foxes and Cats	Spot-tailed Quoll, New Holland Mouse	High	Prohibition of dogs within the offset areas Provision of designated areas within open space / recreation areas where dogs will be permitted to be off leash	To avoid, reduce potential for predation/disturbance by domestic animals (dogs)	Moderate-High	Action Holder	Additional inspections of open space areas	Routine inspection of open space areas and off leash areas by	Development Cost

Impact Addressed	MNES addressed	Risk	Mitigation Measure	Management Objective	Likely Effectiveness	Party Responsible	Corrective Actions	Performance Measures	Estimated Cost
			Implementation of BSA Mgt Plan feral animal control measures				Additional Community Education programs	Council enforcement officers Records of Community Education Programs	
Increased predation and competition/aggression from exotic fauna (Cats, Common Mynah) and aggressive native honeyeaters (Noisy Miner)	Regent Honeyeater, Spot-tailed Quoll, Swift Parrot, New Holland Mouse	Medium - High	CEMP Education Program	To avoid, reduce potential for predation/disturbance by domestic and exotic animals (cats)	Low-Moderate	Action Holder	Additional inspections of open space areas Additional Community Education programs	Routine inspection of open space areas and off leash areas by Council enforcement officers Records of Community Education Programs	Development Cost
Increased roads and vehicle impacts	Spot-tailed Quoll, New Holland Mouse	Low	Internal Road speed limits	To avoid, reduce potential for road kill of STQ, NHM in action area	Moderate-High	Action Holder	Additional Community Education programs	Monitoring of road kills	Development Cost and Council rates
Increased incidence of rubbish and garden waste dumping	Tuncurry Midge Orchid (direct impacts), weed invasion affecting habitat for all MNES	Low-Medium	The work site will be maintained free of rubbish and monitored daily to ensure compliance. Disposal containers regularly emptied Management of Biobank site	To prevent the spread of litter and rubbish across development site	Moderate - High	Action Holder	Increase number of rubbish bins, frequency of emptying bins	Bins and waste storage units not exceeding 100% capacity Incident reports Weekly inspections Monthly audits BSA site monitoring and annual reports	Development Cost and Council rates
Increased off-road driving, dirt and trail bike riding (erosion, creation of new tracks and trails, direct impacts to TMO)	Tuncurry Midge Orchid (direct impacts), indirect impacts to remaining MNES)	High	Fencing/gates/signage restriction of access to mgt trials to authorised vehicles only	To avoid unauthorised recreational use of offset areas	Moderate-High	Action Holder	Increase Crown Lands staff presence at BSA site to undertake enforcement action if/as required	Attendance at community education days BSA site annual reporting	BSA Mgt Costs ($4.5M)
Altered fire regimes (e.g. increases in fire from arson, accidental fire & hazard reduction burns to protect new residences/buildings)	Tuncurry Midge Orchid (direct impacts), indirect impacts to remaining MNES through habitat changes	Low	All required APZs included in impact area Implementation of Ecological Burns via BSA Site Mgt Plan	To ensure appropriate ecological fire management of offset areas	High	Action Holder	Increase Crown Lands staff presence at BSA site to undertake enforcement action if/as required	BSA site annual reporting	BSA Mgt Costs ($4.5M)
Accidental damage to TMO during maintenance activities within powerline corridor	TMO	Medium-High	Liaison with Essential Energy	To ensure appropriate management of TMO in powerline corridor	High	Action Holder	Liaison with Essential Energy	BSA site annual reporting	BSA Mgt Costs ($4.5M)
Inform the long-term management of TMO and its habitat	TMO	Low	TMO Research and Monitoring Fund	To inform appropriate management of TMO	High	Crown Lands	Implement adaptive management program for TMO informed by research program	BSA site annual reporting	$250,000 over 5 years
Disturbance and predation of nesting turtles/shorebirds	Green Turtle Sooty Oystercatcher (BC Act)	Medium - High	Implement Turtle and Shorebird Monitoring Program	To avoid, reduce potential disturbance by domestic animals (dogs) and beach use	Moderate	Crown Lands	Community Education, Signage, temporary fencing at nesting sites, restriction of dogs on beach during nesting period	Shore Bird Monitoring Program annual reporting	$25,000/year over 10 years

7.2 Biodiversity Offsets

7.2.1 Offset policy and guidance

The EPBC Act Offsets Policy (DSEWPaC 2012) outlines the offsetting framework for residual significant impacts to a Matter of NES. Offsets are required when the avoidance and mitigation strategies have not removed the need for offsets, i.e. when a significant residual impact is still likely to occur. The aim of the policy is to ensure that an overall conservation outcome is achieved that improves or maintains the affected MNES.

Offsets can be provided through direct or indirect offsetting. Direct offsets provide for a measurable conservation gain for the affected MNES and must reach a minimum of 90 % when applying the offsets calculator. A direct offset must:

- be additional to what is already required
- include transparent governance arrangements such that it can be measured, monitored, audited and enforced
- be informed by scientifically robust information
- be equal in quality to that of the impact site
- provide some form of legal security over the offset for at least the duration of the impact
- be proportionate to the level of statutory protection that applies to the protected matter
- be suitable in size and scale proportionate to the impacts to the Matter of NES
- account for the risk of the offset not succeeding
- improve habitat for the affected Matter of NES
- avert some level of loss for the affected Matter of NES.

7.2.2 Offsets required for NSW Biodiversity Certification Application

The proposed development has implemented a number of measures to avoid and minimise impacts to MNES as outlined in Section 7.1, however it was not possible to completely avoid all impacts and residual impacts to MNES remain. CLWB will offset these impacts in accordance with the EPBC Act Offset Policy (DSEWPaC 2012).

The EPBC Act Offsets Policy requires residual 'significant' impacts to MNES to be offset.

This PER report has concluded that the residual impacts to TMO and Grey-headed Flying-fox, in combination with the impacts of the 2019/2020 summer bushfires have the potential to have significant impacts at the local and regional level and thus require offsets and that the DAWE considers that impacts to New Holland Mouse, Swift Parrot, Regent Honeyeater and Spot-tail Quoll may also be significant and require offsets.

In addition, the North Tuncurry State Significant Site Biocertification Assessment (ELA 2019) requires offset for impacts to non EPBC listed vegetation communities and NSW listed threatened fauna species including Brush-tailed Phascogale, Eastern Pygmy Possum and Squirrel Glider. The biocertification assessment has found that 5,744 ecosystem credits are required for impacts to three vegetation types and 4,846 TMO species credits for impacts to 63 TMOs as shown in Tables 25 and 26. This is equivalent to approximately 618 ha of the same vegetation types (at an average of 9.3 credits/ha) and 682 TMO individuals (at 7.12 credits generated per individual TMO).

These offset commitments will be met by registering 317.62 ha of land within the study area as an on-site Biodiversity Stewardship site (or BSS) within 12 months of biodiversity certification being conferred and prior to the commencement of the action. This conservation measure will generate 2,964 ecosystem credits (or around 50% of all vegetation offsets required), 9,066 TMO species credits and 1,662 Eastern Pigmy Possum and Brush-tailed Phascogale credits. These credits are sufficient to meet all the offset needs for the main access road, E1 Business Lands, the first 12 Stages of development and the TMO pollinator corridors in Stages 13-18.

An additional 350-400 ha of land at Nabiac, owned by MCC may also be registered as a Biodiversity Stewardship site (**Figure 52**) for the impacts associated with Stages 13-22, the Village Centre, Golf Course and E2 Industrial Zone). The proposed offset area includes the required matching vegetation types and confirmed habitat for Grey-headed Flying Fox, New Holland Mouse, Long-nosed Potoroo, Spotted-tailed Quoll (see Figure 55) as well as further records and habitat for the TMO and NSW listed threatened fauna species (Brush-tailed Phascogale, Eastern Pygmy Possum and potential habitat for Koala).

Landcom has entered into discussions and reached in principle agreement with MCC to make this area available for the proposal if/when required. In the interim, the area will continue to be managed by MCC as a defacto conservation area as part of MCC ground water aquifer management regime.

Alternatively, CLWB may meet the offset requirements for Stages 13 to 22 (and the Village Centre, Golf Course and E2 Industrial Zone) of the proposed development by purchasing credits as required from the credit market and/or Biodiversity Conservation Fund (BCF) established under the NSW BC Act before commencing any of these stages (i.e. the offsets for Stages 13-22 will be delivered if and as required, prior to any impacts associated with these stages occurring).

A number of biobank and biodiversity stewardship sites have been registered in recent years on the lower north coast and others are currently being assessed. These sites are also capable of providing the remaining ecosystem and species credits required.

An application to register a 317.62 ha North Tuncurry Crown land Biobank site was submitted to the NSW Minister for the Environment in August 2020 and was required to be registered by 24 August 2021 together with the application for Biocertification (ELA 2019). However, this application will now need to be re-submitted as a Biodiversity Stewardship site Agreement (BSA) as the 24 August deadline under the old TSC Act has passed. Once registered, the habitat to be conserved will be protected and managed in-perpetuity as the North Tuncurry Crown Land BSA site.

The management of the Crown lands North Tuncurry BSA site will be commenced prior to the commencement of construction (expected to be approximately 5 years after project approval) and will be fully funded by CLWB) on an annual basis for 5 years (expected to be between $100,000 and $120,000 per year). The BSA area will then be progressively managed in accordance with a BSA Management Plan with signage, access control and feral animal management occurring across the site from Year 1 of the commencement of development, and weed control/restoration works progressing in defined Management Areas (Management Areas 1, 2 and 3 as shown in **Figure 53**) from the southern end of the site to the north and targeting areas critical to TMO protection in the initial years of implementation.

Prior to commencement of the sixth stage or sixth year after commencement (whichever is sooner), CLWB will 'retire' all ecosystem and species credits generated by the on-site BSA site thereby fully meeting the Total Fund Deposit amount (expected to be around $4.5 M).

CLWB (or any future developer/developers who become subject to the Biodiversity Certification Agreement) will either purchase the remaining credits required for development in any of the Stages from Stage 13 onwards from the MCC Biodiversity Stewardship site at Nabiac (**Figure 54**), any other registered Biobank (or Biodiversity Stewardship site) or the NSW Biodiversity Conservation Fund, prior to the commencement of the relevant Stage or Stages of development.

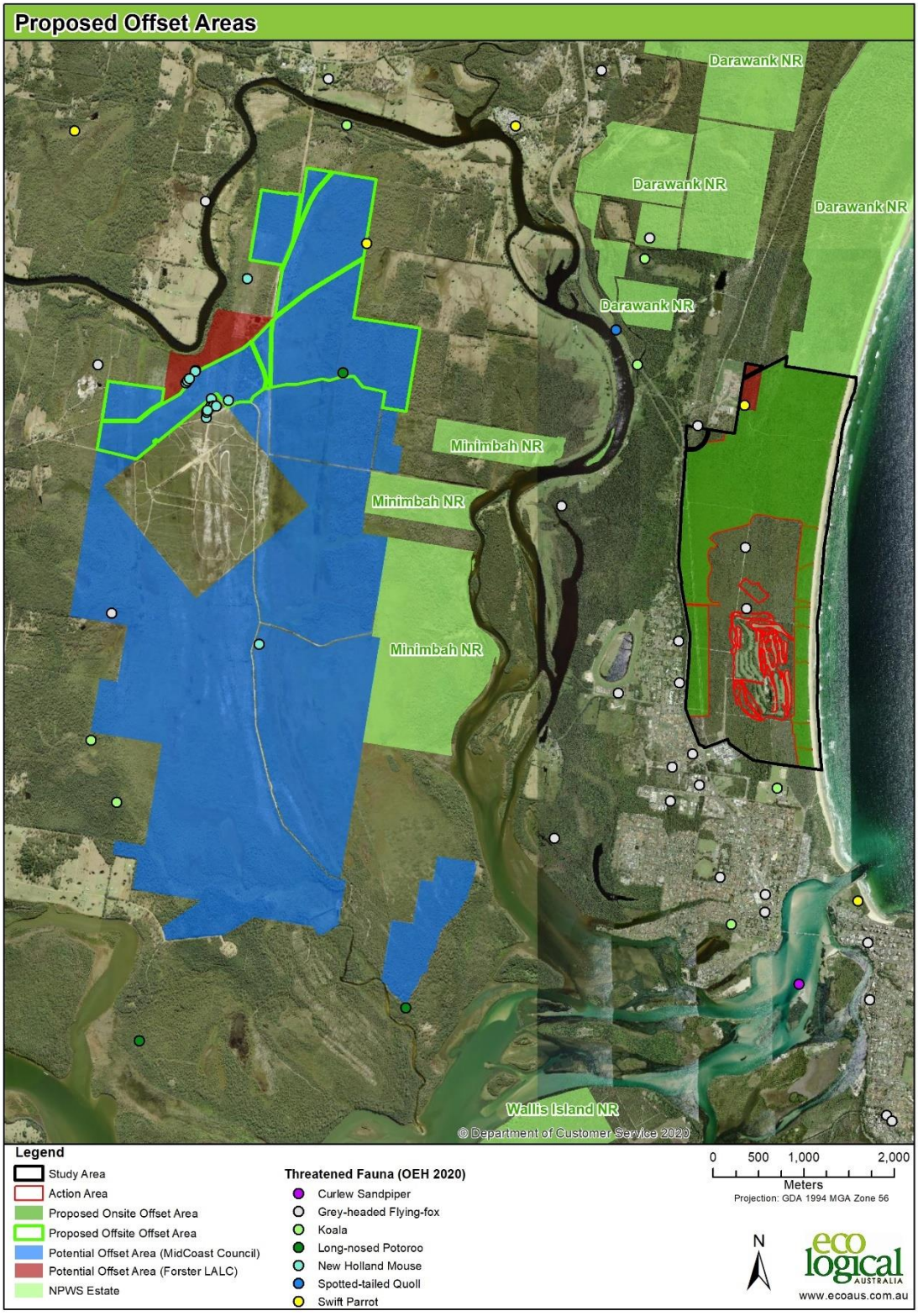


Figure 53: Proposed on and off-site offset areas to be managed in perpetuity to meet NSW offset requirements and adjacent conservation lands.

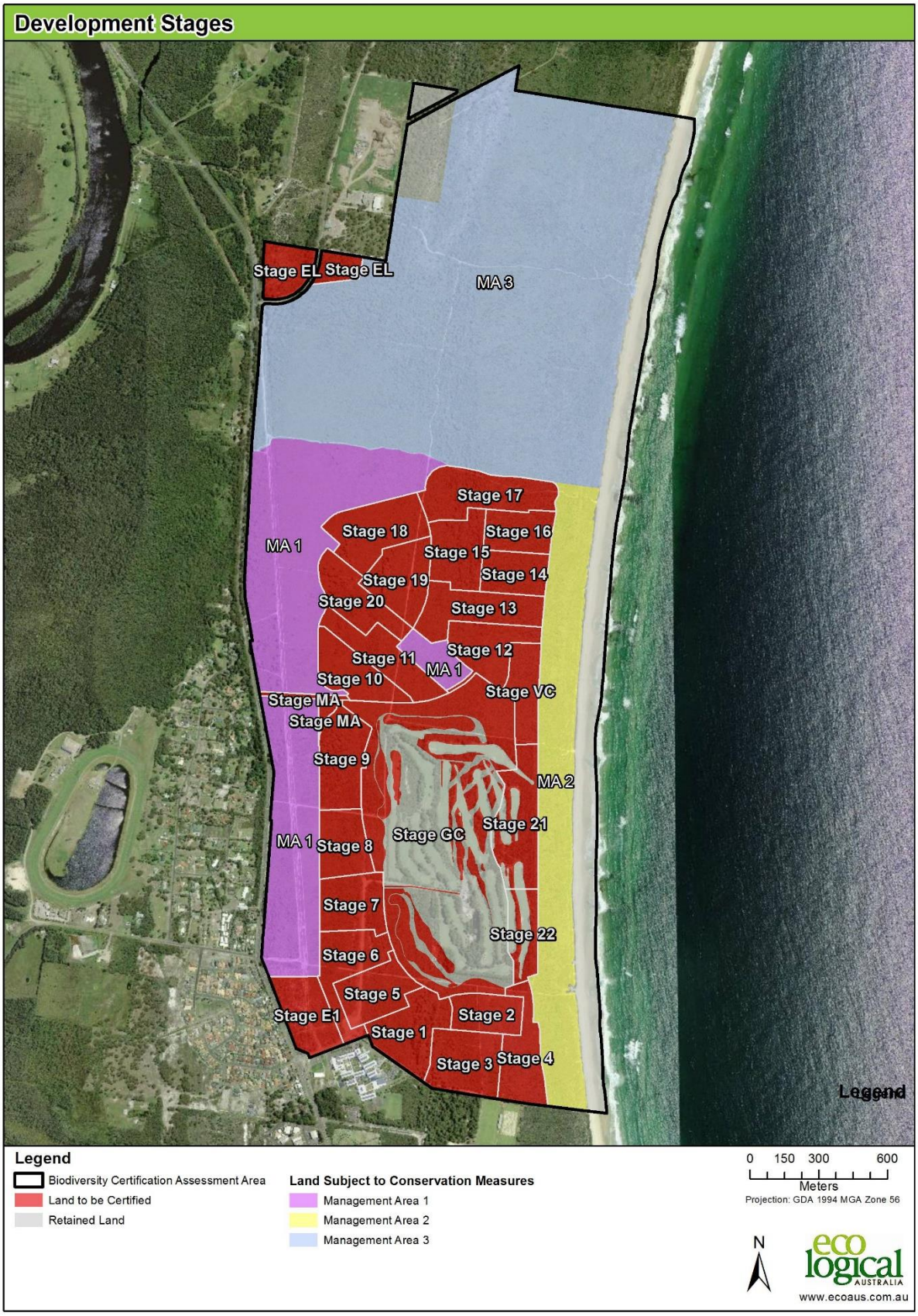


Figure 54: North Tuncurry Biodiversity Stewardship Site Management Areas

Figure 55: MNES habitat for MCC Off-site offset area near Nabiac.

Note: The precise location of endangered orchids have been redacted from the public exhibition version of this document

Table 25: NSW Biocertification Ecosystem credit required and generated by proposed 317.62 ha on-site offsets

Veg Zone	BioMetric Vegetation Type	Condition	Ancillary Zone	Credits Required	Credits Generated (On-site Offset Area	Credit Status
1	Banksia dry shrubland	Moderate to good	Good	2,527	746	
2	Banksia dry shrubland	Moderate to good	Burnt	146	110	
3	Banksia dry shrubland	Moderate to good	Blackbutt	135		-2,187
4	Banksia dry shrubland	Moderate to good	Pine	260	25	
5	Blackbutt - Smooth-barked Apple shrubby open forest	Moderate to good	Good	751	614	
6	Blackbutt - Smooth-barked Apple shrubby open forest	Moderate to good	Shrubby	320	6	
7	Blackbutt - Smooth-barked Apple shrubby open forest	Moderate to good	Burnt	224	9	-714
8	Blackbutt - Smooth-barked Apple shrubby open forest	Moderate to good	Pine	92	44	
9	Coast Banksia - Coast Wattle dune scrub	Moderate to good	Good	1,120	884	
10	Coast Banksia - Coast Wattle dune scrub	Moderate to good	Regen		299	120
11	Coast Banksia - Coast Wattle dune scrub	Moderate to good	Blackbutt	123		

Veg Zone	BioMetric Vegetation Type	Condition	Ancillary Zone	Credits Required	Credits Generated (On-site Offset Area	Credit Status
12	Coast Banksia - Coast Wattle dune scrub	Moderate to good	Pine	46		
13	Coast Banksia - Coast Wattle dune scrub	Moderate to good	Dune	0	266	
	Total			5,744	2,964	-2,780

Table 26: NSW Biocertification species credits required and generated by on-site offsets

Common Name	No. individuals Impacted / Area habitat	Credits Required	No. individuals protected / Area habitat	Credits Generated (100% Funded & Managed Measure)	Credit Status
Tuncurry Midge Orchid	63 plants	4,846	1,511 plants	9,066	4,220
Brush-tailed Phascogale	198.66 ha	3,973	277.06 ha	1,662	-2,264
Eastern Pygmy-possum	198.66 ha	3,973	277.06 ha	1,662	-2,264

Table 27: Potential number and type of ecosystem credits generated by proposed Nabiac Biodiversity Stewardship site

PCT	Veg Type	Biometric Vegetation Type	Vegetation Class	Vegetation Formation	Credits required for Certified Land	Credit deficit / surplus Table 25	Estimate additional offset area required Table 25	MCC Proposed Offset (ha)	Potential ecosystem credits generated	Credit Status (after Veg Class/Formation variations)
687	HU509	Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands o	Coastal Dune Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby sub-formation)	1,387	-714	-71	0.00	0	883
1637	HU851	Scribbly gum - Wallum Banksia - Prickly-leaved Paperbark heathy coastal woodland on coastal lowlands						159.69	1,597	
772	HU530	Coast Banksia - Coast Wattle dune scrub	Sydney Coastal Heathlands	Heathlands	1,289	120	-219	0.00	0	-200
663	HU503	Banksia dry shrubland on coastal sands of the North Coast	Wallum Sands Heath		3,068	-2,187		70.52	705	
1705	HU919	Heath-leaved Banksia-Olive Tea-tree-Wallum Boronia wet heath on coastal sands						116.22	1,162	
1230	HU633	Swamp Mahogany swamp forest on coastal lowlands	Coastal Swamp Forest	Forested Wetlands				20.89	209	188
1704	HU918	Fern-leaf Banksia - Prickly-leaved Paperbark-Tantoon - Leptocarpus tenax wet heath on coastal sands	Coastal Heath Swamps	Freshwater Wetlands				6.58	66	123
1734	HU948	Wallum Bottlebrush - Leptocarpus tenax -						1.40	14	

PCT	Veg Type	Biometric Vegetation Type	Vegetation Class	Vegetation Formation	Credits required for Certified Land	Credit deficit / surplus Table 25	Estimate additional offset area required Table 25	MCC Proposed Offset (ha)	Potential ecosystem credits generated	Credit Status (after Veg Class/Formation variations)
		Baloskion pallens Wallum Sedge heath								
780	HU532	Coastal floodplain sedgelands, rushlands, and forblands	Coastal Floodplain Wetlands					4.32	43	
		Total Area/Ecosystem credits			5,744	-2,781	-290	379.62	3,796	994

7.3 EPBC Act Offsets Calculations (adequacy assessment)

This PER report has concluded that the residual impacts to TMO and Grey-headed Flying-fox have the potential to have significant impacts at the local and regional level and thus require offsets. Whilst not considered to have significant impacts as a result of the proposed action, impacts to the New Holland Mouse and potential foraging habitat of the Swift Parrot/Regent Honeyeater and Spotted-tailed Quoll will also be offset by the proposed on-site and off-site offset areas. Subject to the final determination by DAWE, offsets for these species have also been calculated in accordance with the EPBC Act offset policy.

7.3.1 Habitat quality scoring

The offset calculator for the TMO, Grey-headed Flying-fox, New Holland Mouse, Swift Parrot/Regent Honeyeater and Spotted-tailed Quoll relies on the use of scores for 'habitat quality' (scored from 1-10) for both the impact and offset areas. These scores are determined through the consideration of 'site condition',' site context' and 'species stocking rates'.

Site condition is broadly an understanding of the condition of a site in relation to the ecological requirements of the specific ecological community. This includes considerations such as vegetation health and structure, the diversity of characteristic species present, and the number of the relevant habitat features present for each MNES.

Site context is the relative importance of a site in terms of its position in the landscape, considering the connectivity needs of the MNES. This includes considerations such as the proximity of the site in relation to other areas of suitable habitat, threats that may occur nearby, increase of threats as a result of the proposed action and the role of the site in relation to the overall population or extent of habitat available. Habitat quality needs to be assessed consistently on both the impact and offset calculators and a score out of ten is required for each area as input in the Offset Calculator.

One quality score has been calculated for the area of habitat to be removed and conserved in the on-site offset area (this is because the condition of the vegetation is consistent across the study area) and a different score for the proposed off-site offset area at Nabiac (as the vegetation at Nabiac is composed of different vegetation types which provide different foraging, shelter, nesting opportunities).

7.3.2 Quantification of impact

The Offsets calculator moderates the area of impact based on the quality of habitat or number of individuals. The 'quantum of impact, on which the assessment of offset adequacy is based, decreases with decreasing quality.

7.3.3 Time till conservation gain

It is anticipated that conservation gains will be achieved over the short term (5-10 years) and long term (> 20 years). The most significant gains are estimated to be made in the first 5-10 years of the stewardship site management plan actions being implemented as part of the BSA (i.e. active commencement of weed control and feral animals control programs from Year 1 of project commencement that historically have not existed for the area). The ecological benefits of management are expected to continue throughout the life of the BSA until the full ecological benefit is realised. The habitat to be conserved is already in good condition but has not benefited from weed or feral animal control and un-restricted access is leading to degradation of habitat values. A majority of the

management actions are focused on maintaining the current condition of the habitat and ensuring that illegal access is controlled. The management actions will be implemented as part of the BSA (**Appendix D14**).

Table 28: Timing and management actions to achieve a conservation gain

Timing	Management actions
Short term (within 5 years)	Fencing, exclusion zones and signage established
	Weed control of primary target weeds within first five years
	Management of waste and human disturbance
	Retention of dead timber and rocks
	Control of feral and overabundant herbivores

7.3.4 Level of certainty of conservation gain

Offsets that involve the restoration or regeneration of habitat are subject to uncertainty when considering the gains that can be achieved (Gibbons and Lindenmayer 2007). However, when consideration is given to the likelihood of degradation to a site that is placed under restricted use and a management regime, the introduction of funded management will result in a conservation gain. To increase the gain, the management prescription for the offsets should be based on best practice assisted regeneration as advocated by (DECCS 2005). This is based on tested conservation techniques with high levels of certainty (DECCS 2005).

Assisted regeneration is successful when continued over extended periods of time, often over five to ten years. The protection and long term security of the North Tuncurry BSS as part of a BSA Agreement will ensure 'maintain and improvement' outcomes are achieved and that management of the site is continued in-perpetuity. In addition, the offsets will be monitored as part of the BSA to ensure that the predicted gains are being achieved on-site. This will also allow the management actions to be adaptive to ensure that the best ecological and conservation outcome is achieved.

7.3.5 Calculation of proportion of impact mitigated by offsets

Using the EPBC Act Offset Policy calculator, Table 29 shows the 'Quantum of Impacts' for each MNES considered to have significant residual impacts (TMO and GHFF) as well as other impacted MNES (NHM, Swift Parrot/Regent Honeyeater and Spotted-Tail Quoll) based on the 'Quality' scores and justification for each species provided in **Appendix K.**

Table 30 provides the 'Percentage of Offset met' based on the area of habitat in the proposed on-site and off-site offset areas, time loss averted, time to ecological benefit, risk of loss with and without offset and quality weightings (as defined by the EPBC Act Offset Policy (DSEWPaC 2012) with justifications provided in **Appendices K**.

The EPBC calculated offset targets are met for each MNES considered to be significantly impacted and subject to the final selected off-site offset area, for other MNES that DAWE considers may also be significantly impacted.

7.3.6 Timing for implementation

The application to register a North Tuncurry Crown land Biobank site was submitted to the NSW Minister for the Environment in August 2020, however, was required to be registered by 24 August 2021 together with the application for Biocertification (ELA 2019). As the Biocertification assessment will not be determined by 24 August 2021, the offset area will need to be re-submitted as a Biodiversity Stewardship site Agreement (BSA). Once registered, the habitat to be conserved will be protected and managed in-perpetuity as the North Tuncurry Crown Land Biodiversity Stewardship site.

The management of the North Tuncurry Crown Land Biodiversity Stewardship site will be commenced prior to the commencement of construction (expected to be approximately 3 years after project approval or around 2024/2025) and will be fully funded by CLWB) on an annual basis for 5 years (expected to be between $100,000 and $120,000 per year). The BSA area will then be progressively managed in accordance with the BSA Management Plan with signage, access control and feral animal management occurring across the site from Year 1 of the commencement of development, and weed control/restoration works progressing in defined Management Areas (Management Areas 1, 2 and 3 as shown in **Figure 53**) from the southern end of the site to the north and targeting areas critical to TMO protection in the initial years of implementation.

Prior to commencement of the sixth stage or sixth year after commencement (whichever is sooner), CLWB will 'retire' all ecosystem and species credits generated by the on-site BSA site thereby fully meeting the Total Fund Deposit amount (expected to be around $4.5m in 2021 dollars).

CLWB (or any future developer/developers who become subject to the Biodiversity Certification Agreement) will either purchase the remaining credits required for development in any of the Stages from Stage 13 onwards from the MCC Biodiversity Stewardship site at Nabiac (**Figure 54**), any other registered Biobank (or Biodiversity Stewardship site) or the NSW Biodiversity Conservation Fund, prior to the commencement of the relevant Stage or Stages of development.

7.3.7 Parties responsible for implementation of offset strategy

The following parties will be responsible for the various mitigation and offset commitments included in this PER

A Biocertification Agreement will be entered into between the Crown Lands Branch of DPIE and the NSW Minister stating that at least 317.63 ha of land proposed for conservation (including the 4.08 ha TMO Reserve) but excluding the powerline maintenance corridor and access to the beach) will be submitted for registration as the North Tuncurry Crown Land Biodiversity Stewardship site within 12 months of biocertification being conferred.

- A Planning Agreement under the EP&A Act will be entered into between the Crown Lands Branch of DPIE and MidCoast Council stating that the TMO pollinator corridors shown in **Figure 46** will be restored in accordance with a Vegetation Management Plan, dedicated to MCC, classified as Community Land – Natural Area under the *Local Government Act* 1993 and be subject to the preparation and implementation of a Plan of Management to protect and maintain their value as pollinator corridors in perpetuity.
- The Crown Lands Branch of DPIE (or any future developer/developers who becomes subject to the Biodiversity Certification Agreement) will prepare and implement a Construction Environment Management Plan (CEMP), which includes restoration of the TMO orchid pollinator corridors, to guide the development of the land subject to the action and ensure that all direct and indirect impacts (e.g. APZs, utilities, access, stormwater run-off) are contained within the development footprint and appropriate mitigation measures are put in place to minimise indirect impacts to MNES across the study area, including those utilising Nine Mile Beach.
- The management of the North Tuncurry Crown Land Biodiversity Stewardship site will be commenced prior to the commencement of construction and will be fully funded by CLB) on an annual basis for 5 years (expected to be between $100,000 and $120,000 per year). The BSA area will be progressively managed in accordance with a BSA Management Plan with signage, access control and feral animal management occurring across the site from Year 1 of the commencement of development, and weed control/restoration works progressing in defined Management Areas (Management Areas 1, 2 and 3 as shown in **Figure 47**) from the southern end of the site to the north and targeting areas critical to TMO protection in the initial years of implementation.
- CLWB will commit **$250,000** of funding over a 5 year period, commencing from the first year after project approval, to develop a long term research and monitoring program for the TMO consistent with, where available, any priorities outlined in any Conservation Strategies or Species Recovery Plans.
- CLWB will continue to liaise with Essential Energy, informed by the TMO Research Program, regarding the ongoing management and maintenance of the powerline corridor that traverses the western section of the study area and provides habitat for TMO. This will ensure that the powerline maintenance program is sympathetic to the habitat needs of TMO. This may include the on-going slashing of heathland vegetation and/or other management practices such as regeneration burning of habitat areas (as informed by the TMO Research Program.
- CLWB, in conjunction with existing shorebird recovery programs, will establish a Turtle and Shorebird nesting monitoring program along Nine Mile Beach adjacent to the BCAA and erect temporary fencing, where and when necessary, to minimise disturbance if nesting activity is detected. CLWB will commit **$250,000** of funding over a 10 year period, commencing from the first year after project approval to establish this monitoring program.
- CLWB will work with MCC to develop policies to restrict and minimise vehicle and domestic dog (other than in winter) access to Nine Mile Beach adjacent to the BCAA.

7.3.8 Monitoring requirements

Monitoring is to be undertaken as part of the implementation of the BSA. Annual implementation reports will be prepared, a copy of which will be provided to DAWE, which will report on the progress of the implementation of the management plan.

Monitoring and reporting associated with the CEMP would ensure that indirect impacts to retained areas through runoff and sedimentation, access, rubbish dumping and spread of weeds is not occurring.

Table 29: Quantum of offset required for MNES

Impacted MNES	Status	Stages 1-12	Stages 13-25	Area (ha) / Ind	Quality Weighting (Condition : Context : Stocking Rate)	Quality[1]	Quantum of Impact
TMO	CE	27	36	63			63.00
Grey-headed Flying Fox on-site	Vul	101.84	99.52	201.36	25%:50%:25%	6	120.82
***New Holland Mouse on-site	Vul	101.84	99.52	201.36	25%:50%:25%	6	120.82
***Swift Parrot On-site	CE	20.09	35.14	55.23	25%:50%:25%	4	22.09
***Regent Honeyeater On-site	CE	1.20	29.42	30.61	25%:50%:25%	3	22.09
***Spotted-tail Quoll on-site	End	101.84	99.52	201.36	25%:25%:50%	4	80.54

*** Offsets not required for these species under EPBC Offset Policy as residual impacts determined to be not significant

Table 30: Percentage Offset Quantum met by proposed on and off-site offset areas

		OFFSETS												
Impacted MNES	Status	Area of Offset habitat / ind	Time Loss Averted (Years)[2]	Time until Ecological Benefit (Years)[3]	Risk of loss (%) without offset[4]	Risk of loss (%) with Offset	Confidence in result	Quality Weighting (Condition : Context : Stocking Rate)	Start Quality	Future Quality without Offset	Future Quality with Offset[5]	% of Impact Offset		Offset Met
TMO (Individuals) Stages 1-12 on-site	CE	750	10				75%		750	600	750	215.81%	389.54%	Yes
TMO (Individuals) Stages 13-25 on-site	CE	761	10				75%		761	600	761	173.73%		Yes
Grey-headed Flying Fox Stages 1-12 on-site	Vul	282.53	20	10	5%	1%	90%	25%:50%:25%	6	5	7	88.70%	100.00%	Yes
Grey-headed Flying Fox Stages 1-12 off-site	Vul	36.00	20	10	5%	1%	90%	25%:50%:25%	6	5	7	11.30%		
Grey-headed Flying Fox Stages 13-25 off-site	Vul	314.00	20	10	5%	1%	90%	25%:50%:25%	6	5	7	100.88%		
New Holland Mouse Stages 1-12 on-site offset	Vul	278.55	20	10	5%	1%	90%	25%:50%:25%	6	5	7	87.45%	100.01%	Yes
New Holland Mouse Stages 1-12 off-site offset	Vul	40.00	20	10	5%	1%	90%	25%:50%:25%	6	5	7	12.56%		
New Holland Mouse Stages 13-25 off-site	Vul	312.00	20	10	5%	1%	90%	25%:50%:25%	6	5	7	100.23%	100.23%	
Swift Parrot Stages 1-12 On-site	CE	69.70	20	10	5%	1%	90%	25%:50%:25%	4	3	5	81.01%	100.58%	Yes
Swift Parrot Stages 1-12 Off-site	CE	16.50	20	10	5%	1%	90%	25%:50%:25%	6	5	7	19.57%		
Swift Parrot Stages 13-25 Off-site	CE	150.00	20	10	5%	1%	90%	25%:50%:25%	6	5	7	101.73%	101.73%	Yes
Regent Honeyeater Stages 1-12 On-site	CE	3.90	20	10	5%	1%	90%	25%:50%:25%	3	2	4	100.14%	100.14%	Yes
Regent Honeyeater Stages 13-25 on-site	CE	60.75	20	10	5%	1%	90%	25%:50%:25%	3	2	4	63.62%	101.04%	Yes
Regent Honeyeater Stages 13-25 off-site	CE	35.00	20	10	5%	1%	90%	25%:50%:25%	5	4	6	37.42%		
Spotted-tail Quoll Stages 1-12 on-site	End	278.55	20	10	5%	1%	90%	25%:50%:25%	4	3	5	113.48%	214.39%	Yes
Spotted-tail Quoll Stages 13-25 off-site	End	238.00	20	10	5%	1%	90%	25%:50%:25%	5	4	6	100.91%		

8. Other Approvals and Conditions

Section 7 of the PER Guidelines require the PER to provide information on any approval, conditions, permit or certificate requirements that apply, or that the proponent reasonably believes are likely to apply, to the proposed action including:

a) details of any planning scheme (local, State or Commonwealth), plan or policy under any planning system that is relevant to the proposed action, including:

- what environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy;
- how the scheme provides for the prevention, minimisation and management

b) a description of any approval that has been obtained from a State, Territory or Commonwealth agency or authority (other than an approval under the EPBC Act), including any conditions or requirements that apply to the action;

c) a statement identifying any additional approvals that are required; and

d) a description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action.

This section addresses these requirements.

8.1 Planning Scheme approvals required for the proposal

Planning Scheme Proposal approvals required – North Tuncurry Rezoning Application

A rezoning study to support a State Environment Planning Policy amendment to the Great Lakes LEP 2014 for the North Tuncurry Urban Release Area (Ethos Urban 2020 – **Appendix H**) was submitted to the DPIE in April 2020 with the project now been referred to as the North Tuncurry Urban Release Area or NTURA.

Biocertification Assessment

An application to biodiversity certify the action area under the now repealed NSW *Threatened Species Conservation Act* 1995 was made to the NSW Minister for the Environment in July 2019.

It is expected that the Planning proposal to rezone the land and Biocertification Assessment will be placed on public exhibition at the same time as this PER Report.

Registration of Offset Areas

An application to register a North Tuncurry Crown Land Biobank site over 317.63 ha was submitted to the DPIE in August 2020 (ELA 2020 – **Appendix D14**), consistent with the commitments in the Biocertification Assessment (ELA 2019). The savings provisions for which this application was made expires on 24 August 2021 and this application will be re-submitted as a Biodiversity Stewardship site within 12 months of the rezoning and biocertification applications being approved.

Development Applications under the NSW EP&A At 1979

Once the rezoning application has been approved and made by the NSW Planning Minister, and the Biocertification application has been 'conferred', detailed Precinct Pans and Development Applications will be submitted under the NSW *Environmental Planning and Assessment Act* 1979.

Operation and maintenance plans for waste, sediment control, sewerage, wastewater and stormwater will be addressed as part of the conditions of the Development Applications at the detailed design stage and form part of the EMP.

8.2 Approvals obtained from State, Territory and Commonwealth agencies

No approvals have been obtained under State, Territory or Commonwealth agencies.

8.3 Additional approvals required

The additional approvals required are listed in Section 8.1

8.4 Monitoring, enforcement and review procedures that will apply to the action

The monitoring, enforcement and review procedures that will apply to the action will be included in the Biocertification approval (which will include conditions to register nominated offset areas and purchase and retire biodiversity credits prior to the commencement of each stage of development), the Biodiversity Stewardship site Agreement (which will require the implementation of the offset area management plan, annual monitoring and reporting) and the conditions of each Development Application (that will include the hours of operation, the requirement to prepare and implement Construction Environmental Management Plans, the implementation of mitigation measures, obtain construction certificates etc), as well as any condition imposed under any EPBC Act approval.

9. Consultation

Section 8 of the PER Guidelines require the PER to provide information on the consultation processes related to the action, including:

a) any consultation that has already taken place and the documented responses or results of that consultation;

b) any documented response to, or result of, the consultation;

c) any consultation proposed before or during the proposed action, about the relevant impacts of the action, including:

- the methodology and proposed consultation process;
- the identification of affected parties, including any communities;
- a description of the adequacy of the consultation process;

d) a description of the views expressed by the consulted parties; and

e) identification of affected parties, including a statement mentioning any communities that may be affected and describing their views.

This section of the PER addresses this requirement.

9.1 Consultation that has already taken place

Extensive consultation has been undertaken with the community (including indigenous stakeholder groups), MidCoast Council and government agencies during the formulation of the rezoning proposal for North Tuncurry. A Community Reference Group was established in June 2013 to facilitate an exchange of information between key stakeholders and Landcom. A Communication and Community Engagement Report has been prepared which details the involvement of the local community and key stakeholders in the project to date, including details of consultation activities which have occurred since the commencement of project planning in late-2011 (Appendix E in **Appendix H** - KJA 2019).

These activities will be supplemented by ongoing community consultation during the formal exhibition and assessment of the project and, should the proposal proceed, during detailed design, planning applications and construction of individual stages of the proposed development.

9.2 Documentation of consultation that has already taken place, parties identified and views expressed

A Communication and Community Engagement Report has been prepared which details the involvement of the local community and key stakeholders in the project to date, including details of consultation activities which have occurred since the commencement of project planning in late-2011 (Appendix E in **Appendix H** - KJA 2019).

9.3 Consultation proposed during the proposed action

The Planning Proposal, Biocertification Assessment Report and PER report are all required to be publicly exhibited and a response to submissions report prepared prior to final decision making.

A detailed exhibition strategy will be prepared including further public meetings once the necessary approvals have been obtained for the public exhibition.

The proponent will be required to provide regular community updates during the implementation of the action in accordance with the conditions of consent.

10. Information Sources

Section 9 of the PER Guidelines require the PER to suitably reference information utilised in the preparation of the PER, including:

a) the source of the information (as cited below);

b) how recent the information is; (refer to publication dates)

c) how the reliability of the information was tested (the majority of the references used are State and Commonwealth Government publications or peer reviewed scientific papers); and

d) what uncertainties (if any) are in the information (there are no known uncertainties in the refences used to prepare this PER.

The following references were used to assist in compiling this PER.

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RPS 2011b. *EPBC Act Referral for the North Tuncurry Mixed Use Development* - unpublished report prepared for the Australian Government Department of Sustainability, Environment, Water, Population and Communities, 3 May 2011.

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11. Environmental Record of Person(s) Proposing to Take the Action

Section 10 of the PER Guidelines requires the PER to document details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the person proposing to take the action and for an action for which the person has applied for a permit.

Table 31: Details of proceedings under Commonwealth, State or Territory law against the proponents.

	Yes	No
Does the party taking the action have a satisfactory record of responsible environmental management?	✓	
Landcom is committed to sustainability and reports annually on its sustainability, including biodiversity impacts. http://www.landcom.com.au/AnnualReport2020/		
Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?		✓
If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework? Yes please refer to our sustainability targets and annual report.	✓	
Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?		
Yes Landcom has previously referred several actions under the EPBC Act including the Edmondson Park residential development (EPBC 2009/4832), Little Bay Redevelopment (EPBC 2003/1048) and Mount Annan Residential Subdivision (EPBC 2002/762	✓	

12. Conclusion

Section 11 of the PER Guidelines require the PER to include a conclusion as to the environmental acceptability of the proposal including a discussion on the consistency with principles of Ecologically Sustainable Development and the objects of the EPBC Act. Further, reasons supporting undertaking the proposal in the manner proposed should be outlined together with the proposed offset measures for any unavoidable impacts.

This section address this requirement.

The proposed action will develop 227.81 ha of the study area, impacting 201.67 ha of existing native vegetation in 25 stages over an approximate 35 year period (approximately 6.5 ha per year), into approximately 2,100 dwellings.

A comprehensive package of mitigation measures have been developed (Section 7 of this PER), that will form part of an Environmental Management Plan to reduce and mitigate both direct and indirect impacts. These measures include pre-clearance surveys, fencing, signage and restricted access to on-site conservation areas, sympathetic management of the existing powerline corridor and a TMO and shorebird/turtle research and monitoring program to inform better management of offset areas. Following consideration of these mitigation measures, the final impacts to MNES have been assessed as:-

- 63 individual TMO plants at 25 locations of the 2,433 plants recorded at 434 locations in the study area (or 2.59% of the 2,433 known individuals within the study area)
- 201.36 ha of moderate quality New Holland Mouse habitat
- 201.36 ha of moderate quality Grey-headed Flying-fox foraging habitat
- 55.23 ha of low to moderate quality potential / occasional foraging habitat for the Swift Parrot
- 30.61 ha of low quality potential / occasional foraging habitat for the Regent Honeyeater
- 201.36 ha of potential foraging habitat for the Spotted-tailed Quoll
- Potential indirect impacts to occasional Green Turtle nesting sites

The proposal will permanently dedicate 317.63 ha of land as a permanent on-site conservation area, that will be registered as a Biodiversity Stewardship Site under the NSW *Biodiversity Conservation Act* 2016. A further 350-400 ha off-site offset area will be secured either via the registration of a second stewardship site at Nabiac, owned by MidCoast Council, or via the purchase and retirement of the required additional biodiversity credits from other registered stewardship sites in the region or the NSW Biodiversity Conservation Fund (BCF).

The management of the North Tuncurry Crown Land Biodiversity Stewardship site will be commenced prior to the commencement of construction and will be fully funded by CLWB) on an annual basis for 5 years (expected to be between $100,000 and $120,000 per year). The offset area will be progressively managed in accordance with a Biodiversity Stewardship site Management Plan with signage, access control and feral animal management occurring across the site from Year 1 of the commencement of development, and weed control/restoration works progressing in defined Management Areas from the

southern end of the site to the north and targeting areas critical to TMO protection in the initial years of implementation.

CLWB will commit **$250,000** of funding over a 5 year period, commencing from the first year after project approval, to develop a long term research and monitoring program for the TMO consistent with, where available, any priorities outlined in any Conservation Strategies or Species Recovery Plans.

CLWB will continue to liaise with Essential Energy, informed by the TMO Research Program, regarding the ongoing management and maintenance of the powerline corridor that traverses the western section of the study area and provides habitat for TMO. This will ensure that the powerline maintenance program is sympathetic to the habitat needs of TMO. This may include the on-going slashing of heathland vegetation and/or other management practices such as regeneration burning of habitat areas (as informed by the TMO Research Program.

CLWB, in conjunction with existing shorebird recovery programs, will establish a Turtle and Shorebird nesting monitoring program along Nine Mile Beach adjacent to the BCAA and erect temporary fencing, where and when necessary, to minimise disturbance if nesting activity is detected. CLWB will commit **$250,000** of funding over a 10 year period, commencing from the first year after project approval to establish this monitoring program.

CLWB will work with MCC to develop policies to restrict and minimise vehicle and domestic dog (other than in winter) access to Nine Mile Beach adjacent to the BCAA.

The level of impacts are considered to be environmentally acceptable given the significance of the MNES in the study area, the measures considered to reduce, mitigate and offset unavoidable impacts and are consistent with the principles of Ecologically Sustainable Development and the objects of the EPBC Act as outlined in **Appendixes F** and **G**.

Appendix A Referral

Copy of 3 May 2011 EPBC 2011/5954 referral prepared by RPS provided as a separate document.

Appendix B Controlled Action Decision

Copy of 6 June 2011 EPBC 2011/5954 controlled action decision and assessment pathway provided as a separate document.

Appendix C PER Guidelines

Copy of 11 July 2011 Guidelines for the content of a draft Public Environment Report: North Tuncurry Mixed Use Development, NSW (EPBC 2011/5954) provided as a separate document.

Appendix D Compendium of previous ecological investigations of the study area

Provided as separate Pdf documents

D1_ERM 2005 North Tuncurry Ecological Constraints and Opportunities. Report prepared for Landcom by ERM, October 2005.

D2_ERM 2010a Crown Land off The Lakes Way North Tuncurry Ecological Assessment. Report prepared for Landcom by ERM, 12 January 2010.

D3_ERM 2010b Ecology Assessment of Crown Land at North Tuncurry – Tuncurry Midge Orchid Survey. Letter to Landcom from ERM, 12 January 2010.

D4_Paget, A 2008. Results of searches for the Tuncurry Midge-Orchid (*Genoplesium littorale*, syn *Corunastylis littoralis*). Report to the NSW Scientific Committee, Hunter Central Rivers CMA, Autumn 2008.

D5_RPS 2012a. *Ecological Inventory Report – North Tuncurry*. Unpublished report prepared for Landcom, March 2012.

D6_RPS 2011a. Corunastylis littoralis Tuncurry Midge Orchid Combined Survey Results 2010/2011 - North Tuncurry, unpublished report prepared for Landcom, August 2011.

D7_RPS 2012b. Review of Tuncurry Midge orchid (Genoplesium littorale syn. Corunastylis littoralis) for a proposed Rezoning, Crown Lands, North Tuncurry. Unpublished report prepared for Landcom, September 2012.

D8_ELA 2011. Independent Review of Tuncurry Midge orchid Investigations – North Tuncurry Investigation Area. Letter to Landcom, dated 12 December 2011.

D9_RPS 2013. *Tuncurry Midge Orchid Survey results*. Letter prepared by RPS for Landcom, 7 August 2013.

D10_ELA 2019. North Tuncurry State Significant Site – Biodiversity Certification Assessment Report & Biodiversity Certification Strategy. Report prepared for Department of Planning , 15 July 2019.

D11_FloraSearch 2013. Pollination of the Tuncurry Midge Orchid (Genoplesium littorale). Report prepared for Landcom, June 2013.

D12_FloraSearch 2014 Pollination of the Tuncurry Midge Orchid (Corunastylis littoralis) Supplementary Information. Report prepared for Landcom NSW by Flora Search, June 2014.

D13_FloraSearch 2018. Efficacy of the 'Orchid Reserve' and 'Orchid Pollinator Corridors' in the proposed North Tuncurry Development. Letter to Landcom dated 27 April 2018. FloraSearch, Orange, NSW.

D14_ELA 2020. Biobanking Agreement Credit Assessment Report - North Tuncurry Biobank Site Biobank Site. Report prepared for Landcom, 27 July 2020.

Vegetation Community Descriptions from ELA 2019

Biometric vegetation type	Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern NSW North Coast Bioregion
	
Description	This community occurred ranged from a woodland to forest structure, with one small area in the east of the Nabiac Offset site occurring as a derived grassland due to previous clearing of the canopy. A mid stratum was uniformly present within this vegetation type, though the cover of this layer ranged from mid-dense (approximately 40% projected foliage cover) to sparse (approximately 10% projected foliage cover). The ground stratum included a combination of low shrubs, ferns, graminoids and grasses.
Location and habitat	This vegetation type occurred within both the North Tuncurry and Nabiac Offset sites, occurring on deep freely draining podzolised sands and generally in areas of increased depth including slight rises throughout the BCAA.
Ancillary codes	Five different ancillary codes were identified for this vegetation types as follows: Good – applied to relatively undisturbed stands of this vegetation type Shrubby – applied to stands with a low canopy and dense midstorey of Banksia aemula typically occurring at the ecotone with 'Banksia dry shrubland on coastal sands of the NSW North Coast Bioregion' Burnt – applied to stands of this vegetation which have been recently been burnt (estimated at less than 18 months) Pine – applied to stands of this vegetation type in which Pinus elliottii was present Cleared – applied to a single area where this vegetation type has previously been cleared and in which no canopy is present
Upper stratum	The canopy of this vegetation type was dominated by *Eucalyptus pilularis (*Blackbutt*)* with a number of other species occurring occasionally or as sub-dominants including *E. robusta* (Swamp Mahogany)*, E. signata* (Scribbly Gum)*, E. globoidea* (White Stringybark)*, Corymbia gummifera* (Red Bloodwood) and *C. intermedia (*Pink Bloodwood)*.* The canopy was generally up to 25 m in height with projected foliage cover of 10 to 30%, although the height and cover of the canopy commonly decreased close to the boundaries with adjacent vegetation types.
Midstorey	A diverse midstorey was present within this vegetation type, commonly including *Banksia aemula*, *Acacia longifolia* subsp. *longifolia, Leptospermum trinervium* and *Leucopogon lanceolatus*.
Groundcovers	A ground layer of up to approximately 1.5 m in height occurred within this vegetation type and was typically dominated by *Pteridium esculentum* (Common Bracken) and *Lomandra longifolia* (Spiny-headed mat-rush) with a number of other species common including *Dillwynia retorta s.l. Xanthorrhoea macronema, Pomax umbellata* and *Imperata cylindrica*
Corresponding vegetation types	**Sandhill Blackbutt –Dry Open Forest (Gerrard 2004)** **Eucalyptus pilularis Dry Sclerophyll Forest (dunal) (RPS 2012)** **Blackbutt – Bloodwood/Apple (GLC 2003)**

Biometric vegetation type	Blackbutt - Smooth-barked Apple shrubby open forest on coastal sands of the southern NSW North Coast Bioregion
Biometric Vegetation Type	Banksia dry shrubland on coastal sands of the NSW North Coast Bioregion
	
Description	This community occurred ranged from an open-scrub to tall shrubland. A diverse understory was present within this vegetation type including sub-shrubs, sedges and graminoids.
Location and habitat	This vegetation type occurred within both the North Tuncurry and Nabiac Offset sites, occurring on freely draining podzolised sands.
Ancillary codes	Four different ancillary codes were identified for this vegetation types as follows: Good – applied to relatively undisturbed stands of this vegetation type Burnt – applied to stands of this vegetation which have been recently been burnt (estimated at less than 18 months) Pine – applied to stands of this vegetation type in which *Pinus elliottii* was present as a canopy emergent Blackbutt – applied to areas of this vegetation type in which emergent eucalyptus species, (mostly *E. pilularis*) were present.
Upper Stratum	The upper stratum of this vegetation type was up to 5 m in height (RPS 2012), although commonly only 3 m in height, with projected foliage cover generally between 10 – 40% (RPS 2012). This stratum was dominated by *Banksia aemula* (Wallum Banksia) with a co-dominant or sub-dominant species present including *Allocasuarina littoralis* and *Leptospermum spp.* Emergent low *Eucalyptus* species were present close to the margins of this vegetation community with emergent *Pinus elliottii* also present within the North Tuncurry site.
Midstorey	A range of sub shrubs were present within this vegetation type frequently merging with the upper stratum including *Ricinocarpos pinifolius* (Wedding Bush*) Dillwynia retorta, Boronia pinnata, Persoonia lanceolata* (Lance Leaf Geebung), *Leucopogon lanceolatus, Conospermum taxifolium, Acacia longifolia* var. *longifolia* (Sydney Golden Wattle), *Melaleuca nodosa*, *Leptospermum semibaccatum* (Prickly-leaved Paperbark).
Groundcovers	A low and sparse ground layer generally less than 1 m in height with projected foliage cover less than 60 % (RPS 2012) occurred within this vegetation type. Dominant species included *Hypolaena fastigiata* and *Caustis recurvata*, with a diverse range of low shrubs and graminoids also present.
Corresponding vegetation types	Banksia (GLC 2003) *Banksia aemula* Dry Heathland (RPS 2012) *Banksia aemula* – Dry Heath (Gerrard 2004)

Biometric Vegetation Type	Coast Banksia-Coast Wattle dune scrub, Sydney Basin and South East Corner

Description	This community occurred as a tall shrubland to closed-scrub with a variety of tall shrubs and midstorey species dominant with an understorey of varying density including low shrubs and graminoids.
Location and habitat	This community was restricted to the North Tuncurry site and more specifically within the eastern portion of this site on the Holocene foredune close to the sea (RPS 2012).
Ancillary codes	Four ancillary codes were identified for the vegetation type as follows: Good – applied to relatively undisturbed stands of this vegetation type Regen – applied to a stand of this vegetation type which has been more recently burnt than the majority of this vegetation type within the North Tuncurry site (estimated at up to 4 years prior to survey) Pine – applied to stands of this vegetation type in which *Pinus elliottii* was present as a canopy emergent Blackbutt – applied to areas of this vegetation type in which emergent eucalyptus species, (mostly *E. pilularis*) were present.
Upper Stratum	This community occurred as a tall shrubland to closed-scrub (Specht 1970) up to 6 m in height with projected foliage cover of up to approximately 60% with a variety of tall shrubs and midstorey species dominating the upper stratum including *Leptospermum laevigatum*, *Banksia serrata, Leptospermum trinervium, Monotoca elliptica, Banksia integrifolia* and *Acacia longifolia* subsp*. longifolia.* Emergent *Eucalyptus* species and *Pinus elliottii* were occasionally present within this vegetation type, generally in proximity to the Golf Course.
Midstorey	A mid-dense to sparse midstorey was present within this vegetation type including a number of medium sized to low shrub species which commonly mixed with the upper and lower stratums. Commonly recorded species included *Leucopogon parviflorus, Dillwynia retorta, Acacia suaveolens* and *Bossiaea rhombifolia* subsp*. rhombifolia.*
Groundcovers	A variable groundcover occurred within this vegetation type with density varying in response to density of the taller stratum. This layer was dominated by *Lomandra longifolia, Pteridium esculentum, Themeda australis* (Kangaroo Grass)*, Gonocarpus tetragynus* and *Dianella caerulea* var, *caerulea* (Blue Flax Lily).
Corresponding vegetation types	Scrub (GLC 2003) *Leptospermum laevigatum* Dry Sclerophyll Shrubland (RPS 2012)

Appendix E Names and qualifications of persons preparing this PER

The following are brief curriculum vitae's for the key project staff. Please note that since this project commenced in 2013, there have been a number of staff movements, and some of the staff who undertook the field work and prepared components of the PER are no longer with Eco Logical Australia, they have however been consulted in making revisions to this report.

Name	Qualifications	PER Role
Eco Logical Australia staff		
Robert Humphries, Principal Consultant	Master Applied Science (Bushfire Ecology) 1994 Bachelor Applied Science 1985 Accredited Assessor (BC Act)	Project Manager Liaison with Landcom, Crown Lands Division & Department of Planning, Industry and Environment PER Report preparation and review. Biocertification & Biobank Report preparation and review EPBC Offset Policy calculations
Daniel McKenzie	Bachelor of Environmental Science and Management (Honours) 2011	Senior Fauna Ecologist Targeted fauna surveys including microhabitat searches, spotlighting, hair tubes and remote cameras (Tuncurry and Nabiac) Remote camera image analysis PER Report preparation
Brian Towle	Bachelor Environmental Science (Honours) 2005 Published several peer reviewed scientific papers on Australian orchids including pollination in Corunastylis littoralis Accredited Biobanking and BC Act Assessor	Senior Botanist Vegetation mapping and community descriptions Targeted threatened flora survey (Tuncurry and Nabiac) Biometric plots (As outlined in Appendix D10)
Dr Lachlan Copeland	PhD Plant Systematics 2002-2005 Bachelor of Natural Resources (Honours) 1992-1995 Accredited Assessor (BC Act) Has published numerous scientific papers on the taxonomy and ecology or Australian orchids	Peer review of RPS TMO orchid survey reports and assistance in identification of potential hybrids (As outlined in Appendix D10)
Gordon Patrick	Bachelor of Environmental Science Accredited Assessor (BC Act) Bushland Regeneration Certificate II Has undertaken numerous projects mapping vegetation types and undertaking targeted surveys for threatened species	Vegetation mapping and community descriptions Targeted threatened flora survey Biometric plots (As outlined in Appendix D14)

Name	Qualifications	PER Role
Lily Gorrell	Bachelor of Natural Resources Management 2007 Accredited Assessor (BC Act) Has undertaken numerous projects mapping vegetation types and undertaking targeted surveys for threatened species	Vegetation mapping and community descriptions Targeted threatened flora survey Biometric plots (As outlined in Appendix D14)
Dee Ryder	Bachelor of Environmental Science Management Has undertaken numerous projects involving targeted surveys for threatened species	Ecologist Targeted fauna surveys including microhabitat searches, spotlighting, hair tubes and remote cameras (Tuncurry and Nabiac) Remote camera image analysis
Michelle Frolich	Bachelor of Science (Marine Science Honours) 2007 Accredited Assessor (BC Act)	Map preparation and GIS area calculations BCAM & BBAM Offset Calculations (As outlined in Appendix D10 and D14)
Sub-Consultants and previous survey work		
Georgeanna Story (Scatsabout Ecological Pty Ltd))	Specialist hair analysis	Hair analysis 2020
RPS Ecologists 2009-2013 Matt Doherty, Toby Lambert, Lauren Vanderwyk, Paul Hillier, Rob Samsom, David Tierney and Isaac Mamott and Barbara Triggs (Hair Analysis) and Anna McConville (Ultrasonic bat calls)	Qualifications as listed in Appendix D5	Vegetation mapping, targeted flora and fauna surveys (including TMO 2009-2013) Spotlighting, call play back, bird census, frogs and reptile searches, anabat, cage and Elliot traps and hair tubes (As outlined in Appendix D5-D9)
ERM Australia Ecologists 2005 and 2009/10 Tessa Wilson, Steve O'Connor, Naomi Buchhorn, Paul Douglas	Qualifications as listed in Appendix D1-D3	Vegetation mapping, targeted flora and fauna surveys (including TMO 2009) Spotlighting, call play back, bird census, frogs and reptile searches, anabat, cage and Elliot traps and hair tubes (As outlined in Appendix D1-D3)

Appendix F : Consistency of action against the Principles of Ecologically Sustainable Development

The following Principles are principles of ecologically sustainable development

(a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;

The assessment of this proposal against these considerations will be undertaken by the Department.

(b) the precautionary principle — if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;

The assessment outlined in this PER report is based on extensive flora and fauna surveys conducted across the study area over a nearly 20 year period. It is considered that the MNES present or likely to be present in the study area have been comprehensively assessed and have allowed for an informed decision on the significance of the likely impacts and where these are likely to be serious or irreversible.

(c) the principle of inter-generational equity — that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;

The proposal includes a comprehensive offset package that will provide for the in perpetuity protection of viable populations of relevant MNES, including the protection of over 60% of the known population of the Tuncurry Midge Orchid.

(d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making; and

The final Masterplan has been informed by the ecological constraints of the study area

(f) improved valuation, pricing and incentive mechanisms should be promoted.

The proposed environmental offsets are based on best practice metrics on the valuation of biodiversity values and the quantum of offsets provided and level of funding is based on the calculated in perpetuity cost of management, with these funds held in a specifically designed Trust Account to ensure compliance with all management and reporting requirements.

Appendix G : Consistency of action against the objects of the EPBC Act

The objects of the EPBC Act are:

(a) to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance; and

The Matters of National Environmental Significance have been clearly identified and assessed in the PER report.

(b) to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources; and

See **Appendix F** of this PER.

(c) to promote the conservation of biodiversity; and

The assessment has undertaken an extensive investigation of the ecological constraints of the study area in formulating the proposed Master Plan and has identified key areas for the in perpetuity protection and management of conservation values.

(ca) to provide for the protection and conservation of heritage; and

Items/areas of Aboriginal and European heritage have been assessed and considered in the Master Plan development. Refer to Appendices M, N and O in the Planning Proposal Report (**Appendix H**).

(d) to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples; and

The proposed action has included extensive Government, Community and Stakeholder consultation (Refer to Appendix E in the Planning Proposal Report (**Appendix H**).

(e) to assist in the co-operative implementation of Australia's international environmental responsibilities; and

Not relevant to this PER.

(f) to recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and

Not relevant to this PER

(g) to promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.

A Native Title Agreement has been reached with the native title owners (Lakkari) that includes employment of the local aboriginal community in the implementation of the action and potential management of the offset area.

Appendix H : North Tuncurry Rezoning Study (Ethos Urban 2020)

Provided as ZIP file contain the main report and Appendices A-Z

Appendix I PMST Search

Provided as a separate Pdf document

Appendix J Likelihood table for EPBC Act listed ecological communities and threatened species

The Protected Matters Search Tool (http://www.environment.gov.au/epbc/protected-matters-search-tool) was accessed on 9 August 2021 with a report generated for a 10km buffer on the centre of the study area. The results are summarised below along with the 'likelihood of occurrence' for the species or community. This likelihood is based on database or other records, presence or absence of suitable habitats, features of the proposed site, results of field surveys and professional judgement.

Note despite PMST results, the tables exclude fauna that are exclusively marine or estuarine (e.g. Fish, Albatross, Petrels, Cetaceans etc) due to the absence of marine habitat within the study area

TSC/EPBC Act Status

CE = Critically Endangered species, population or ecological community.

E = Endangered species, population (E2) or ecological community (E3).

V = Vulnerable species, population or ecological community

Five terms used for the likelihood of occurrence of species are defined as follows:

"Known" = the species was or has been observed on the subject site

"Likely" = a medium to high probability that a species uses or occurs on the subject site,

"Potential" = suitable habitat for a species occurs on the subject site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur,

"Unlikely" = a very low to low probability that a species uses the subject site or occurs on the site,

"No" = habitat on the subject site and in the vicinity is unsuitable for the species.

Threatened Ecological Communities

Name	EPBC listing status	Likelihood of Occurrence
Coastal Swamp Oak Forest	Endangered	No not recorded in study area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	No not recorded in study area
Lowland Rainforest of Subtropical Australia	Critically Endangered	No not recorded in study area
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	No not recorded in study area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	No not recorded in study area

Threatened Fauna

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
Anthochaera phrygia	Regent Honeyeater	E4A	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also regularly recorded in the Central Coast and Hunter Valley regions.	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of Casuarina cunninghamiana (River Oak).	Potential – Reporting rate in region low – One record of the species to the South of the study area near Seal Rocks and one record to the North near Old Bar.	Yes
Botaurus poiciloptilus	Australasian Bittern	E1	E	Found over most of NSW except for the far north-west.	Permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. (bullrushes) and Eleocharis spp. (spikerushes).	No – no habitat present	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
Calidris canutus	Red Knot		E, M	Summer migrant to Australia. In NSW, widespread in suitable habitat along the coast. Occasionally recorded inland in all regions.	Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	Unlikely - not usually observed on open ocean beaches	No
Calidris ferruginea	Curlew Sandpiper	E1	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin.	Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Unlikely - not usually observed on open ocean beaches	No
Calidris tenuirostris	Great Knot	V	CE, M	In NSW, recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith.	Intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	Unlikely - not usually observed on open ocean beaches	No
Caretta	Loggerhead Turtle	E1	E, M	In NSW, seen in coastal waters as far south as Jervis Bay and have been recorded nesting on the NSW north coast and feeding around Sydney.	Marine. Loggerheads nest on the southern Great Barrier Reef and adjacent mainland coastal areas, including Bundaberg, Wreck Island, Erskine Island, Tryon Island, Wreck Rock beach and Pryce Cay.	No – no habitat in study area and unlikely to nest on the nearby beach	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes.	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Unlikely – found mainly in areas with extensive cliffs and caves	No
Charadrius mongolus	Lesser Sand-plover	V	CE, M	Summer migrant to Australia. Found around the entire coast but in NSW most common on north coast. Rarely recorded	Favours beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats	Unlikely –due to the lack of appropriate habitat.	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
				south of the Shoalhaven estuary, and there are few inland records.			
Chelonia mydas	**Green Turtle**	**V**	**V, M**	**Occurs in coastal waters of NSW, generally on the north or central coast, with occasional records from the south coast. Scattered nesting records along the NSW coast.**	**Marine. Nesting occurs on beaches. Nesting beaches occur on offshore islands, cays and also along some sections of the mainland coast. Scattered nesting records along the NSW coast. In Queensland, the southern Great Barrier Reef has 13 major rookeries including North West, Wreck, Hoskyn and Heron Islands.**	**Known – recrded nesting along Nine Mie beach in 2007 and 2009**	**Yes**
Dasyornis brachypterus	Eastern Bristlebird	E1	E	There are three main populations: Northern - southern Qld/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border.	Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	Unlikely – no known populations in area and not detected during fauna surveys	No
Dasyurus maculatus (SE mainland population)	**Spotted-tailed Quoll**	**V**	**E**	**Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld.**	**Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.**	**Potential – records of the species nearby to the study area. Species occurs at low densities, is highly mobile and difficult to detect**	**Yes**
Dermochelys coriacea	Leatherback Turtle	E1	E, M	All coastal waters of Australia. Large numbers feed in coastal waters south to the central coast of NSW. Occasional breeding records from NSW coast,	Marine. Nesting occurs on beaches. No large rookeries have been recorded in Australia. Scattered nesting previously occurred along the southern	Unlikely – no regular nesting beach nearby	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
				including between Ballina and Lennox Head in northern NSW.	Queensland coast from Bundaberg to Roundhill Head and along the coast of Arnhem Land from Coburg Peninsula to Maningrida, including Croker Island.	and no marine habitat in study area	
Erythrotriorchis radiatus	Red Goshawk	E4A	V	In NSW, extends to ~30°S. Recent records confined to the Northern Rivers region north of the Clarence River. No recent breeding records in NSW	Open woodland and forest, often along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and coastal riparian Eucalyptus forest.	Unlikely – study area outside of current geographic range	No
Grantiella picta	Painted Honeyeater	V	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas.	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely – habitat unsuitable	No
Lathamus discolor	**Swift Parrot**	**E1**	**CE**	**Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes.**	**Box-ironbark forests and woodlands.**	**Potential, suitable foraging habitat (Blackbutt and Swamp Mahogany) recorded at Halliday's Point 2002 and Foster-Tuncurry 2007 and 2016**	**Yes**
Litoria aurea	Green and Golden Bell Frog	E1	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region.	Marshes, dams and stream-sides, particularly those containing Typha spp. (bullrushes) or Eleocharis spp. (spikerushes). Some populations occur in highly disturbed areas.	Unlikely - Not recorded during fieldwork. This species is unlikely to occur within the site due to the lack of appropriate habitat.	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
Mixophyes balbus	Stuttering Frog	E1	V	Along the east coast of Australia from southern Qld to north-eastern Victoria.	Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	Unlikely - Not recorded during fieldwork. This species is unlikely to occur within the site due to the lack of appropriate habitat.	No
Mixophyes iteratus	Giant Barred Frog	E	E	The Giant Barred Frog is distributed along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains. Declines appear to have occurred at the margins of the species' range, with no recent records south of the Hawkesbury River and disappearances from a number of streams in QLD. Northern NSW, particularly the Coffs Harbour-Dorrigo area, is a stronghold.	Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor.	Unlikely - Not recorded during fieldwork. This species is unlikely to occur within the site due to the lack of appropriate habitat.	No
Numenius madagascariensis	Eastern Curlew		CE, M	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records.	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	Unlikely due to the lack of appropriate habitat.	No
Petauroides volans	Greater Glider		V	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. An isolated	Eucalypt forests and woodlands.	Unlikely - not recorded during extensive fieldwork, habitat marginal	No - listing date subsequent to EPBC referral decision

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
				inland subpopulation occurs in the Gregory Range west of Townsville			
Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit.	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	Unlikely due to the lack of appropriate habitat.	No
Phascolarctos cinereus	Koala	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands.	Eucalypt woodlands and forests with preferred browse species. Eucalyptus pilularis (Blackbutt), a known browse species on the mid north coast recorded as dominant species in Blackbutt – Smooth-barked Apple shrubby open forest	Potential, recorded south of study area in 1988 & 1991 and north-west of study area in 2013.	No - listing date subsequent to EPBC controlled action decision
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm.	Coastal heaths and dry and wet sclerophyll forests.	Potential – not recorded during fauna surveys	No
Pseudomys novaehollandiae	**New Holland Mouse**		**V**	**Fragmented distribution across eastern NSW.**	**Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.**	**Recorded during fauna surveys 2020**	**Yes**
Pteropus poliocephalus	**Grey-headed Flying-fox**	**V**	**V**	**Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria.**	**Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.**	**Known to occur – observed foraging in study area**	**Yes**
Rostratula australis	Australian Painted Snipe	E1	E	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the	Swamps, dams and nearby marshy areas.	Unlikely - Not recorded within the site during fieldwork. Unlikely to occur within the site due to	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
				Hawkesbury River and the Clarence and lower Hunter Valleys.		the lack of appropriate habitat.	
Thinornis rubricollis rubricollis	Hooded Plover	E	V	Occurs in coastal NSW north to Sussex Inlet. Occasional records from the Shoalhaven River, Comerong Beach and Lake Illawarra.	Sandy ocean beaches, tidal bays and estuaries, rock platforms, rocky or sand-covered reefs, and small beaches in lines of cliffs. Also use near-coastal saline and freshwater lakes and lagoons.	Unlikely - known primarily from Southern NSW north to Sussex Inlet	No

Threatened Flora

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
Allocasuarina defungens	Dwarf Heath Casuarina	E1	E	Only in NSW, from the Nabiac area, north-west of Forster, to Byron Bay on the NSW north coast.	Tall heath on sand, also nearby-coastal hills or headlands adjacent to sandplains.	Unlikely – not observed in the study area during extensive flora surveys	No
Allocasuarina simulans	Nabiac Casuarina	V	V	Restricted to the mid-north coast of NSW, from Nabiac to Forster.	Heathland on coastal sands.	Unlikely – not observed in the study area during extensive flora surveys	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
Asperula asthenes	Trailing Woodruff	V	V	Only in NSW, in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area	Damp sites, often along river banks.	Unlikely – Preferred habitat not present. Not observed during field surveys	No
Corunastylis littoralis	**Tuncurry Midge Orchid**	**E4A**	**CE**	**Known only from a small area just north of Tuncurry on the NSW mid-north Coast.**	**Coastal heath in deep, well-drained sandy soils, with Leptospermum laevigatum, Monotoca elliptica, Ochrosperma lineare and Banksia spp.**	**Known to occur within the study area and will be impacted by the proposed action**	**Yes**
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton.	Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	Unlikely – location north of Forster, no records of the species nearby and habitat marginal	No
Cynanchum elegans	White-flowered Wax Plant	E1	E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley.	Dry rainforest; littoral rainforest; Leptospermum laevigatum-Banksia integrifolia subsp. integrifolia (Coastal Tea-tree– Coastal Banksia) coastal scrub; Eucalyptus	Unlikely - not observed during field surveys and preferred habitat were generally absent.	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
					tereticornis (Forest Red Gum) or Corymbia maculata (Spotted Gum) open forest and woodland; and Melaleuca armillaris (Bracelet Honeymyrtle) scrub.		
Euphrasia arguta		E4A	CE	In NSW, recently recorded only from Nundle area of the north western slopes and tablelands, from near the Hastings River and from the Barrington Tops.	Eucalypt forest with a mixed grass and shrub understorey, disturbed areas, along roadsides.	Unlikely	No
Macadamia integrifolia	Macadamia Nut	P	V	Not known to occur naturally in the wild in NSW; recorded from Camden Haven but it is not known if the tree was cultivated or growing naturally.	Drier subtropical rainforest.	No - habitat unsuitable	No
Persicaria elatior	Tall Knotweed	V	V	In south-eastern NSW recorded from Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests).	Beside streams and lakes, swamp forest or disturbed areas.	Unlikely – preferred habitat is generally absent and no nearby records of the species.	No
Phaius australis	Southern Swamp Orchid	E1	E	Qld and north-east NSW as far south as Coffs Harbour.	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	Unlikely – study area is south of limit of distribution and	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution	Habitat	Likelihood of occurrence in the study area and justification	Assessment required
						habitat marginal	
Syzygium paniculatum	Magenta Lilly Pilly	E1	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest.	Subtropical and littoral rainforest on gravels, sands, silts and clays.	Unlikely - not recorded within the site and preferred habitat is generally absent.	No
Tetratheca juncea	Black-eyed Susan	V	V	Confined to the northern Sydney Basin bioregion and the southern North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock.	Low open forest/woodland, heathland and moist forest, mainly on low nutrient soils associated with the Awaba Soil Landscape.	Unlikely - not recorded within the site and the study area is North of the species currently known distribution (Closest BioNet records near Bulahdelah)	No
Thesium australe	Austral Toadflax	V	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands.	Grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely - not recorded within the site and habitat is absent.	No

Appendix K : EPBC Offset calculations and justification of input values for MNES

The EPBC Act Offset Policy offset calculators are provided for each impacted MNES as an excel spreadsheet. The following tables provide justification for each of the parameters used in the calculations.

Table 32: Offset calculation justification for Corunastylis littoralis

Threatened species	Listing status
Corunastylis littoralis	Critically Endangered

Impact – Number of Individuals/Features

Impact	63 individuals from 25 of 434 recorded locations in the study area directly occupying 3.36 ha of habitat
Source	Table 11 in Section 6.4 of PD report

Offset – Number of Individuals/Features

Description	The proposed 317.63 ha offset area protects 1,511 individuals form 272 recorded locations directly occupying 17.36 ha of habitat (Table 11 in Section 6.4 of PD report).	
Guide component	**Assessed value**	**Discussion**
Time horizon	20	The proposed offset will be a registered Biodiversity Stewardship site under the NSW Biodiversity Conservation Act 2016 providing in perpetuity protection on title and fully funded active conservation management. Accordingly the maximum 20 year averted loss time is entered.
Start value	1,511	There are 1,511 recoded individuals in the on-site offset area (Table 11 in Section 6.4 of PD report)
Future value without offset	1,200	In the absence of an offset, it is expected that a number of plants will be lost by un managed vehicle access and rubbish dumping in the offset area (the majority of plants have been recorded from the edges of existing tracks.
Future value with offset	1,511	Under in perpetuity active conservation management, with proposed fencing and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved (as informed by a 5 years $250,000 research and monitoring program). As fencing and management is proposed to commence prior to construction, and the benefits of management will be immediate (fencing/signage, restricted access), time until ecological benefit has been set at 10 years.
Confidence	75%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title which only the NSW Minister for the Environment can remove or terminate (and if a site is terminated and alternative offset of equivalent value most be secured). The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. The confidence around the risk of loss is accordingly set at a high 75%.

Summary

Final % of impact offset	Based on the above scores, the % of impact offset score is calculated as 191.76%.
Cost of offset ($)	The management of the offset area has a calculated $4.5 M cost of management held by the Biodiversity Conservation Trust to provide for the in perpetuity management obligations). The land value of the offset area based on vacant rural land is conservatively set at $1.5M based on around $5,000/ha.
Other compensatory measures (if proposed)	None.

Table 33: Offset calculations justification for Grey-headed Flying-fox

Threatened species or ecological community	Listing status
Grey-headed Flying Fox	Vulnerable

Impact Site - Area of Habitat or Area of Community

Size (ha)	All of the forested and heathland habitat within the impact area (201.36 ha) is considered to be Grey-headed Flying-fox (GHFF) foraging habitat. There are no GHFF camps within the study area although there is a nationally important camp 9km to the north of the study area at Cape Hawke.	
Description	Of the 201.36 ha of GHFF foraging habitat to be impacted, 55.23 is moderate to high quality foraging habitat containing important winter and spring Eucalyptus pilularis, E. robusta (although around 50% of this is small fragmented patches with pine regrowth), 37.45 ha is low to moderate quality foraging habitat containing Banksia integrifolia and 108.67 ha is low quality foraging habitat containing Banksia aemula (Table 21 of PER report).	
Guide component	**Assessed value**	**Discussion**
Quality	6	All of the suitable habitat areas within the study area are likely to be used from time to time by GHFF when canopy species are in flower. As there is a large camp nearby, it is likely that many individuals will use the site for foraging. An impact quality score of 6/10 has been assigned to the GHFF habitat to be impacted based on the high proportion of the impact area that is of lower foraging quality (Coastal Heath and Dry Banksia Shrubland) Given the quality of the impacted vegetation, and the corresponding lower stocking rate, a start Quality score of 6/10 is provided based on a weighted mean of Condition 25% (4/10), Context (proximity to a National Camp) 50% (8/10) and low Stocking Rate 25% (4/10). Overall Quality Score = 1+4+1 = 6/10.

Offset Site - Area of Habitat or Area of Community

Size (ha):	282.53 ha	
Description	The proposed on-site offset area comprises 282.53 ha of forested (69.70 ha) and shrubland (212.83 ha) vegetation types in a similar condition to the impact areas suitable as GGFF foraging habitat as shown in Figure 51 and is scored as 6/10.	
Averted loss Component		
Guide component	**Assessed value**	**Discussion**
Time over which loss is averted	20 years (max)	The proposed offset will be a registered Biodiversity Stewardship site under the NSW Biodiversity Conservation Act 2016 providing in perpetuity protection on title and fully funded active conservation management. Accordingly the maximum 20 year averted loss time is entered
Risk of loss without offset: (0 – 100%)	10%	The risk of loss without an offset has been set at a relatively low 5% as the site is Crown land and is generally sued as 4WD access to 9 Mile Beach. This access is causing some damage to the habitat values in regards to widening of tracks, creation of new tracks and introduction of weeds and rubbish that are incrementally over time, without appropriate mitigation measures, degrading habitat values.

Size (ha):	**282.53 ha**	
Risk of loss with offset (0 – 100%)	1%	Under in perpetuity active conservation management, with proposed fencing, signage and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved. The risk of loss with an offset is accordingly set at a low 1%.
Confidence (Risk related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title which only the NSW Minister for the Environment can remove or terminate (and if a site is terminated and alternative offset of equivalent value most be secured). The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. The confidence around the risk of loss is accordingly set at a high 90%.
Quality Improvement Component		
Time until ecological benefit	10 years	As the site is currently not actively managed for conservation and existing access, weed and feral animal populations are leading to a degradation of the ecological values of the proposed offset area, and the benefits of management will be immediate (fencing/signage, restricted access), the time until ecological benefit is expected to be relatively short. Further as the management obligations of a Biodiversity Stewardship Agreement are fully funded and required to be implemented in perpetuity and are subject to satisfactory annual reporting, the benefit is expected to be maintained. The time to ecological benefit is accordingly set at a relatively short 10 years to increase the current start quality from an initial moderate 6/10 to a small increase of 7/10
Start quality (0 – 10)	6	All of the suitable habitat areas within the study area are likely to be used from time to time by GHFF when canopy species are in flower. As there is a large camp nearby, it is likely that many individuals will use the site for foraging. An offset quality score of 6/10 has been assigned to the GHFF habitat in the offset area based on the high proportion of the impact area that is of lower foraging quality (Coastal Heath and Dry Banksia Shrubland) Given the quality of the offset vegetation, and the corresponding lower stocking rate, a start Quality score of 6/10 is provided based on a weighted mean of Condition 25% (4/10), Context (proximity to a National Camp) 50% (8/10) and low Stocking Rate 25% (4/10). Overall Quality Score = 1+4+1 = 6/10.
Future quality without offset (0 – 10)	5	Whilst the current Start quality is regarded as being 6/10, the proposed offset land is not required to be actively managed to enhance and maintain ecological values and is thus subject to incremental degradation by access, weeds and feral animals. Infestations of Bitou Bush and Lantana are currently contributing to this degradation. Without the legal requirement to actively manage the site to improve and maintain ecological values, the site will degrade and is accordingly given a small reduction for 'future quality without offset' score of 5/10.
Future quality with offset (0 – 10)	7	Under in perpetuity active conservation management, with proposed fencing and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved ($4M will be provided in the Biodiversity Trust Fund to provide for annual management, monitoring and reporting).. As the start quality has already been set at a moderate 6/10, only a small increase in quality to 7/10 over the 10 years to ecological benefit is provided.

Size (ha):	282.53 ha	
Confidence (Quality related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title.). The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. If the owner of a Biodiversity Stewardship Agreement is deemed not to be satisfactory fulfilling their management obligations under the Agreement, there are provisions for the NSW Land and Environment Court to legally enforce requirements, order any rectification necessary and/or make payments to a third party to undertake the required management. The confidence around the increase in quality is accordingly set at a high 90%.

Summary

Final % of impact offset	Based on the above scores, the % of impact offset score is calculated as 44.86% for the proposed on-site offset area and 59.54% for the off-site offset measures.
Cost of offset ($)	The management of the offset area has a calculated $4.5M cost of management held by the Biodiversity Conservation Trust to provide for the in perpetuity management obligations). The land value of the offset area based on vacant rural land is conservatively set at $1.5M based on around $5,000/ha.
Other compensatory measures (if proposed)	In addition to the on-site offsets described above, and in accordance with the commitment sin the PER Report an additional 314 ha of off-site offset will be required to be secured by the registration of a second Biodiversity Stewardship Agreement site on Mid Coast Council owned land at Nabiac or the equivalent number of Biodiversity credits for the same MNES will be purchased and retired from the NSW Biodiversity Conservation Fund.

Table 34: Offset calculation justification for New Holland Mouse

As described in Section 6.8 of this PER, it was concluded that impacts to the NHM were not likely to be significant (as the study area is not recognised as being an important population for the species). Accordingly these offset calculations are provided on a precautionary basis only.

Threatened species or ecological community	Listing status
New Holland Mouse	Vulnerable

Impact Site - Area of Habitat or Area of Community

Size (ha)	All of the forested and heathland habitat within the impact area (201.36 ha) is considered to be New Holland Mouse (NHM) habitat.	
Description	Of the 201.36 ha of habitat to be impacted, 108.67 ha is moderate to high quality heathland, 55.23 ha is moderate woodland/forest habitat and 37.45 ha is low quality, low floristic diversity coastal dune shrubland (Table 19 of PD report).	
Guide component	**Assessed value**	**Discussion**
Quality	6	All of the suitable habitat areas within the study area are likely to be used from time to time by NHM when conditions are right (i.e. early seral stages following fire) as the species is likely to be present in the broader landscape. An impact quality score of 6/10 has been assigned to the NHM habitat to be impacted based on the low number of NHM records in the study area over nearly 20 years of surveys, despite the study areas representing a large, well connected area of suitable habitat. The Start Quality score of 6/10 is provided based on a weighted mean of Condition 25% (4/10), Context (large area of suitable habitat) 50% (8/10) and a low Stocking Rate 25% (4/10). Overall Quality Score = 1+4+1 = 6/10.

Offset Site - Area of Habitat or Area of Community

Size (ha):	278.55 ha	
Description	The proposed on-site offset area comprises 278.55 ha of forested (69.70 ha) and shrubland (208.85 ha) vegetation types in a similar condition to the impact areas as shown in Figure 50 and is scored as 6/10.	
Averted loss Component		
Guide component	**Assessed value**	**Discussion**
Time over which loss is averted	20 years (max)	The proposed offset will be a registered Biodiversity Stewardship site under the NSW Biodiversity Conservation Act 2016 providing in perpetuity protection on title and fully funded active conservation management. Accordingly the maximum 20 year averted loss time is entered
Risk of loss without offset: (0 – 100%)	10%	The risk of loss without an offset has been set at a relatively low 5% as the site is Crown land and is generally sued as 4WD access to 9 Mile Beach. This access is causing some damage to the habitat values in regards to widening of tracks, creation of new tracks and introduction of weeds and rubbish that are incrementally over time, without appropriate mitigation measures, degrading habitat values.

Size (ha):	**278.55 ha**	
Risk of loss with offset (0 – 100%)	1%	Under in perpetuity active conservation management, with proposed fencing, signage and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved. The risk of loss with an offset is accordingly set at a low 1%.
Confidence (Risk related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title which only the NSW Minister for the Environment can remove or terminate (and if a site is terminated and alternative offset of equivalent value most be secured). The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. The confidence around the risk of loss is accordingly set at a high 90%.
Quality Improvement Component		
Time until ecological benefit	10 years	As the site is currently not actively managed for conservation and existing access, weed and feral animal populations are leading to a degradation of the ecological values of the proposed offset area, and the benefits of management will be immediate (fencing/signage, restricted access), the time until ecological benefit is expected to be relatively short. Further as the management obligations of a Biodiversity Stewardship Agreement are fully funded and required to be implemented in perpetuity and are subject to satisfactory annual reporting, the benefit is expected to be maintained. The time to ecological benefit is accordingly set at a relatively short 10 years to increase the current start quality from an initial moderate 6/10 to a small increase of 7/10
Start quality (0 – 10)	6	All of the suitable habitat areas within the study area are likely to be used from time to time by NHM. Based on the low number of NHM records in the study area over nearly 20 years of surveys, despite the study areas representing a large, well connected area of suitable habitat. Given the low stocking rate, a start Quality score of 6/10 is provided based on a weighted mean of Condition 25% (4/10), Context 50% (8/10) and low Stocking Rate 25% (4/10). Overall Quality Score = 1+4+1 = 6/10.
Future quality without offset (0 – 10)	5	Whilst the current Start quality is regarded as being 6/10, the proposed offset land is not required to be actively managed to enhance and maintain ecological values and is thus subject to incremental degradation by access, weeds and feral animals. Infestations of Bitou Bush and Lantana are currently contributing to this degradation. Without the legal requirement to actively manage the site to improve and maintain ecological values, the site will degrade and is accordingly given a small reduction for 'future quality without offset' score of 5/10.
Future quality with offset (0 – 10)	7	Under in perpetuity active conservation management, with proposed fencing and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved ($4.5 M will be provided in the Biodiversity Trust Fund to provide for annual management, monitoring and reporting).. As the start quality has already been set at a moderate 6/10, only a small increase in quality to 7/10 over the 10 years to ecological benefit is provided.

Size (ha):	278.55 ha	
Confidence (Quality related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title. The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. If the owner of a Biodiversity Stewardship Agreement is deemed not to be satisfactory fulfilling their management obligations under the Agreement, there are provisions for the NSW Land and Environment Court to legally enforce requirements, order any rectification necessary and/or make payments to a third party to undertake the required management. The confidence around the increase in quality is accordingly set at a high 90%.

Summary

Final % of impact offset	Based on the above scores, the % of impact offset score is calculated as 44.23% for the proposed on-site offset area and 59.54% for the off-site offset measures.
Cost of offset ($)	The management of the offset area has a calculated $4.5M cost of management held by the Biodiversity Conservation Trust to provide for the in perpetuity management obligations). The land value of the offset area based on vacant rural land is conservatively set at $1.5M based on around $5,000/ha.
Other compensatory measures (if proposed)	In addition to the on-site offsets described above, and in accordance with the commitments in the PER Report an additional 312 ha of off-site offset will be required to be secured by the registration of a second Biodiversity Stewardship Agreement site on Mid Coast Council owned land at Nabiac (where the NHM has been recorded – refer to Figure 54) or the equivalent number of Biodiversity credits for the same MNES will be purchased and retired from the NSW Biodiversity Conservation Fund.

Table 35: Offset calculations Justification for Spotted-tail Quoll

As described in Section 6.7 of this PER, it was concluded that impacts to the STQ were not likely to be significant (as the species has not been recorded in the study area despite repeated targeted surveys over nearly 20 years). Accordingly these offset calculations are provided on a precautionary basis only.

Threatened species or ecological community	Listing status
Spotted-tail Quoll	Endangered

Impact Site - Area of Habitat or Area of Community

Size (ha)	All of the forested and heathland habitat within the impact area (201.36 ha) is considered to be potential Spotted-tail Quoll (STQ) habitat.	
Description	Of the 201.36 ha of potential STQ habitat to be impacted, 55.23 is moderate to high quality habitat containing suitable denning areas (fallen logs), 108.67 ha is low to moderate quality heathland habitat and 37.45 ha is low quality habitat comprising coastal shrubland (Table 17 of PER report).	
Guide component	**Assessed value**	**Discussion**
Quality	4	Despite repeated surveys over a nearly 20 year period, the STQ has not been recorded in the study area despite its large area, condition and connectedness to areas where the STQ has been recorded. Accordingly a start Quality score of 4/10 is provided based on a weighted mean of Condition 25% (4/10), Context 25 % (8/10) and low Stocking Rate 50% (2/10). Overall Quality Score = 1+2+1 = 4/10.

Offset Site - Area of Habitat or Area of Community

Size (ha):	278.55 ha	
Description	The proposed on-site offset area comprises 278.55 ha of forested (69.70 ha) and shrubland (208.85 ha) vegetation types in a similar condition to the impact areas and is scored as 4/10.	
Averted loss Component		
Guide component	**Assessed value**	**Discussion**
Time over which loss is averted	20 years (max)	The proposed offset will be a registered Biodiversity Stewardship site under the NSW Biodiversity Conservation Act 2016 providing in perpetuity protection on title and fully funded active conservation management. Accordingly the maximum 20 year averted loss time is entered
Risk of loss without offset: (0 – 100%)	10%	The risk of loss without an offset has been set at a relatively low 5% as the site is Crown land and is generally sued as 4WD access to 9 Mile Beach. This access is causing some damage to the habitat values in regards to widening of tracks, creation of new tracks and introduction of weeds and rubbish that are incrementally over time, without appropriate mitigation measures, degrading habitat values..
Risk of loss with offset (0 – 100%)	1%	Under in perpetuity active conservation management, with proposed fencing, signage and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved. The risk of loss with an offset is accordingly set at a low 1%.

Size (ha):	**278.55 ha**	
Confidence (Risk related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title which only the NSW Minister for the Environment can remove or terminate (and if a site is terminated and alternative offset of equivalent value most be secured). The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. The confidence around the risk of loss is accordingly set at a high 90%.
Quality Improvement Component		
Time until ecological benefit	10 years	As the site is currently not actively managed for conservation and existing access, weed and feral animal populations are leading to a degradation of the ecological values of the proposed offset area, and the benefits of management will be immediate (fencing/signage, restricted access), the time until ecological benefit is expected to be relatively short. Further as the management obligations of a Biodiversity Stewardship Agreement are fully funded and required to be implemented in perpetuity and are subject to satisfactory annual reporting, the benefit is expected to be maintained. The time to ecological benefit is accordingly set at a relatively short 10 years to increase the current start quality from an initial low 4/10 to a small increase of 5/10
Start quality (0 – 10)	4	All of the suitable habitat areas within the study area could be used from time to time by STQ. Accordingly a start Quality score of 4/10 is provided based on a weighted mean of Condition 25% (4/10), Context 25 % (8/10) and low Stocking Rate 50% (2/10). Overall Quality Score = 1+2+1 = 4/10.
Future quality without offset (0 – 10)	3	Whilst the current Start quality is regarded as being 4/10, the proposed offset land is not required to be actively managed to enhance and maintain ecological values and is thus subject to incremental degradation by access, weeds and feral animals. Infestations of Bitou Bush and Lantana are currently contributing to this degradation. Without the legal requirement to actively manage the site to improve and maintain ecological values, the site will degrade and is accordingly given a small reduction for 'future quality without offset' score of 3/10.
Future quality with offset (0 – 10)	5	Under in perpetuity active conservation management, with proposed fencing and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved ($4.5 M will be provided in the Biodiversity Trust Fund to provide for annual management, monitoring and reporting).. As the start quality has been set at a low 4/10, only a small increase in quality to 5/10 over the 10 years to ecological benefit is provided.
Confidence (Quality related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title.). The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. If the owner of a Biodiversity Stewardship Agreement is deemed not to be satisfactory fulfilling their management obligations under the Agreement, there are provisions for the NSW Land and Environment Court to legally enforce requirements, order any rectification necessary and/or make payments to a third party to undertake the required management. The confidence around the increase in quality is accordingly set at a high 90%.

Summary

Final % of impact offset	Based on the above scores, the % of impact offset score is calculated as 57.39% for the proposed on-site offset area and 78.59% for the off-site offset measures.
Cost of offset ($)	The management of the offset area has a calculated $4.5M cost of management held by the Biodiversity Conservation Trust to provide for the in perpetuity management obligations). The land value of the offset area based on vacant rural land is conservatively set at $1.5M based on around $5,000/ha.
Other compensatory measures (if proposed)	In addition to the on-site offsets described above, and in accordance with the commitment sin the PER Report an additional 238 ha of off-site offset will be required to be secured by the registration of a second Biodiversity Stewardship Agreement site on Mid Coast Council owned land at Nabiac (where the STQ has been recorded – refer to Figure 54) or the equivalent number of Biodiversity credits for the same MNES will be purchased and retired from the NSW Biodiversity Conservation Fund.

Table 36: Offset calculation Justification for Swift Parrot

As described in Sections 6.5 and 6.6 of this PER, it was concluded that impacts to the Swift Parrot was not likely to be significant (as the species have not been recorded in the study area and there are relatively small areas of low quality habitat present). Accordingly these offset calculations are provided on a precautionary basis only.

Threatened species or ecological community	Listing status
Swift Parrot	Critically Endangered

Impact Site - Area of Habitat or Area of Community

Size (ha)	55.23 ha of potential Swift Parrot / Regent Honeyeater habitat of low to moderate quality (low proportion of preferred browse species) will be impacted by the proposal.	
Description	Of the 55.23 ha of potential habitat to be impacted, 30.61 ha is of moderate quality foraging habitat and 24.62 ha is of low quality (Table 13 of PER report).	
Guide component	**Assessed value**	**Discussion**
Quality	4	As the Swift Parrot and Regent Honeyeater have not been recorded in the study area and the habitat is of low to moderate quality, an impact quality score of 4/10 has been assigned. The Start Quality score of 4/10 is based on a weighted mean of Condition 25% (4/10), Context (large area of potential habitat) 50% (4/10) and a low Stocking Rate 25% (4/10). Overall Quality Score = 1+2+1 = 4/10.

Offset Site - Area of Habitat or Area of Community

Size (ha):	69.70 ha on-site and up to 165 ha of higher quality habitat off-site required to meet 100% target	
Description	The proposed on-site offset area comprises 69.70 ha of Blackbutt Forest with higher foraging potential than that being impacted as shown in Figure 50 and is scored as 4/10.	
Averted loss Component		
Guide component	**Assessed value**	**Discussion**
Time over which loss is averted	20 years (max)	The proposed offset will be a registered Biodiversity Stewardship site under the NSW Biodiversity Conservation Act 2016 providing in perpetuity protection on title and fully funded active conservation management. Accordingly the maximum 20 year averted loss time is entered
Risk of loss without offset: (0 – 100%)	10%	The risk of loss without an offset has been set at a relatively low 5% as the site is Crown land and is generally sued as 4WD access to 9 Mile Beach. This access is causing some damage to the habitat values in regards to widening of tracks, creation of new tracks and introduction of weeds and rubbish that are incrementally over time, without appropriate mitigation measures, degrading habitat values.
Risk of loss with offset (0 – 100%)	1%	Under in perpetuity active conservation management, with proposed fencing, signage and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved. The risk of loss with an offset is accordingly set at a low 1%.

Size (ha):	69.70 ha on-site and up to 165 ha of higher quality habitat off-site required to meet 100% target	
Confidence (Risk related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title which only the NSW Minister for the Environment can remove or terminate (and if a site is terminated and alternative offset of equivalent value most be secured). The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. The confidence around the risk of loss is accordingly set at a high 90%.
Quality Improvement Component		
Time until ecological benefit	10 years	As the site is currently not actively managed for conservation and existing access, weed and feral animal populations are leading to a degradation of the ecological values of the proposed offset area, and the benefits of management will be immediate (fencing/signage, restricted access), the time until ecological benefit is expected to be relatively short. Further as the management obligations of a Biodiversity Stewardship Agreement are fully funded and required to be implemented in perpetuity and are subject to satisfactory annual reporting, the benefit is expected to be maintained. The time to ecological benefit is accordingly set at a relatively short 10 years to increase the current start quality from an initial moderate 6/10 to a small increase of 7/10
Start quality (0 – 10)	4	Based on the lack of Swift Parrot records in the study area, a start Quality score of 4/10 is provided based on a weighted mean of Condition 25% (4/10), Context 50% (4/10) and low Stocking Rate 25% (4/10). Overall Quality Score = 1+2+1 = 6/10.
Future quality without offset (0 – 10)	3	Whilst the current Start quality is regarded as a low 4/10, the proposed offset land is not required to be actively managed to enhance and maintain ecological values and is thus subject to incremental degradation by access, weeds and feral animals. Infestations of Bitou Bush and Lantana are currently contributing to this degradation. Without the legal requirement to actively manage the site to improve and maintain ecological values, the site will degrade and is accordingly given a small reduction for 'future quality without offset' score of 3/10.
Future quality with offset (0 – 10)	5	Under in perpetuity active conservation management, with proposed fencing and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved ($4.5M will be provided in the Biodiversity Trust Fund to provide for annual management, monitoring and reporting).. As the start quality has already been set at a low 4/10, only a small increase in quality to 5/10 over the 10 years to ecological benefit is provided.
Confidence (Quality related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title. The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. If the owner of a Biodiversity Stewardship Agreement is deemed not to be satisfactory fulfilling their management obligations under the Agreement, there are provisions for the NSW Land and Environment Court to legally enforce requirements, order any rectification necessary and/or make payments to a third party to undertake the required management. The confidence around the increase in quality is accordingly set at a high 90%.

Summary

Final % of impact offset	Based on the above scores, the % of impact offset score is calculated as 100.67% % for the proposed on-site offset area and 165 ha of higher quality off-site habitat.
Cost of offset ($)	The management of the offset area has a calculated $4.5 M cost of management held by the Biodiversity Conservation Trust to provide for the in perpetuity management obligations). The land value of the offset area based on vacant rural land is conservatively set at $1.5M based on around $5,000/ha.
Other compensatory measures (if proposed)	In addition to the on-site offsets described above, and in accordance with the commitments in the PER Report an additional 165 ha of off-site offset will be secured by the registration of a second Biodiversity Stewardship Agreement site on Mid Coast Council owned land at Nabiac (where there is similar/higher quality Swift Parrot habitat – refer to Figure 54) or the equivalent number of Biodiversity credits for the same MNES will be purchased and retired from the NSW Biodiversity Conservation Fund.

Table 37: Offset calculation Justification for Regent Honeyeater

As described in Sections 6.5 and 6.6 of this PER, it was concluded that impacts to the Regent Honeyeater was not likely to be significant (as the species have not been recorded in the study area and there are relatively small areas of low quality habitat present). Accordingly these offset calculations are provided on a precautionary basis only.

Threatened species or ecological community	Listing status
Regent Honeyeater	Critically Endangered

Impact Site - Area of Habitat or Area of Community

Size (ha)	30.61 ha of potential Regent Honeyeater habitat of low to moderate quality (low proportion of preferred browse species) will be impacted by the proposal.
Description	30.61 ha is of low quality (lack of preferred browse species) foraging habitat (Table 14 of PER report).

Guide component	Assessed value	Discussion
Quality	3	As the Regent Honeyeater has not been recorded in the study area and the habitat is of low quality, an impact quality score of 3/10 has been assigned. The Start Quality score of 3/10 is based on a weighted mean of Condition 25% (2/10), Context (small area of potential habitat) 50% (4/10) and a low Stocking Rate 25% (2/10). Overall Quality Score = 0.5+2+0.5 = 3/10.

Offset Site - Area of Habitat or Area of Community

Size (ha):	278.55 ha
Description	The proposed on-site offset area comprises 64.65 ha of similar low quality Blackbutt Forest (69.70 ha) as shown in Figure 50 and is scored as 3/10 and will require an additional 40 ha of higher quality foraging habitat off-site (scored 5/10) to meet the 100% offset

Averted loss Component		
Guide component	**Assessed value**	**Discussion**
Time over which loss is averted	20 years (max)	The proposed offset will be a registered Biodiversity Stewardship site under the NSW Biodiversity Conservation Act 2016 providing in perpetuity protection on title and fully funded active conservation management. Accordingly the maximum 20 year averted loss time is entered
Risk of loss without offset: (0 – 100%)	10%	The risk of loss without an offset has been set at a relatively low 5% as the site is Crown land and is generally used as 4WD access to 9 Mile Beach. This access is causing some damage to the habitat values in regards to widening of tracks, creation of new tracks and introduction of weeds and rubbish that are incrementally over time, without appropriate mitigation measures, degrading habitat values.
Risk of loss with offset (0 – 100%)	1%	Under in perpetuity active conservation management, with proposed fencing, signage and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved. The risk of loss with an offset is accordingly set at a low 1%.

Size (ha):	278.55 ha	
Confidence (Risk related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title which only the NSW Minister for the Environment can remove or terminate (and if a site is terminated and alternative offset of equivalent value most be secured). The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. The confidence around the risk of loss is accordingly set at a high 90%.
Quality Improvement Component		
Time until ecological benefit	10 years	As the site is currently not actively managed for conservation and existing access, weed and feral animal populations are leading to a degradation of the ecological values of the proposed offset area, and the benefits of management will be immediate (fencing/signage, restricted access), the time until ecological benefit is expected to be relatively short. Further as the management obligations of a Biodiversity Stewardship Agreement are fully funded and required to be implemented in perpetuity and are subject to satisfactory annual reporting, the benefit is expected to be maintained. The time to ecological benefit is accordingly set at a relatively short 10 years to increase the current start quality from an initial moderate 6/10 to a small increase of 7/10
Start quality (0 – 10)	4	Based on the lack of Swift Parrot / Regent Honeyeater records in the study area, a start Quality score of 4/10 is provided based on a weighted mean of Condition 25% (4/10), Context 50% (4/10) and low Stocking Rate 25% (4/10). Overall Quality Score = 1+2+1 = 6/10.
Future quality without offset (0 – 10)	3	Whilst the current Start quality is regarded as a low 4/10, the proposed offset land is not required to be actively managed to enhance and maintain ecological values and is thus subject to incremental degradation by access, weeds and feral animals. Infestations of Bitou Bush and Lantana are currently contributing to this degradation. Without the legal requirement to actively manage the site to improve and maintain ecological values, the site will degrade and is accordingly given a small reduction for 'future quality without offset' score of 3/10.
Future quality with offset (0 – 10)	5	Under in perpetuity active conservation management, with proposed fencing and access restriction, ongoing weed control, it is expected that the quality of habitat will be maintained and improved ($4.5M will be provided in the Biodiversity Trust Fund to provide for annual management, monitoring and reporting).. As the start quality has already been set at a low 4/10, only a small increase in quality to 5/10 over the 10 years to ecological benefit is provided.
Confidence (Quality related)	90%	The registration of a Biodiversity Stewardship Agreement has the highest level of legal protection on title. The monitoring, reporting, audit and compliance requirements of a Biodiversity Stewardship Agreement also require an annual site inspection and reporting with provision to legally enforce any rectification necessary. If the owner of a Biodiversity Stewardship Agreement is deemed not to be satisfactory fulfilling their management obligations under the Agreement, there are provisions for the NSW Land and Environment Court to legally enforce requirements, order any rectification necessary and/or make payments to a third party to undertake the required management. The confidence around the increase in quality is accordingly set at a high 90%.

Summary

Final % of impact offset	Based on the above scores, the % of impact offset score is calculated as 29.47% for the proposed on-site offset area and 4.55% for the off-site offset measures.
Cost of offset ($)	The management of the offset area has a calculated $4.5M cost of management held by the Biodiversity Conservation Trust to provide for the in perpetuity management obligations). The land value of the offset area based on vacant rural land is conservatively set at $1.5M based on around $5,000/ha.
Other compensatory measures (if proposed)	In addition to the on-site offsets described above, and in accordance with the commitments in the PER Report an additional 35 ha of off-site offset will be required to be secured by the registration of a second Biodiversity Stewardship Agreement site on Mid Coast Council owned land at Nabiac (where there is potential Regent Honeyeater habitat – refer to Figure 54) or the equivalent number of Biodiversity credits for the same MNES will be purchased and retired from the NSW Biodiversity Conservation Fund.

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