Murramarang South Coast Walk

(NPWS Estate)

Final alignment -
Flora and fauna assessment

24 April 2021

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hjm consulting

Version control

Project Name	Murramarang South Coast Walk (NPWS Estate) – Final alignment - Flora and fauna assessment
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Mapping	Deidre Krejzlik, DKGIS

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Executive summary

This flora and fauna assessment report has been prepared for the final alignment and associated works for the NSW National Parks and Wildlife Service (NPWS) estate components of the proposed Murramarang South Coast Walk. The proposed walk extends along the coastline for 48 km from Maloneys Beach in the south adjacent to the Clyde River, north to the Murramarang Aboriginal Area and Bawley Point. The proposed activity being assessed is located within Murramarang National Park and Murramarang Aboriginal Area, and within the Batemans Marine Park, on the south coast of NSW, in the Sydney Basin and South East Corner Bioregions.

The proposed activity is spread across the 48 km of the proposed walk. The construction phase includes development of approximately 12.77 km of new trail sections, upgrading of approximately 3.08 km of existing trail sections, closure and rehabilitation of approximately 5.87 km of redundant trail sections, and the upgrade of four precincts. The trail components of the proposed activity are to be within a 1.2 m corridor, with the majority being of natural earth. The operation phase of the proposed activity is for the construction phase components as well as for 10.33 km of trail alignment on the beaches and rock platforms and approximately 9.26 km of existing trail sections. The subject site is the area to be directly impacted by the proposed activity equates to approximately 23.87 ha.

The assessment, including extensive field surveys, was limited to a study area which incorporated the subject site and an additional area 10 m either side of the trail corridor and the remainder of the precincts. The study area was approximately 91.83 ha. The locality is defined as the area within a 10 km radius of the subject site.

The geology of the study area includes the Permian Sydney Basin formation and older Ordovician beds of the Lachlan Fold Belt. The geology of the area is considered scientifically important. The dominant plant community within the study area is Spotted Gum - White Stringybark – Burrawang shrubby open forest on hinterland foothills, northern South East Corner Bioregion. This community is relatively common across the locality. One threatened plant species potentially occurs in the study area although it was not observed during field surveys. Four potential Threatened Ecological Communities (TECs) were determined to be within or immediately adjacent to the study area: *Bangalay Sand Forest in the Sydney Basin and South East Corner Bioregions*; *Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions*; *Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions*; and *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions*. Each of the potential TECs occur elsewhere in surrounding areas. Thirty -seven listed threatened fauna species and eight listed migratory fauna species were identified as occurring or potentially occurring within the study area, with the habitat and ecology of the species determining that all local populations must satisfy their lifecycle needs beyond the study area. The study area does not contain potential koala habitat as under NSW criteria; however, it contains habitat critical to the survival of the Koala as under Commonwealth criteria. The study area contains numerous riparian corridors, the majority of which appear to be intermittent and ephemeral.

The proposed activity will require the modification or clearing of up to 1.95 ha of native ground cover and/or understory vegetation. No mature canopy trees are to be removed. As a result of the proposed activity, there may be a reduction of potential Bangalay Sand Forest TEC of up to 0.23 ha and a negligible amount e.g. < 0.01 ha, of Swamp Sclerophyll Forest TEC, and an increase in potential Littoral Rainforest TEC of up to 0.08 ha. There will be no direct impact on potential Swamp Oak Floodplain Forest TEC. There will be minimal direct impact to riparian corridors with the proposed activity trail alignment components generally following the contours. Limited foraging and low-quality sheltering habitat of threatened fauna species may be directly impacted by the proposed activity, and foraging habitat for threatened shorebirds may be impacted.

Considering the flora and fauna values of conservation significance, and that the study area is on conservation estate and marine park, the constraints to the proposed activity were identified as: hollow-bearing trees and hollowed logs; threatened fauna feed trees; threatened shorebird habitat; potential TECs; marine environment of the adjacent Marine Park; and riparian corridors. Post-fire habitat refugia was a consideration. Numerous recommendations are made to address the constraints and to mitigate potential impacts of the proposed activity on the flora and fauna values. The recommendations are aimed at reducing the amount of vegetation to be cleared or modified, the amount of fauna habitat resources to be removed, and the TECs that will be impacted.

Taking into account the recommendations, assessments of significance determined that: none of the local populations of the threatened species or TECs listed under the BC Act that occur or potentially occur within the study area were likely to be placed at risk of extinction, or otherwise significantly impacted; and none of the known or potentially occurring entities listed under the EPBC Act were likely to be significantly impacted. An assessment on the impact of the proposed activity on the State Environmental Planning Policy koala habitat was not required. The proposed activity was found to not result in a significant impact on critical Koala habitat under the EPBC Act. A Species Impact Statement under NSW legislation is not required and a referral to the Commonwealth Minister for the Environment is not required.

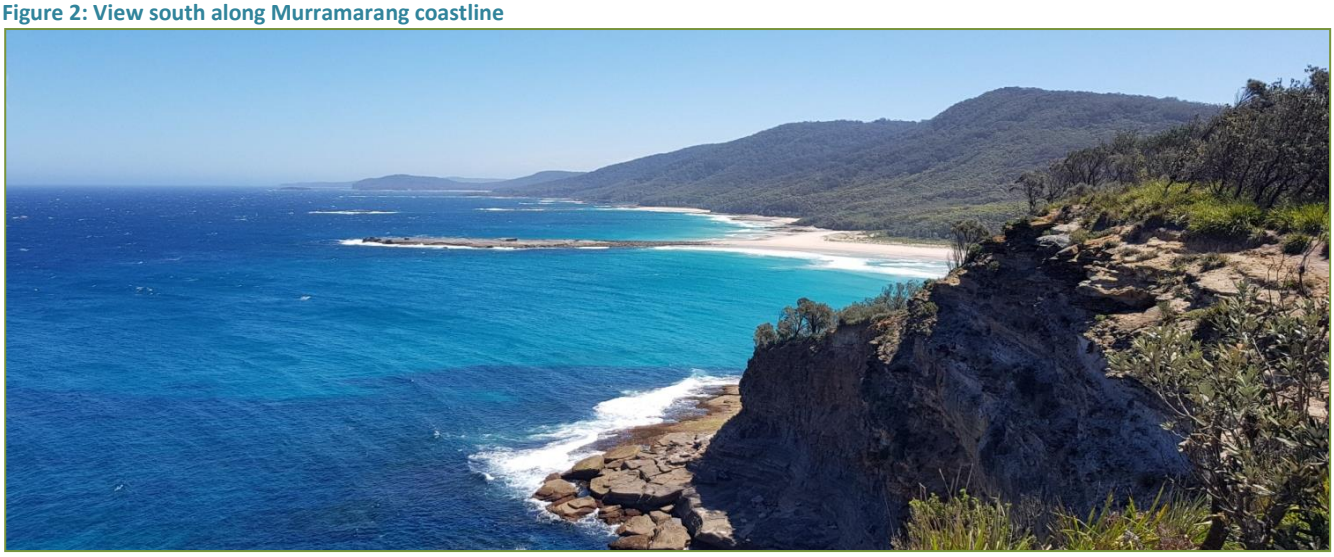
1 Introduction

1.1 Background

The Murramarang South Coast Walk is a proposed multi-day walk located on the south coast of New South Wales. The proposed walk traverses Murramarang National Park and Murramarang Aboriginal Area, and the beaches connecting the coastal villages of Maloneys Beach, South Durras, North Durras, Depot Beach, Kiola and Bawley Point. The proposed walk is approximately 48 km in length, with approximately 35.44 km within the National Parks and Wildlife Service (NPWS) estate and 12.56 km on other land tenures. It is within two local government areas (LGAs), starting in the Eurobodalla LGA and then crossing into the Shoalhaven LGA for the remainder of the walk. Figures 1 and 2 show views of the Murramarang coastline. The location of the proposed walk is shown in Map 1. Map 2 shows the conceptual outline of the proposed walk.

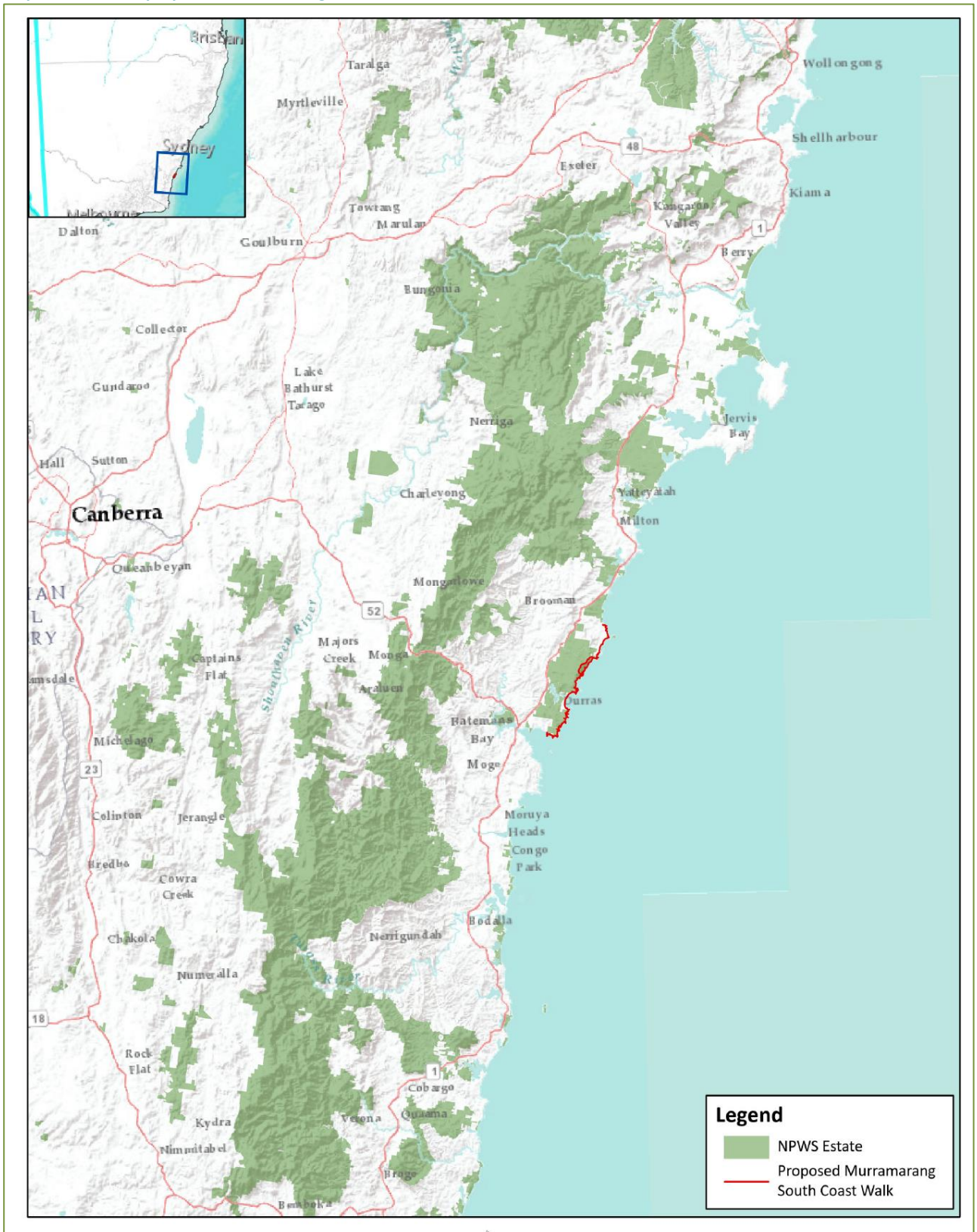
Figure 1: View north of Murramarang coastline

Figure 2: View south along Murramarang coastline

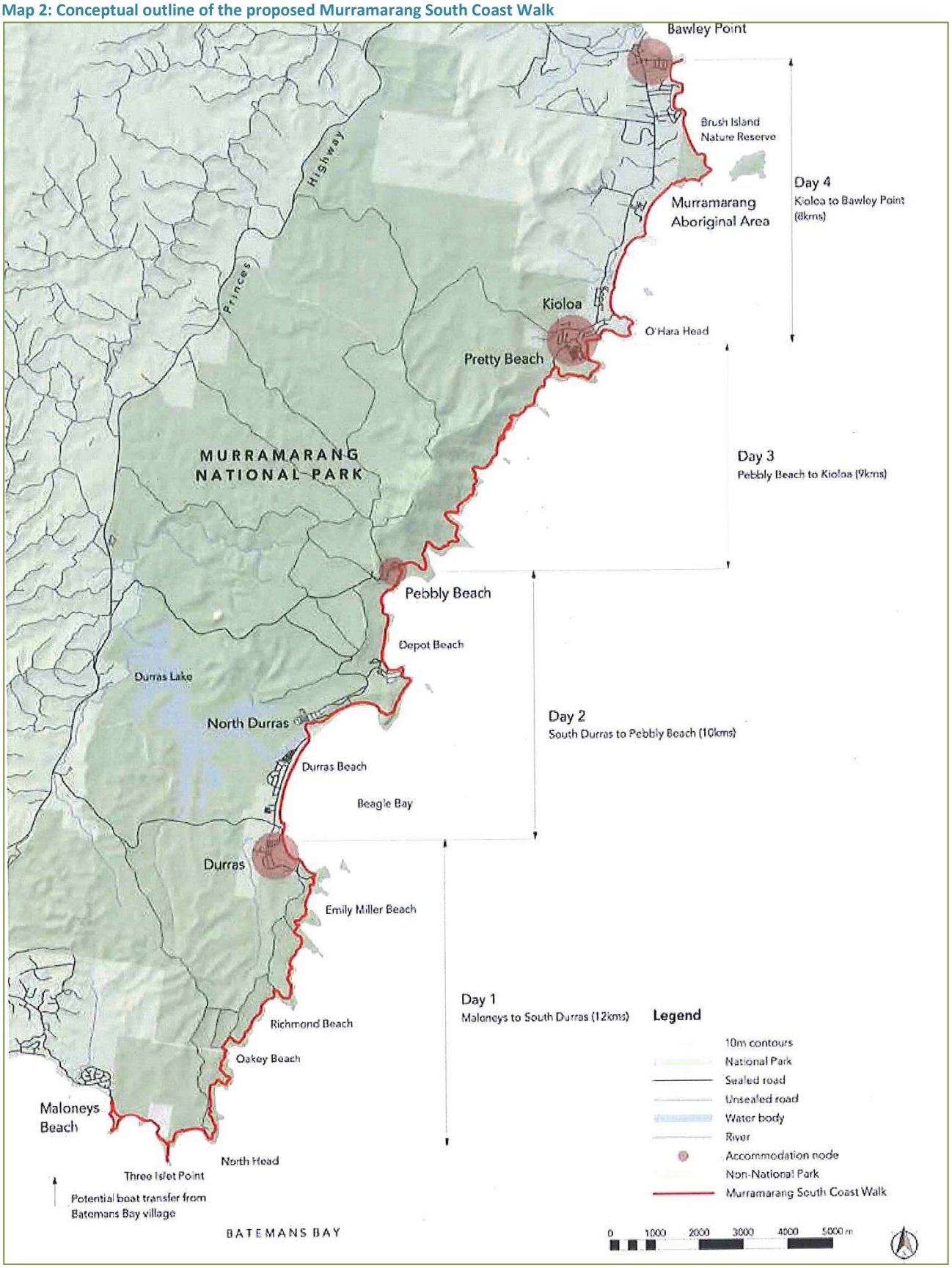


The proposed walk is situated in the Sydney Basin and South East Corner Bioregions. The National Park and Aboriginal Area are managed by NSW NPWS, with the local Aboriginal community actively involved in the management of Murramarang Aboriginal Area. The Murramarang National Park and Murramarang Aboriginal Area extend seaward to the mean low water mark. The Batemans Marine Park extends along the Murramarang coastline from the three-nautical-mile offshore limit of NSW waters to the mean high-water mark within all rivers, estuaries, bays, lagoons, inlets, and saline and brackish coastal lakes.

Map 1: Location of proposed Murramarang South Coast Walk



Map 2: Conceptual outline of the proposed Murramarang South Coast Walk



Source: NewScape 2017

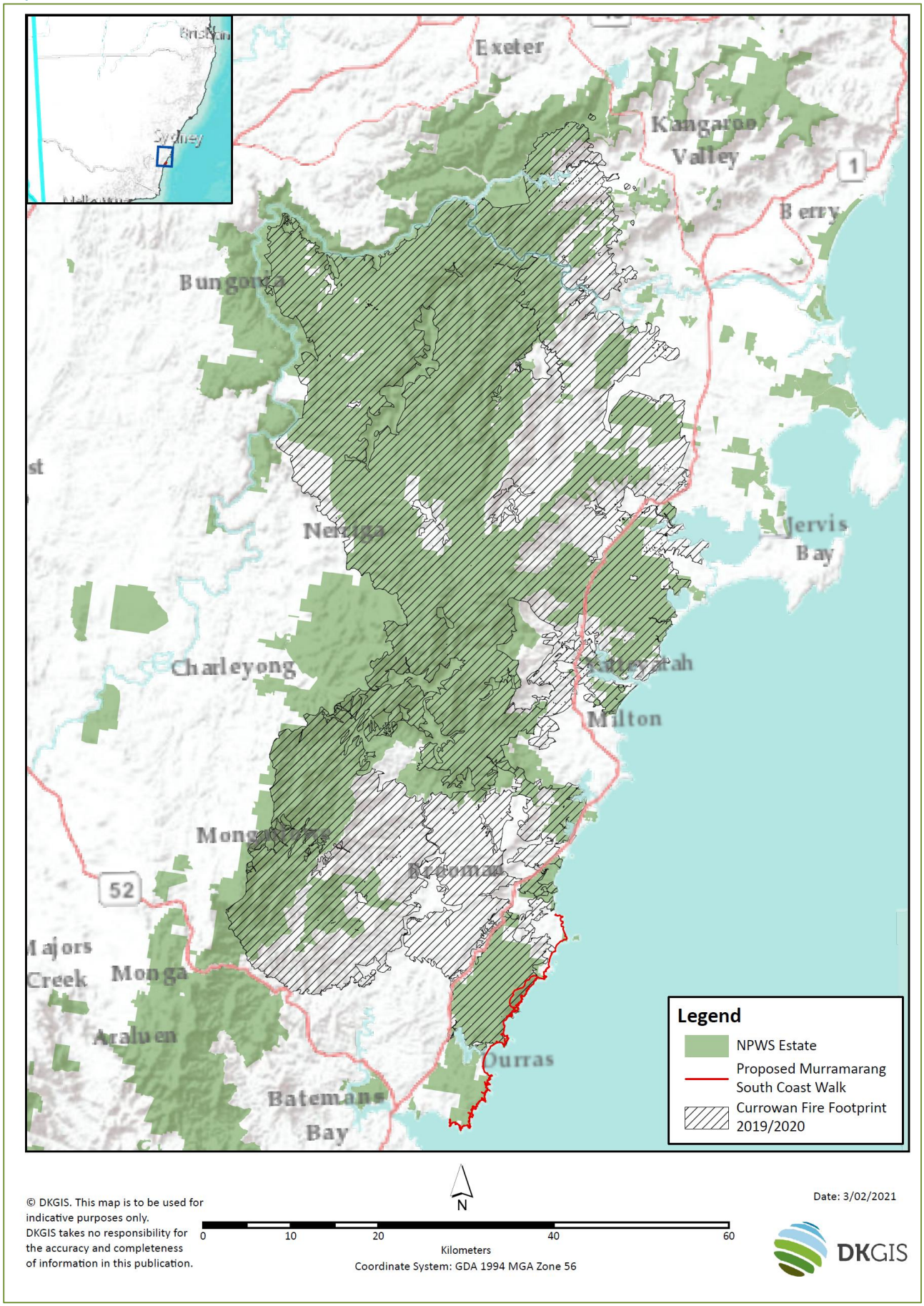
A flora and fauna assessment was undertaken in 2018/2019 for works associated with new, upgraded and redundant trail sections of the proposed walking track within Murramarang National Park and Murramarang Aboriginal Area (see Moorcroft 2019). The assessment, with an Aboriginal cultural heritage assessment, informed a Review of Environmental Factors (REF) Consultation Draft and a Masterplan.

In late 2019/early 2020, the Currowan Fire burnt approximately 500,000 ha in the Shoalhaven and the Eurobodalla LGAs (refer to Map 3 showing the extent of the Currowan Fire). Much of the northern sections of the proposed walk were burnt. Post-fire recovery in these sections is occurring with forest communities recovering quicker than the coastal scrub communities. Refer to figures 3 and 4 for photos. The fire exposed numerous previously unrecorded Aboriginal sites. Another Aboriginal cultural heritage assessment was carried out, and two geological risk assessments, which resulted in realignment of some sections to avoid Aboriginal sites and unstable cliffs.

Figure 3: Coastal scrub vegetation community recovery post-fire

Figure 4: Forest vegetation community recovery post-fire

Map 3: Extent of the Currowan Fire 2019/2020 within the Shoalhaven LGA



Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

This assessment is for the direct and indirect impacts on flora and fauna by the construction and operation phases of the following components of the multi-day walk within the NPWS estate (the proposed activity):

- development of approximately 12.77 km of new trail sections
- upgrade of approximately 3.08 km of existing sections of trail
- inclusion of approximately 10.33 km of beach and rock platform sections
- rehabilitation of approximately 5.87 km of redundant sections of trail
- approximately 9.27 km of existing trail sections
- development of a new track head precinct at Maloneys Beach
- development of a smaller track head at Pretty Beach
- upgrade of water and wastewater infrastructure at Yellow Rock accommodation precinct
- recommissioning and redesign of the Oaky Beach Camping Area

This report describes the flora and fauna values of the area of the proposed activity, particularly the values of conservation significance. It analyses a number of constraints that these values present to the proposed activity. It recommends measures to minimise or avoid the constraints. Taking into consideration these recommendations, the report presents the required statutory assessments in relation to the proposed activity's impact on values of conservation significance listed under relevant legislation. This report is to inform the final REF. Impacts associated with sections of the proposed walk outside of the NPWS estate are not considered in this assessment.

1.2 Description of the proposed activity

1.2.1 General description

The proposed multi-day Murramarang South Coast Walk will traverse the coastal fringe of Murramarang National Park and adjacent areas. The walk will be approximately 48 km and generally follow the coastline north from Maloneys Beach on the northern shores of the Clyde River in the south, through Murramarang National Park, along the beaches adjacent to the coastal villages of South Durras, North Durra, Depot Beach, Merry Beach, Kiola then through Murramarang Aboriginal Area ending at Bawley Point. The walk passes through a variety of coastal vegetation communities, traverses beaches, across rock platforms and over headlands, providing walkers with a range of experiences and views up and down the coast and out to sea. The beach and rock platform sections of the walk include intertidal areas which are also part of Batemans Marine Park. Accommodation for the walk is to be provided at existing NPWS facilities at Yellow Rock, North Head, Depot Beach, Pebbly Beach and Pretty Beach, the recommissioning and redesign of the Oaky Beach Camping Area, and private accommodation facilities within the coastal villages. There will be a number of lookouts, track head signage, as well as directional and wayfinding signage along the track.

The NPWS has advised that access to the area during works associated with the construction and operation phases of the proposed walk is to be on existing trails and will not require any additional vegetation clearing or earthworks.

The NPWS has advised that all works associated with the proposed activity will be in accordance with the design standard as outlined in the *Park Facilities Manual* (Office of Environment and Heritage 2016). Refer to Appendix A for a copy of the relevant sections of the manual. Signage will be in accordance with the *Park Signage Manual* (NSW Office of Environment and Heritage 2017a). Refer to Appendix B for a copy of the relevant sections of the manual.

Information regarding the detail of the proposed activity is based on advice and information obtained from NPWS in the original project brief, during meetings between the consultants and relevant NPWS staff

including the relevant Senior Project Officer, Project Officer, Ranger and Team Leader Ranger, and Shorebird Recovery Coordinator, and follow up conversation held in the field, via email and on the phone.

1.2.2 Trail alignment

The trail components of the proposed activity include construction and operation phases as follows:

- maintenance of a number of existing trail sections
- construction and maintenance of new linking trail sections and upgraded trail sections
- beach and rock platform sections of the walk alignment
- rehabilitation of redundant trail sections.

The above trail components, as well as subsidiary trails which are not part of this assessment, are shown on maps 4 – 7.

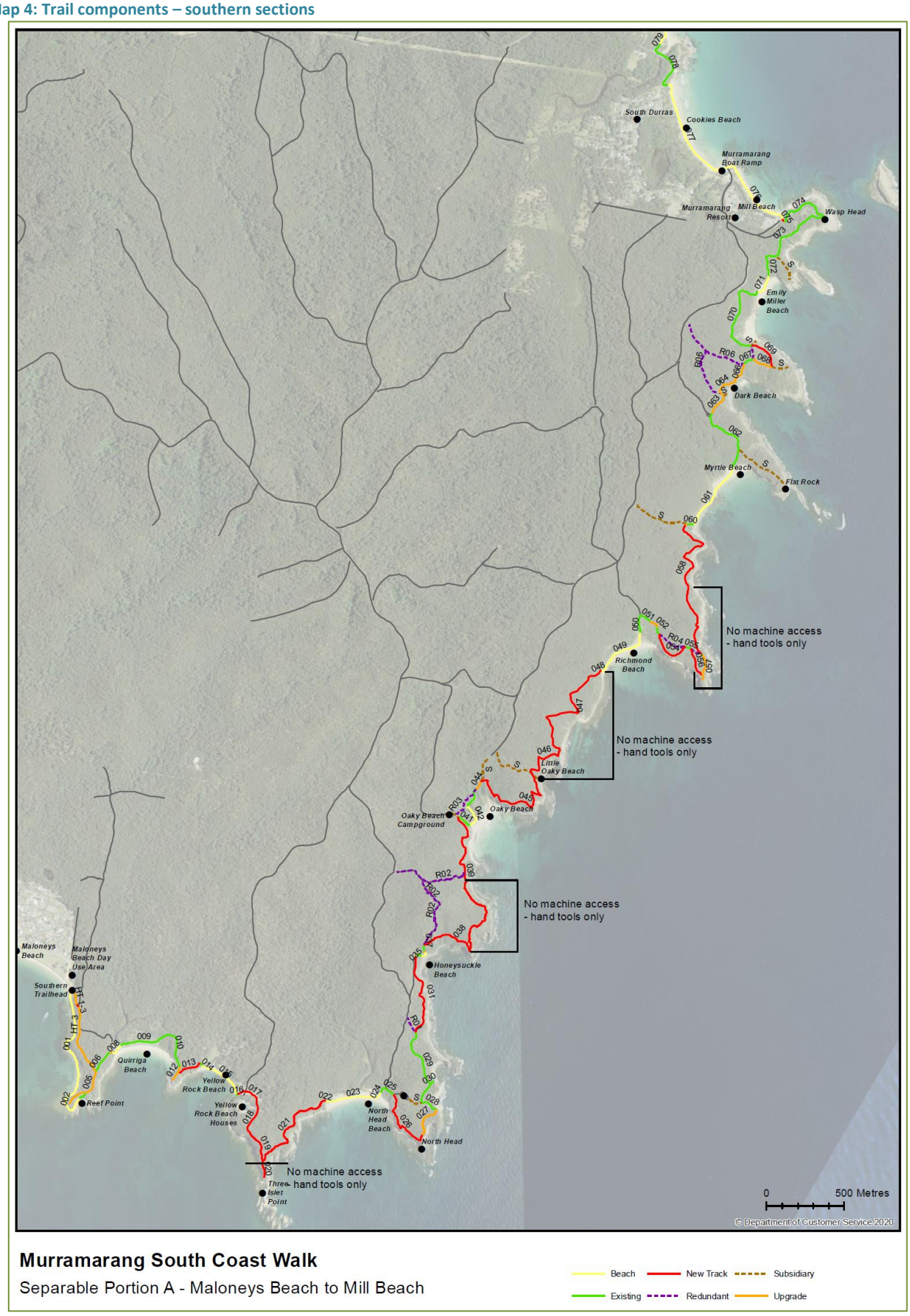
Approximately 41.29 km of trail alignment is subject to the assessment. The proposed walk will be single trail except in places where it follows existing vehicles tracks for a few very short distances e.g. Acheron Fire Trail near Maloneys Beach; the old Oaky Beach access road, and the commencement of the Snapper Point Walking Track at Pretty Beach. A low-tide option for the commencement of the walk from the Maloneys Beach precinct to Reef Point will be promoted in interpretive material.

The construction phase will involve clearing or modifying native ground cover and/or understory vegetation and/or minor earthworks of the of the new linking and upgraded trail sections. No mature canopy trees will be removed as part of the proposed activity. There will be approximately 12.77 km of new linking trail developed, and approximately 3.08 km of existing trail upgraded. A trail corridor of between 600 – 1200 mm is to be used for the construction and ongoing maintenance (the operation) of the trail components (excluding the sections on the beaches and rock platforms). This is to accommodate edge disturbances such as batters and moving fallen timber. Further detail on the new linking trails sections and upgraded trail sections, including associated infrastructure, and rehabilitation of the redundant trail sections is described below. This information was provided by the NPWS. Existing trail sections that are part of the proposed activity and that are not being upgraded or made redundant and rehabilitated, will be maintained in their current condition.

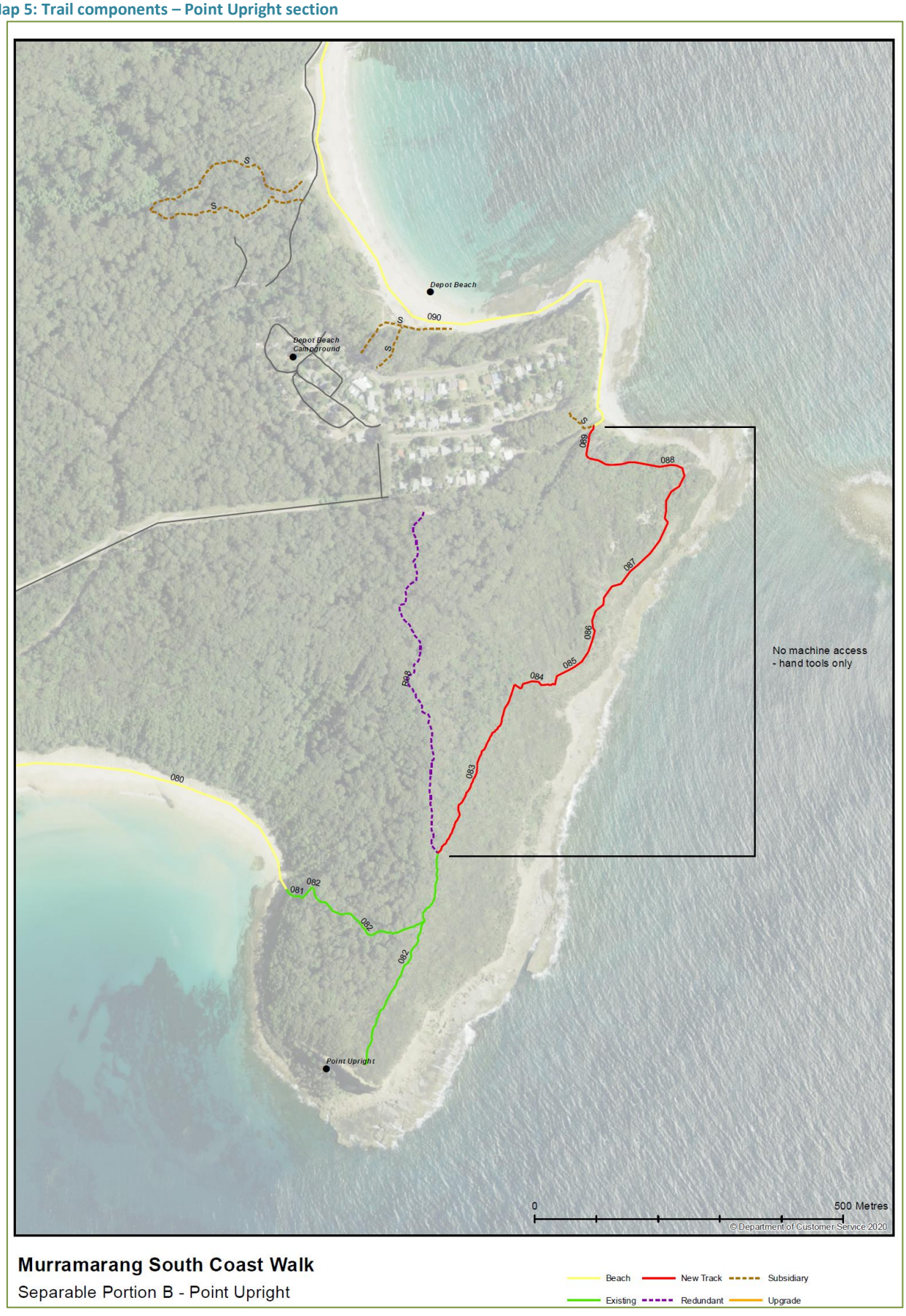
Ground surface

The new and upgraded trail sections are to follow the natural ground surface where possible. There are two sections where rock may need to be brought in by helicopter to create a rocky sandstone trail: Point Upright and south of Granite Point (see photos of these areas in Figure 5 and Figure 6). Works will be consistent with the *Park Facilities Manual* section 5.3.3 (refer to Appendix A). The formed paths at Maloneys Beach precinct will be constructed from concrete, pavers and/or boardwalk to achieve Class 1 disabled access. The works will be consistent with the *Park Facilities Manual* sections 5.3.10, 5.3.13 and 5.9.5 (refer to Appendix A). Gravel paths may also be required at Oaky Beach Camping Area. These works will be consistent with the *Park Facilities Manual* section 5.3.4 (refer to Appendix A).

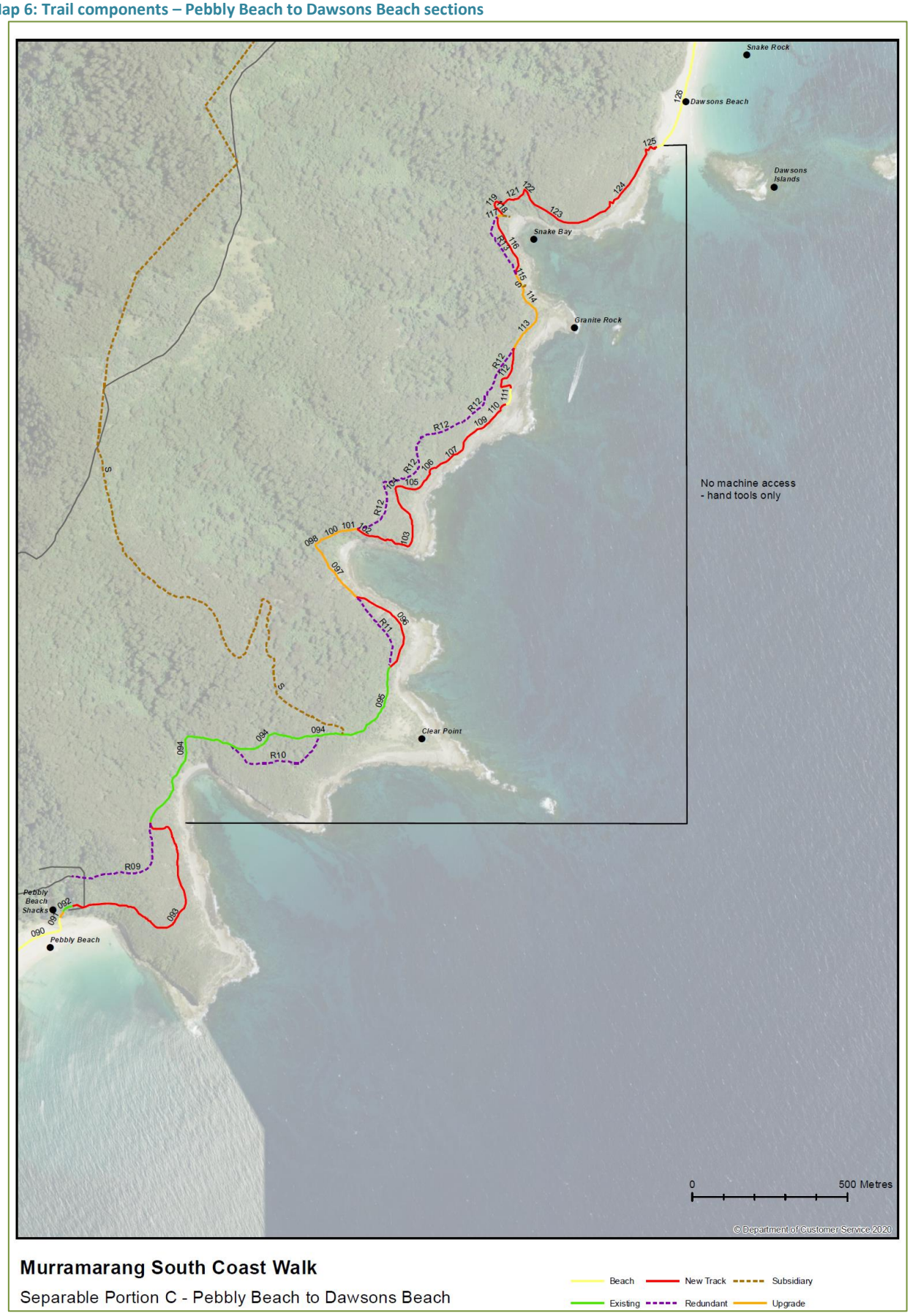
Map 4: Trail components – southern sections



Map 5: Trail components – Point Upright section



Map 6: Trail components – Pebbly Beach to Dawsons Beach sections



Map 7: Trail components –Dawsons Beach to Merry Beach sections

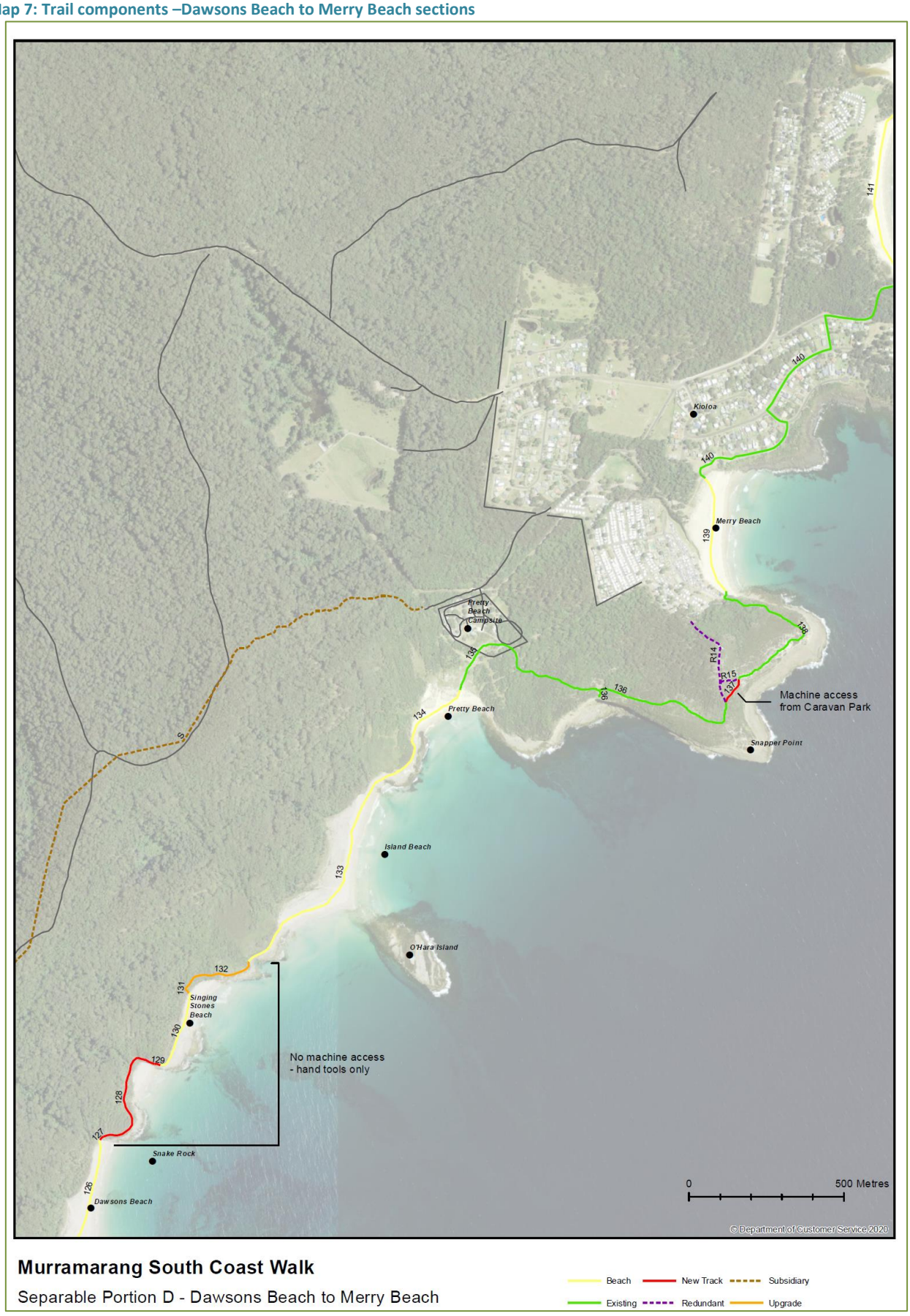


Figure 5: Point Upright rocky section

Photo: Tom Pinzone NPWS

Figure 6: Rocky section south of Granite Point

Photo: Tom Pinzone NPWS

Benching

Numerous trail sections require benching into the slope. Where vehicle access is available small excavators and other small machines will be used for this work. In areas with no vehicle access, these sections will be hand benched.

Installation of new stairs to some beaches and repair of existing stairs

New stairs are required at several locations where sections of the trail link to the beaches and rock platforms. These will mostly be constructed with timber and built onto the slope (refer to the example shown in Figure 7). In some sections, stone or concrete may be used for increased resilience to bushfires and increased longevity (refer to the example shown in Figure 8). These works will be consistent with the *Park Facilities Manual* section 5.5.5 Sleeper stairs (refer to Appendix A). Some existing stairs require basic maintenance; replace timber sleepers, fix erosion issues etc (refer to Figure 9).

Figure 7: Example of timber stairs

Photo: Tom Pinzone NPWS

Figure 8: Example of stone steps

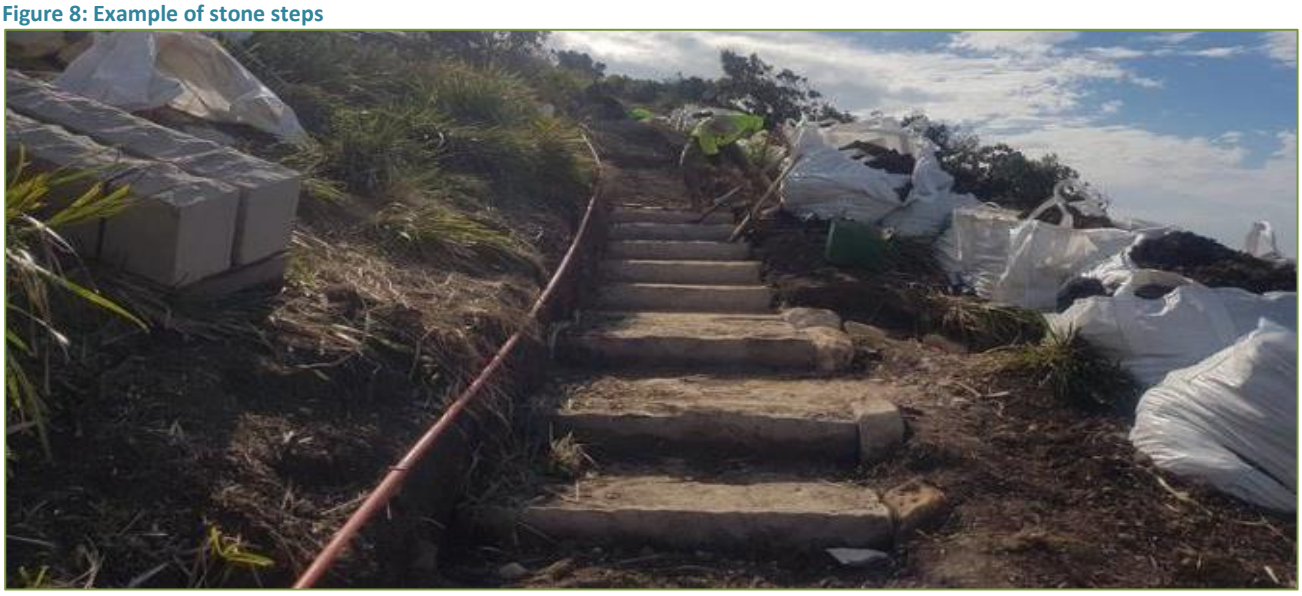


Photo: Tom Pinzone NPWS

Figure 9: Timber stairs at Honeysuckle Bay requiring maintenance

Photo: Tom Pinzone NPWS

Stairs are required at Maloneys Beach where the track commences and rises from the precinct to the Acheron Trail. These will be a mix of surface stairs and structure. The stairs will be located so as to not be visible from the neighbouring suburb. These works will be consistent with the *Park Facilities Manual* section 5.5.6 Elevated stairs (refer to Appendix A).

Reinstating fire impacted infrastructure such as stairs, drains, footbridges and boardwalks

Sections of the existing walking trail that are to be incorporated into the proposed Murramarang South Coast Walk were impacted by the Currowan Fire. These sections require removal of fallen trees, and/or replacement of burnt infrastructure, such as the main section is Singing Stones Beach south of Pretty Beach. Refer to the Figure 10 and Figure 11 as examples of burnt infrastructure that needs reinstating.

Figure 10: Fire damaged stairs south of Pretty Beach

Photo: Tom Pinzone NPWS

Figure 11: Fire damaged boardwalk south of Pretty Beach

Photo: Tom Pinzone NPWS

Small foot bridges spanning drainage lines and creeks

A number of small footbridges are required. These will be constructed with Fibre Reinforced Polymer (FRP) decking in the same design as currently used, with stainless steel fittings. Refer to Figure 12 for an example of an existing footbridge.

Figure 12: Example of footbridge at Richmond Beach

Photo: Tom Pinzone NPWS

Elevated boardwalks

Small sections of boardwalk are required. These will be built from FRP and laid directly on ground (refer to Figure 13 as an example of this type of boardwalk). The main section where this is required is south of Pretty Beach where the boardwalk is fire damaged. Other sections may be required for boggy areas. This type of work will be consistent with the *Park Facilities Manual* sections 5.9.2, 5.9.3 and 5.9.5 (refer to Appendix A).

Figure 13: Example of boardwalk

Photo: Tom Pinzone NPWS

Formalised lookouts

Some lookouts may require formalisation to delineate safe zones or to discourage access to sensitive cultural locations. These lookouts will be built to be similar to the boardwalk example with FRP used to create a pad. Fallen dead vegetation will be used to prevent access from lookout locations. Three Islet Point at Yellow Rock is main example where the FRP pad would be installed over grass near the point to prevent access to unstable cliff and midden location. Refer to Figure 14 as an example of a lookout location.

Figure 14: Three Islet Point lookout location

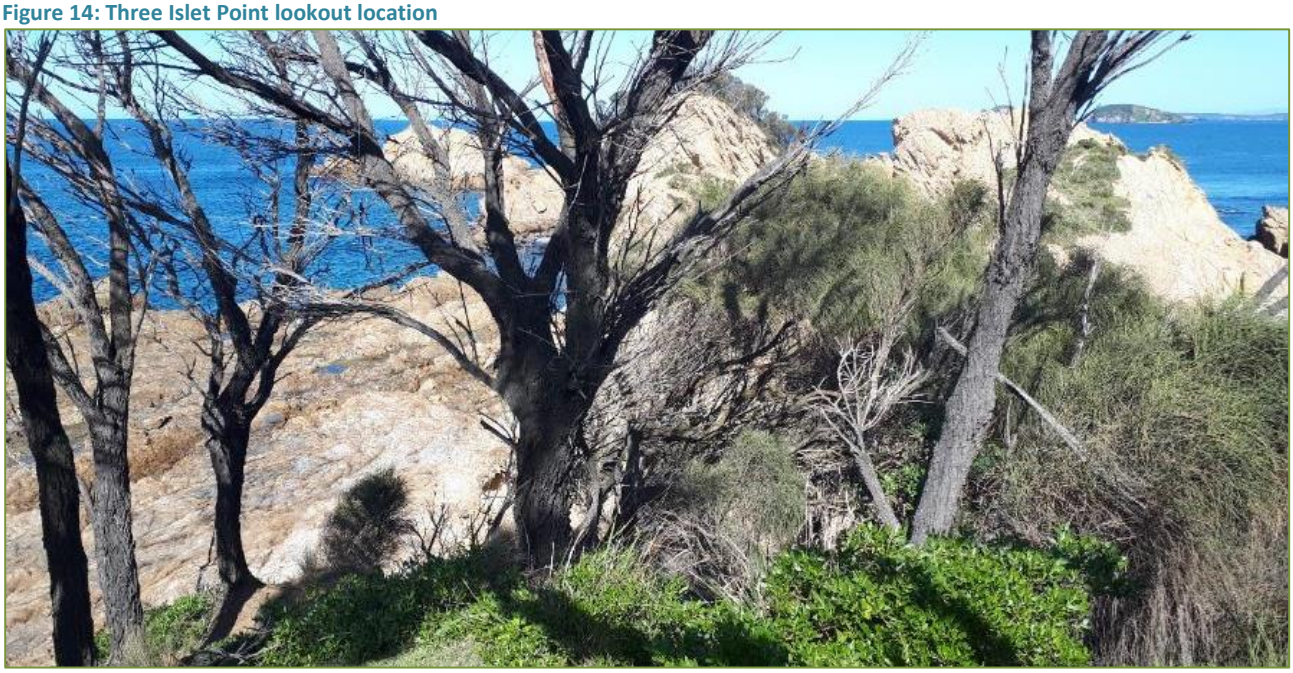


Photo: Tom Pinzone NPWS

Erosion control techniques

Erosion caused by inadequate drainage or informal visitor access will be controlled. Water will be diverted from the top of the slope and fallen timber will be placed strategically downslope to slow run-off. Mulch may also be used where vehicle access is available to the site. Refer to Figure 15 as an example of an eroded area requiring control measures.

Figure 15: Eroding slope near Depot Beach

Photo: Tom Pinzone NPWS

Trailhead, signage, interpretation and wayfinding totems

Track head infrastructure will be installed at Maloneys Beach and Pretty Beach precincts as per the design specifications (refer to section 1.2.3 below). Signage will be consistent with the *Park Signage Manual* (refer to Appendix B for relevant sections). This includes: trail head signs consistent (refer to Figure 16 for an example); major track junctions will have directional signage (refer to Figure 17 for an example); and a limited number of wayfinding totems (refer to Figure 18) and directional markers (refer to Figure 19). A small amount of interpretive information would be provided on the signage where required.

Figure 16: Example trail head sign at carparks, camping areas and day use areas

Figure 17: Example of directional sign for major track junctions

Figure 18: Example wayfinding totem for minor track junctions and other features

Figure 19: Example directional markers

Beach and rock platforms

There is approximately 10.33 km of trail alignment on beaches and rock platforms. There are no construction works proposed for these sections. However, as it is likely that the completion Murramarang South Coast Walk will result in an increased number and frequency of walkers, these alignments, both existing and new, are included in the assessment as a number are within and adjacent to known threatened shorebird habitat.

Redundant trail sections

Redundant trail sections will be rehabilitated and revegetated. This involves removing existing track infrastructure, repairing drainage and erosion issues, covering the redundant trail with mulch and fallen timber and leaving the area too revegetate. These works will be carried out in high use areas where there is a new alignment or where there are erosion issues. Other sections i.e. low use areas, up to the first 50 m of the redundant trail section will be rehabilitated and revegetated to deter visitor access. The remaining redundant trail sections will be left to revegetate naturally. There is approximately 5.87 km of redundant trail sections.

Ancillary activities

All stockpiling and compound sites are to be on existing disturbed areas. Material to be stored would include: track materials, waste, tools, fuel etc. Storing may include temporary installation of a small site shed and toilet.

1.2.3 Precinct developments and upgrades

Maloneys Beach precinct

Maloneys Beach precinct upgrade involves developing the main track head for the proposed walk by:

- carrying out test pitting to ascertain if there is any subsurface Aboriginal cultural heritage in the area
- upgrade of a culvert on entering the NPWS estate
- development of a gravel vehicle drop-off turn-around and gravel 14-space carpark with a spray seal finish
- provide a vegetation barrier between the carpark and neighbouring property and surrounds
- development of a track head and small and large shelters
- development of a track commencement 'celebration' – installation of signage
- development of formed walking paths from the carpark to the track commencement 'celebration'
- decommissioning of an unauthorised vehicle track to beach
- development of picnic zones

All proposed works at Maloneys Beach precinct are within cleared or previously disturbed areas. There will be removal of ground cover and earth works associated with levelling for the carpark, the connecting formed walking paths and the shelters and trail commencement 'celebration'. No mature canopy trees will be removed. There will be no lighting installed for the carpark.

Refer to Figure 20 for a photo of the general site character of the proposed carpark location at Maloneys Beach precinct. Refer to figures 21 to 24 for Maloneys Beach precinct upgrade design specifications.

Figure 20: General site character of proposed carpark location at Maloneys Beach precinct

Figure 21: Maloneys Beach precinct design specifications - northern area

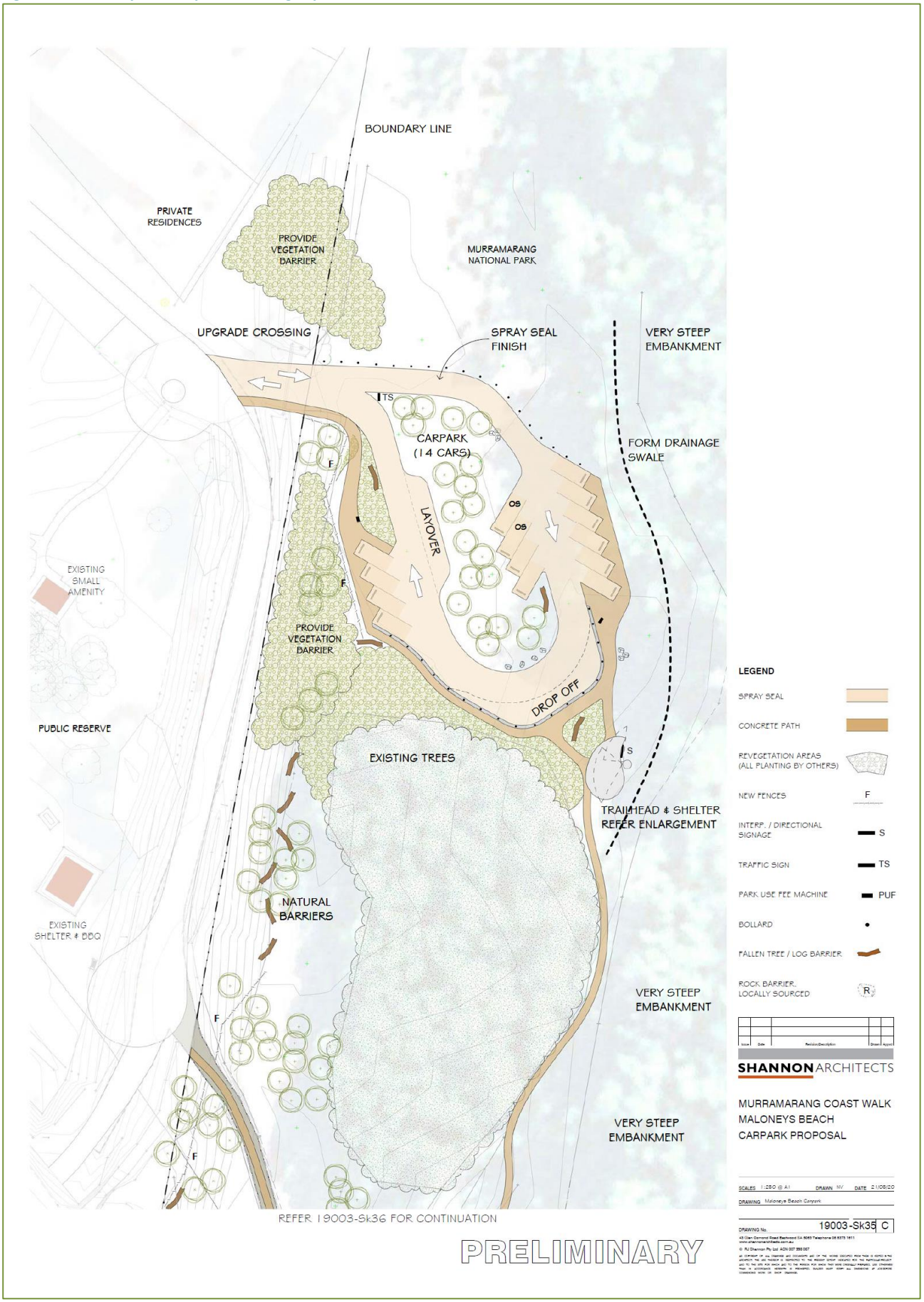


Figure 22: Maloneys Beach precinct design specifications - southern area

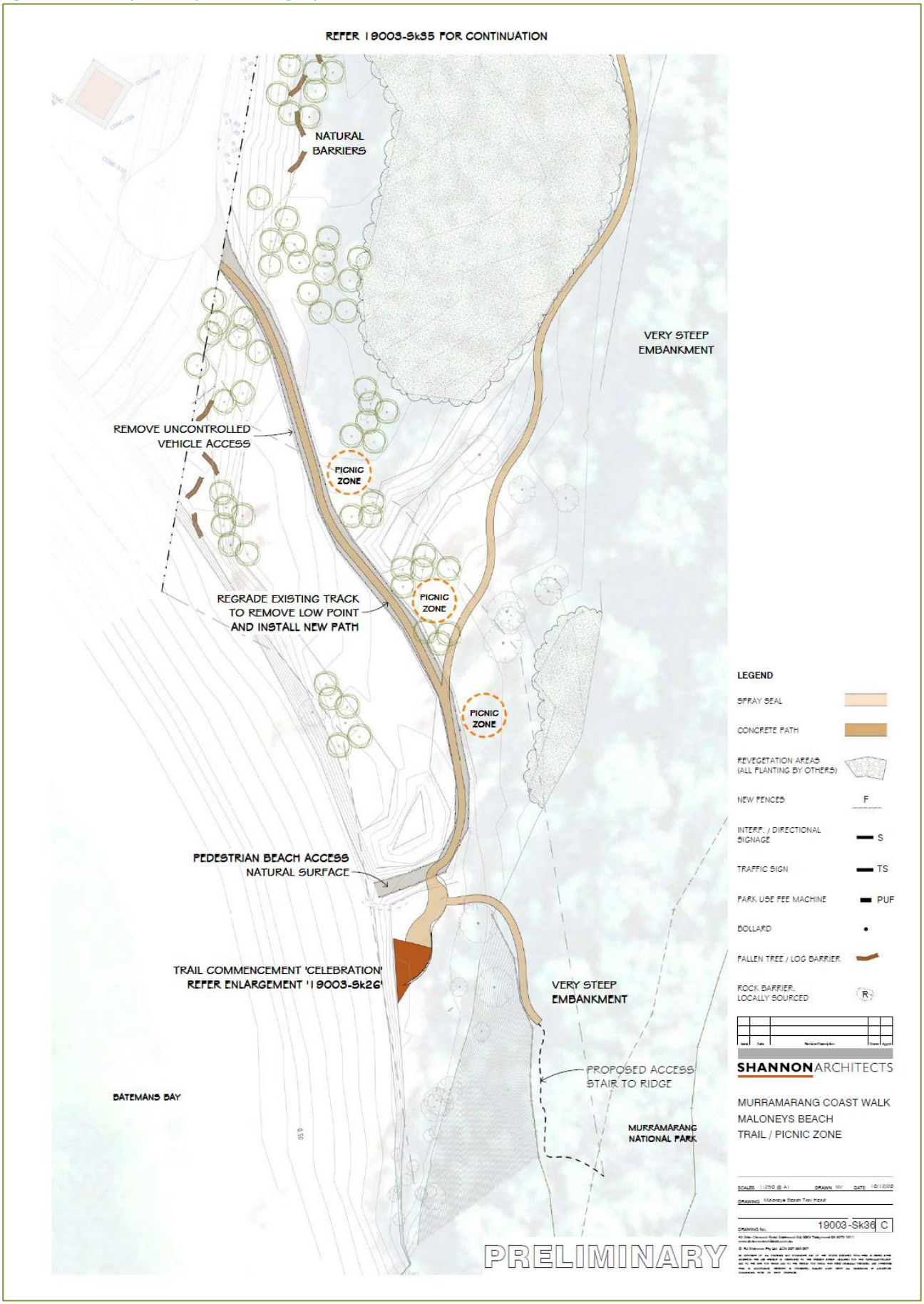
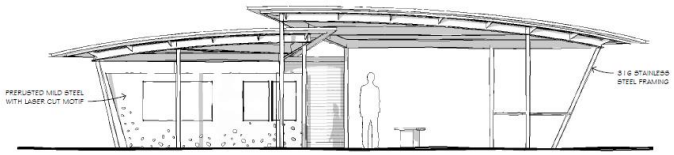
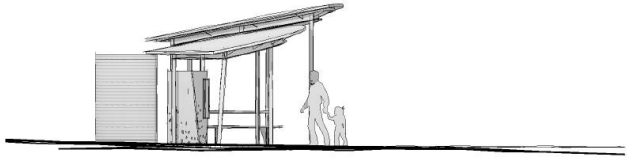


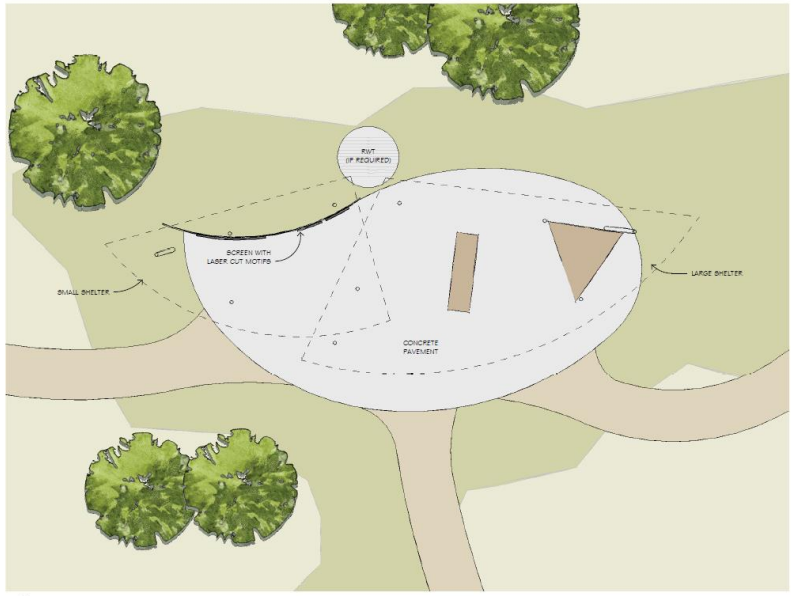
Figure 23: Maloneys Beach precinct design specifications - shelters and sign



South Elevation
SCALE 1 : 50



West Elevation
SCALE 1 : 50



Floor Plan
SCALE 1 : 50

PRELIMINARY

SHANNON ARCHITECTS

MURRAMARANG COAST WALK

SHELTERS COMBINED

LARGE SHELTER, SMALL SHELTER & SIGN

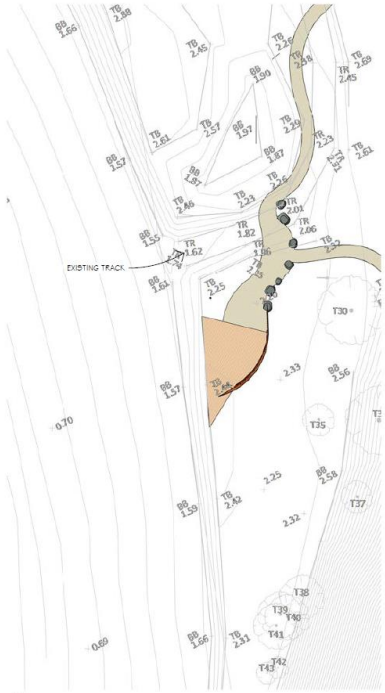
SCALES 1 : 50 DRAWN NV CHECK DS DATE 07/04/20

DRAWING SIGN SHELTER

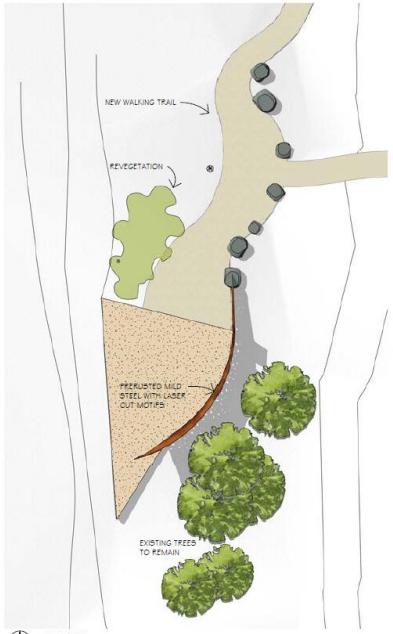
DRAWING No. 16002-Sk29 A

Figure 24: Maloneys Beach precinct design specifications -trail commencement 'celebration'

ELEVATION
SCALE 1 : 100



LOCATION PLAN
SCALE 1 : 200



PLAN
SCALE 1 : 100

PRELIMINARY

Issue	Date	Revision/Description	Drawn	Approved

SHANNON ARCHITECTS

MALONEYS BEACH

PROPOSAL

TRAIL START CELEBRATION

SCALES As indicated DRAWN NV CHECK DS DATE 10/12/20

DRAWING TRAIL START - PLAN, ELEVATIONS &IMPRESSION

DRAWING No. 19003-Sk26 C

10 Glen Osmond Road Eastwood SA 5063 Telephone 08 8373 1911
www.shannonarchitects.com.au

Yellow Rock precinct

Yellow Rock accommodation precinct involves upgrading the existing water and wastewater system by:

- connection of existing downpipes in the precinct to rainwater tanks
- connection of above ground rainwater tanks
- decommissioning of the existing wastewater disposal trenches and associated pipe networks
- connection of a pipe from the existing farm dam to the existing water tank
- decommissioning of a small existing rainwater tank at Beach House
- decommissioning of an existing water tower and pipe network near the Caretakers House
- installation of an additional solar power system at the existing amenity building
- installation of new wastewater treatment unit near the existing amenity building
- connection of sewer pipes to a new wastewater treatment unit using the existing trenches

installation of an Ecomax amended soil mound or equivalent Other works for Yellow Rock precinct include:

- installation of an access gate
- removal of parts of a damaged concrete boat ramp that are within the NPWS estate

All proposed works at Yellow Rock accommodation precinct are within cleared or previously disturbed areas and will require the removal of ground cover and/or minor earth works at or below ground surface i.e. down to 1 m. Proposed works at Yellow Rock precinct will not require the removal of mature canopy trees, and removal of native ground cover and understory vegetation, where it exists, is minimal.

Refer to Figure 25, 26 and 27 for photos of the general site character of the Yellow Rock precinct.

Refer to Figure 28 for the Yellow Rock precinct water and wastewater services plan concept.

Figure 25: General site character of Yellow Rock precinct

Figure 26: Proposed site of Ecomax mound

Figure 27: Yellow Rock precinct amenity building - proposed site for new wastewater treatment unit and solar system

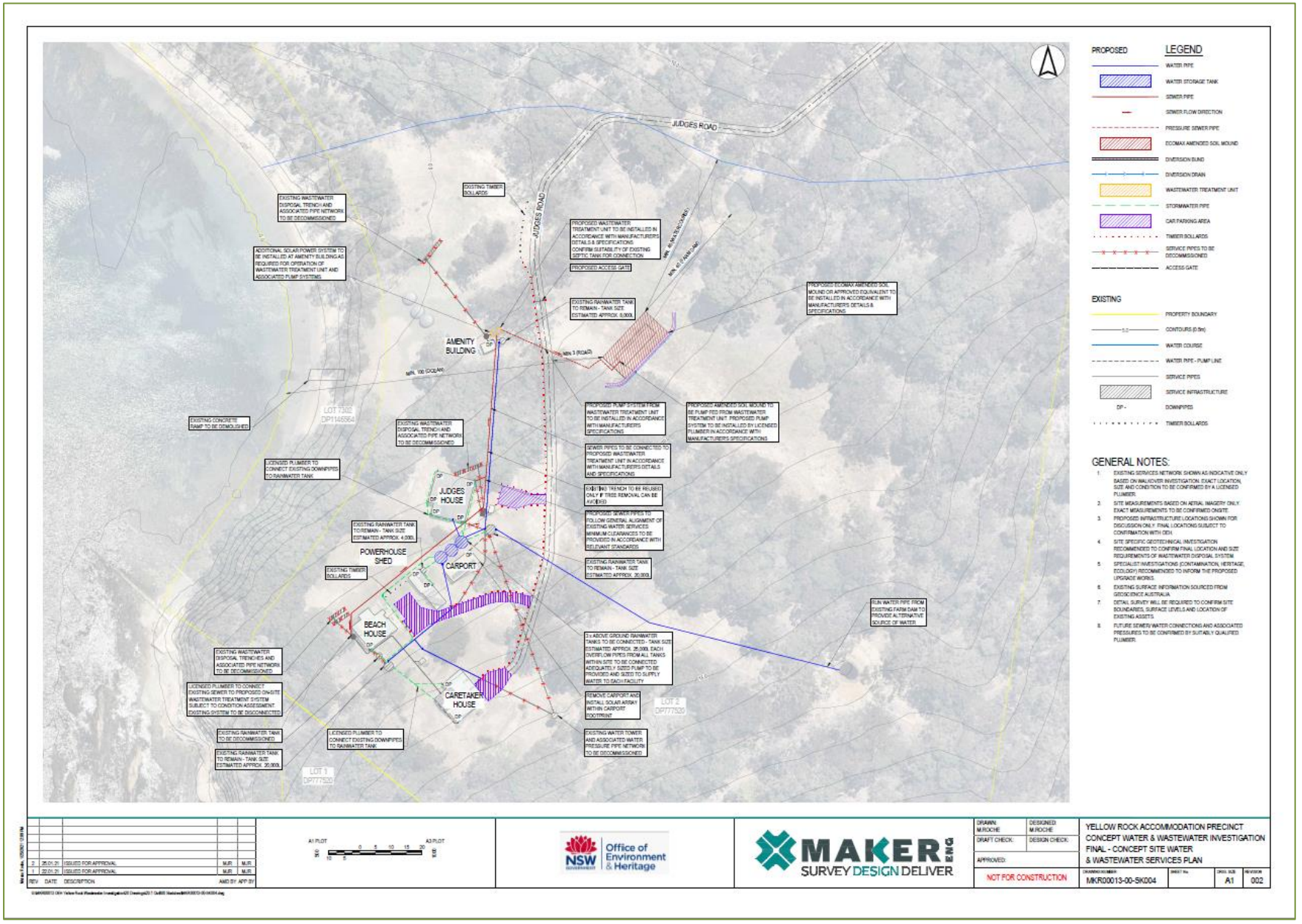
Oaky Beach precinct

Recommissioning the Oaky Beach Camping Area involves the following:

- installation of a four-space day visitor carpark
- development of ten camping sites with adjacent carpark spaces
- development of short linking walking trails from the carpark spaces to the camping sites, from the main trail to the Camping Area and from the main Camping Area to the walk-in camping sites
- development of five walk-in camping sites and one small shelter
- installation of an amenity block

Proposed works at Oaky Beach precinct will not require the removal of mature canopy trees, and removal of native ground cover and understory vegetation, where it exists, i.e. the walk-in camp sites, is minimal. Minor earthworks will be required in some areas.

Figure 28: Yellow Rock precinct water and wastewater services plan concept



Figures 29 and 30 show general site characteristics of the Oaky Beach Camping Area. Refer to Figure 31 for the design specifications. The amenity block will be a Skillion double stall consistent with the *Park Facilities Manual* section 6.4.7 (refer to Appendix A). It will have an in-ground tank and an attached rainwater tank, and due to the slope, will be on a platform. There are no access issues for pumping out. The small shelter is to be a standard skillion shelter consistent with the *Park Facilities Manual* section 6.3.5 (refer to Appendix A). This will also be on a raised platform and have a rainwater tank attached.

Figure 29: Main access road and general site character of Oaky Beach Camping Area

Figure 30: General character of proposed walk-in camping sites at Oaky Beach Camping Area

Pretty Beach precinct

Pretty Beach precinct upgrade involves developing a small alternative track head. This will be completed by utilisation of the existing concrete path and seating area; and installation of track head signage.

Proposed works at Pretty Beach precinct will not require the removal of mature canopy trees, and removal of native ground cover and understory vegetation, where it exists, is negligible. Refer to Figure 32 for Pretty Beach alternative track head precinct design.

Figure 31: Oaky Beach Camping Area recommissioning design concept

Figure 32: Pretty Beach precinct alternative trail head design

1.2.4 Access and use of machinery for construction

Access during the construction and operation phases of the proposed activity is limited to existing vehicle tracks and walking trails. Trail component sections that are accessible by vehicles will be constructed and maintained the use of small machinery, assisted by motorised wheelbarrows or modified 4WD ride-on mowers. Trail component sections that are not accessible by existing vehicle tracks will be constructed and maintained by hand tools. Table 1 below describes the types of machinery and tools to be used for the trail components of the proposed activity. The NPWS will advise on the permitted use of any non-handheld machinery. Refer to maps 4 to 7 above for machinery access requirements. For some remote sections, contractors may camp in the field to reduce travel time to the site. Precinct development works will require small machinery, and possibly larger machinery for the carpark at Maloney Beach.

Table 1: Types of machinery to be used in trail components of the proposed activity

Machinery type	Example photos of machinery in use
Mini Excavator/loader Machinery will be limited to width < 1 m to minimise the tendency to build to the width of the blade or wheelbase. Vegetation and soil disturbance will be minimised by operating only within the trail corridor.	 
Ride on mower Small 4WD ride on mowers and trailers may be used for some trail sections with good access.	 
Motorised carriers Some trail sections may be constructed with the assistance of motorised carriers and wheelbarrows. These units can be electric or petrol and can include a dumping body. Wheelbases will be < 1 m.	 

ebike ebikes may be suitable for some trail sections to more efficiently transport personnel to and from work sites.	 
Motorised hand tools Small motorised tools will be used: chain saws, brush cutters, drills, vacuums, circular saws etc. Small generators and power packs may also be required. For sections without machinery access, all work will be carried out with hand tools only.	 
Hand tools The contractor will be required to use several specialists hand tools; rake hoe, mattock, shovels, shears, hammers etc. For sections without machinery access, all work will be done with hand tools only.	 
Camping in the field The contractor may be required to camp in the field to reduce travel times to the site each day. Camp management will be consistent with minimal impact camping procedures as recently applied in Kosciuszko National Park. This may include the heli-lifting of materials, including a toilet and small shelter.	 

1.2.5 Carrying out works

The NPWS intend to engage contractors to carry out the majority of the construction phase of the proposed activity, with some work being undertaken by NPWS field staff. It is intended that the regular maintenance of the proposed activity will be carried out by NPWS staff.

1.2.6 Sustainability measures

The proposed activity will be consistent with NPWS policy and best practice procedures in relation to infrastructure design and the sourcing of materials. Design specifications take into account minimal maintenance requirements and minimal use of energy.

1.2.7 Construction timetable and staging, and hours of operation

Work for the proposed activity is scheduled to commence in mid-2021 with the initial focus on the construction of the trail components and the recommissioning of the Oaky Beach Camping Area. Work at Yellow Rock and Maloneys Beach would be undertaken after Summer 2021/22 to minimise disruption to these precincts.

Work will be restricted to standard construction hours:

- Monday to Friday 7.00 am to 6.00 pm.
- Saturdays 8.00 am to 1.00 pm.
- No construction on Sundays or Public Holidays

Work hours at Maloneys Beach will be specified in consultation with local residents.

1.3 Subject site, study area, locality and bioregional context

The 'subject site' is the area to be directly affected by the proposed activity (Department of Environment and Conservation 2004; Office of Environment and Heritage 2018). The subject site is within Murramarang National Park and Murramarang Aboriginal Area. Some areas of the subject site are also within the Batemans Marine Park. For this assessment, the subject site is as follows:

- ***Trail alignment components:*** The trail components of the proposed activity include sections of existing trail, new linking trail sections, upgraded trail sections, beach and rock platform sections and redundant trail sections.
    - ***New linking trail sections and upgraded trail sections:*** These components of the subject site take into account the 600 – 1200 mm width of the proposed trail corridor. This trail alignment component of the subject site equates to approximately 1.90 ha.
    - ***Beaches and rock platform sections:*** The proposed and existing trail alignment across the beaches and rock platforms. It is proposed that visitors walk along the intertidal areas to avoid threatened shorebird nesting habitat on the higher areas. As the width of the intertidal area is not consistent along the coastline, and no spatial layers depicting the intertidal area are available, the subject site for these sections is the same width as the study area (see below, i.e. 21.2 m). The subject site for this trail alignment component amounts to approximately 21.90 ha. These areas do not require any vegetation modification or clearing, or earthworks. However, they are included in this assessment as some sections are known threatened shorebird foraging habitat and/or they are adjacent to known threatened shorebird nesting habitat, and, with formalisation and promotion of the walk, will be subject to increased visitor use.
    - ***Redundant trail sections:*** The redundant trail sections are to be rehabilitated as part of the project over the long-term. The subject site for redundant trail is approximately 0.70 ha.
    - ***Existing trail sections:*** The existing trail sections that will be maintained as part of the Murramarang South Coast Walk. These components of the subject site take into account the 600

– 1200 mm width of the proposed trail corridor. This trail alignment component of the subject site equates to approximately 1.11 ha.

- ***Precinct components:*** The areas requiring works at Maloneys Beach; Yellow Rock; Oaky Beach Camping Area; and Pretty Beach. The proposed precincts are already disturbed, have existing infrastructure and are subject to existing visitor use. However, they are included in this assessment as they will require works such as modification or clearing of ground cover and/or understory vegetation and/or minor earthworks. The subject site for the precincts is less than 0.05 ha.

The total subject site is approximately 23.87 ha.

The 'study area' is the subject site with additional areas that are likely to be affected by the proposed activity, directly and indirectly (DEC 2004; OEH 2018). For this assessment, the study area includes the subject site as described above, the proposed remainder of the precinct areas which total approximately 4.2 ha, and, on advice from the NPWS, 10 metres either side of the off beach/rock platform trail components of the subject site. The total study area for the assessment is approximately 91.83 ha. To assist with defining the track alignment, matters of conservation significance in the immediate surrounds of the study area, i.e. a few metres away, were included in the assessment.

The 'locality' is defined in this assessment as the area of land within a 10 km radius of the subject site.

The assessment also considers the context of the study area in relation to the bioregion. The bioregional approach provides a useful way of understanding and interpreting the biodiversity of an area. Under the Interim Biogeographic Regionalisation of Australia (IBRA), the study area is situated in the Jervis subregion of the Sydney Basin Bioregion and the Bateman subregion of the South East Corner Bioregion.

2 Determining flora and fauna values

2.1 Methods

Determining the existing environment of the study area involved the following methods:

- reviewing relevant literature
- searching government databases for listed matters of conservation significance
- reviewing mapping of vegetation, geology, soils and watercourses
- understanding ecology and distribution of species within the bioregion
- seeking advice from the NPWS
- conducting field surveys and analysing survey results
- evaluating the character of the study area
- evaluating the likelihood of matters of conservation significance to occur

2.2 Database searches, and literature and mapping review

2.2.1 Database searches

Searches of the following databases relating to matters of conservation significance were conducted:

- the NSW Office of Environment and Heritage (OEH) BioNet Atlas for species and populations listed as threatened under the NSW *Biodiversity Conservation Act 2016* (BC Act) recorded for Murramarang

National Park and Murramarang Aboriginal Area (http://www.bionet.nsw.gov.au) (last accessed 1 February 2021)

- the NSW OEH BioNet Atlas for ecological communities listed as threatened under the BC Act recorded for Murramarang National Park and Murramarang Aboriginal Area (http://www.bionet.nsw.gov.au) (last accessed 1 February 2021)
- the Australian Government Protected Matters Search Tool (PMST) for matters of national environmental significance and other matters protected by the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) known or likely to occur within a 10 km radius of the subject site (http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf) (last accessed 1 February 2021)
- the Atlas of Living Australia for records of flora and fauna for the locality (http://www.ala.org.au/) (last accessed 4 February 2021)

Copies of the database search reports from the BioNet Atlas and the PMST are at Appendices C, D, E, F and G.

2.2.2 Literature review

A review of relevant literature was undertaken prior to the field surveys. Key literature reviewed included:

- NSW National Parks and Wildlife Service (1998). *Murramarang Aboriginal Area Plan of Management*. The plan of management provides a broad description of the flora and fauna values of Murramarang Aboriginal Area.
- Nicholas Graham Higgs Pty Ltd (2002). *Murramarang National Park, Brush, Belowla and Tollgate Islands Nature Reserves Vegetation Survey and Mapping*. A report to the NSW NPWS. This report details the surveying and re-mapping of vegetation communities within the national park and surrounding NPWS estate area. It includes maps detailing the vegetation communities of the park. The community types are broadly consistent with those used for the Southern Comprehensive Regional Assessment surveys undertaken in 1999. The report lists Priority Forest Ecosystems for conservation purposes. A hard copy of the report was provided.
- NSW National Parks and Wildlife Service (2002a). *Murramarang National Park, Brush Island Nature Reserve, Belowla Island Nature Reserve and Tollgate Islands Nature Reserve Plan of Management*. The plan of management provides a broad description of the flora and fauna values of Murramarang National Park.
- NSW National Parks and Wildlife Service (2002b). *Review of Environmental Factors – Coastal walking track works Murramarang National Park, Murramarang Aboriginal Area, Meroo National Park, Barnunj State Recreation Area*. The REF was prepared for the construction of most of the existing tracks. It includes database search results and the eight-part test (now five-part test) for threatened species listed under NSW legislation.
- Van der Ree (2002). *Review of information to guide the management of the Squirrel Glider Petaurus norfolcensis population in Murramarang National Park*. A report to the NSW NPWS. This report reviews the research and survey efforts in relation to the threatened Squirrel Glider and recommends research and monitoring actions to inform and improve management to minimise adverse impacts on the habitat of the species.

2.2.3 Mapping review

Numerous maps were reviewed to help develop an understanding of the flora and fauna values of the study area. Maps were reviewed prior to the field surveys, and if available in digital form, were loaded onto the mobile collection app, Collector for ArcGIS, to enable reference and verification in the field.

The following maps were reviewed:

- Google Earth Engine Burnt Area Map (GEEBAM)
- Southeast NSW Native Vegetation Classification and Mapping (SCIVI)
- SEED (The Central Resource for Sharing and Enabling Environmental Data in NSW) Vegetation and EEC Maps
- Verified vegetation maps in Nicholas Graham Higgs Pty Ltd (2002)
- NSW State Environmental Planning Policy (Coastal Management) *Coastal wetlands and littoral rainforest map* (Department of Planning and Environment 2018)
- NSW Resources and Geosciences Ulladulla 1:250 000 Geological Map (Rose 1966)
- Shoalhaven 1: 100 000 and 1: 25 000 Coastal Quaternary Geology Map (Troedson and Hashimoto 2013a)
- Eurobodalla 1:100 000 and 1:25 000 Coastal Quaternary Geology Map (Troedson and Hashimoto 2013b)
- Soil profile mapping under eSPADE (OEH 2019)
- Acid sulfate soils risk mapping (OEH 1998)
- Water Management (General) Regulation 2018 Hydroline spatial data 1.0 for stream orders (Department of Primary Industries 2018)
- Eurobodalla Shire Council's LEP online maps
- Shoalhaven City Council's LEP 2014 online maps
- Coastal Risk Australia 2100 mapping (NGIS 2017)
- Batemans Marine Park Zoning Map

2.3 Ecological field surveys

2.3.1 Survey schedule and objectives

The schedule and objectives of field surveys were as outlined below in Table 2. Consultant ecologists Heather Moorcroft (hjm consulting) and Dave Coombes (Eco Logical Australia) were accompanied on the field surveys in 2020 by the NPWS Senior Project Officer Tom Pinzone, and Biodiversity and Conservation staff Angela Jenkins and Nat O'Rourke of the NSW Department of Planning, Industry and Environment. The effort indicated in the table below is limited to the consultant ecologists' hours.

Table 2: Survey schedule and objectives

Survey type	Objectives	Area surveyed	Dates	Weather conditions *	Effort (person hours)
General diurnal survey	Identify and record: • threatened flora species • threatened	Maloneys Beach to North Head	15/11/2018	Min: 15.2°C Max: 17.9°C Rain: 4.8 mm Rain total for preceding 2 weeks:	15

	fauna species • threatened species habitat Validate existing vegetation mapping including threatened ecological community mapping Assess habitat refugia for post-fire recovery			35.6 mm	
		North Head to Richmond Beach	16/11/2018	Min: 13.4°C Max: 19.4°C Rain: 0 mm Rain total for preceding 2 weeks: 40.4 mm	15
		Richmond Beach to Pebbly Beach	06/12/2018	Min: 14.4°C Max: 22.2°C Rain: 0 mm Rain total for preceding 2 weeks: 91.4 mm	15
		Pebbly Beach to Merry Beach/Pretty Beach	07/12/2018	Min: 16.9°C Max: 24.3°C Rain: 0 mm Rain total for preceding 2 weeks: 91.2 mm	15
		Murramarang Aboriginal Area	13/02/2019	Min: 15.7°C Max: 21.9°C Rain: 0 mm Rain total for preceding 2 weeks: 10.8 mm	3
		Maloneys Beach to North Head	3/12/2020	Min: 15.3°C Max: 21.3°C Rain: 0 mm Rain total for preceding 2 weeks: 9.4 mm	12
		Honeysuckle Beach area, and Oaky Beach area including Oaky Beach Camping Area	4/12/2020	Min: 15.8°C Max: 33.4°C Rain: 0 mm Rain total for preceding 2 weeks: 9.4 mm	12
		Pretty Beach to Pebbly Beach; and Point Upright (Depot Beach Headland)	7/12/2020	Min: 14.1°C Max: 26.9°C Rain: 0 mm Rain: total for preceding 2 weeks: 9.0 mm	10
		Myrtle Beach to Murramarang Resort	8/12/2020	Min: 12.2°C Max: 19.8°C Rain: 0.2 mm Rain total for preceding 2 weeks: 2.2 mm	3

Targeted/ seasonal orchid surveys	Identify suitable habitat, survey and record threatened orchid *Cryptostylis hunteriana* that is known to occur in the locality (and other threatened orchids that may occur in the locality)	Point Upright/Depot Headland	17/01/2019	Min: 21.7°C Max: 27.4°C Rain: 0 mm Rain total for preceding 2 weeks: 17.8 mm	4
		Headland north of Pebbly Beach towards Pebbly Beach North	17/01/2019	Min: 21.7°C Max: 27.4°C Rain: 0 mm Rain total for preceding 2 weeks: 17.8 mm	2

2.3.2 Flora and plant community surveys

General diurnal flora and plant community surveys were completed within the study area using a combination of the parallel field traverse survey technique (see Department of Planning, Industry and Environment 2020) and the random meander survey (Cropper 1993). The surveys followed the alignments, as advised and ground truthed by NPWS, and extended out approximately 10 m either side. The survey was to record any threatened species, identify threatened species habitat, verify vegetation communities and identify plant community boundaries. Flora samples were collected to accurately identify species against reference sources where required.

Vegetation communities in the study area were cross-referenced to vegetation mapping. Discrepancies with the vegetation mapping, particularly in relation to the presence or absence, and boundaries, of Threatened Ecological Communities (TECs) under the BC Act and the EPBC Act, were checked against verified vegetation maps (Nicholas Graham Higgs Pty Ltd 2002), the SEPP Coastal Management: Coastal wetlands and littoral rainforest map (Department of Planning and Environment 2018) and the Southeast NSW Native Vegetation Classification and Mapping - SCIVI VIS_ID 2230 20030101S (Department of Environment, Climate Change and Water 2010), based on Tozer *et al*. (2010).

During the 2018/2019 general diurnal flora and plant community surveys, numerous non-threatened orchid species *Cryptostylis subulata* (Large Tongue Orchid) and/or *C. erecta* (Tartan Tongue Orchid) were observed in three locations within the study area. The cryptic threatened species *C. hunteriana* (Leafless Tongue Orchid) is often associated with these species (OEH 2017b), and, taking the dominant plant community type into account, two of the three locations within the study area were identified as having suitable habitat for the Leafless Tongue Orchid: Depot Headland north from Point Upright, and the headland immediately north of Pebbly Beach. Additional targeted surveys were carried out for the Leafless Tongue Orchid at these two locations when the species was known to be in flower at nearby reference sites within the southern Shoalhaven LGA (Meroo National Park and Sussex Inlet). The targeted orchid surveys combined parallel field traverses with random meanders.

The Large Tongue Orchid and/or Tartan Tongue Orchid were observed during the 2020 general diurnal flora and plant community surveys. As these surveys coincided with known flowering of the cryptic threatened Leafless Tongue Orchid in the region, additional targeted surveys were not carried out in these areas.

2.3.3 Fauna and habitat surveys

Diurnal fauna surveys were conducted of the study area in association with the flora and plant community surveys. As the type and condition of habitat in an area influences the diversity and abundance of fauna (DEC 2004), the diurnal fauna surveys also included a habitat search. The study area was traversed to identify habitat components, particularly for breeding, sheltering and foraging resources. These components were recorded and described and included information on the type of vegetation present and the presence and/or absence of tree hollows, streams, foraging substrates, rocky outcrops, beach and rock platform environments and other features likely to attract threatened fauna. Characteristic signs supporting the presence of threatened fauna such as feeding signs, nests, dens, scats, cough pellets, whitewash and diggings were also sought during the survey. The results of the habitat search were incorporated in the evaluation of likelihood occurrence to help predict whether threatened fauna is likely to occur or have potential to occur in the study area.

2.4 Likelihood of occurrence

Using data obtained from the methods above, an evaluation on the likelihood of ecological matters of conservation significance occurring in the study area was carried out. The evaluation was based on:

- identification of species, habitat and vegetation communities during field surveys
- records of threatened entities for the locality and/or study area identified from database searches
- advice from NPWS staff
- bioregional particulars for species including distribution
- preferred habitat and ecology of species and communities
- geological mapping for plant community verification

The following five categories for the likelihood of occurrence evaluation are used in this report:

- 'yes' = the matter of conservation significance was or has been observed in the study area or immediate surrounds
- 'likely' = there is a medium to high probability that the matter of conservation significance uses or occurs in the study area or immediate surrounds
- 'potential' = suitable habitat/plant community type for the matter of conservation significance occurs in the study area, but there is insufficient information to categorise the matter of conservation significance as likely or unlikely to occur
- 'unlikely' = there is a low to very low probability that the matter of conservation significance uses or occurs in the study area or immediate surrounds
- 'no' = the habitat/environment within the study area or immediate surrounds is unsuitable for the matter of conservation significance

Likelihood of occurrence for threatened species and threatened ecological communities are at Appendix H and Appendix I. Those matters of conservation significance that are known, likely or have potential to occur within the study area are subject to statutory impact assessments as required under relevant legislation, both NSW and Commonwealth. The precautionary principle was applied to determine if a matter of conservation significance occurred in the study area. Therefore, even if the potential for a matter of conservation significance was low then it was included in the assessment.

2.5 Limitations

2.5.1 Spatial data inconsistencies

Multiple spatial data sets have been used for this assessment. The spatial data for the proposed activity was provided by the NPWS. The trail alignment does not always exactly match with existing aerial photography. Spatial data for the plant community types, mapped threatened ecological communities (TECs) and threatened species are from public domains such as NSW Government's central resource for Sharing and Enabling Environmental Data (SEED). The mapping of these layers does not always align with on-ground occurrences i.e. patches of a threatened ecological community or a record for threatened terrestrial fauna record are mapped immediately off-shore. The spatial data for the Currowan Fire Footprint has been sourced from the NPWS fire history layer. The data was originally captured by the Rural Fire Service during the 2019/2020 bushfire season and has been given an accuracy rating of *Fair* by NPWS.

2.5.2 Field surveys

The results of flora and fauna surveys can be optimised by conducting investigations using multiple methods over the longest practicable period. This approach is more likely to compensate for the effect of unfavourable weather, seasonal changes, and climatic variation than surveys over a shorter period. In general, the longer the survey period the more species will be detected. However, due to time constraints and the scope of the project, the presence of fauna species, particularly threatened fauna species known or likely to occur, has been assumed where suitable habitats or resource features occur within the study area. Adoption of the precautionary approach in context of the survey effort and methods applied is considered adequate to gather the data necessary to assess the impacts of the proposed activity on the flora and fauna found in the study area.

2.5.3 Plant community determination

The precautionary approach was also adopted for determining plant community types and TEC occurrence. Determining where one community finishes and another community starts can be complex. Existing mapping of plant communities was not at a scale appropriate to help with this determination, and on occasion the mapping was found to be inaccurate with mapped communities not consistent with communities observed during the field surveys. Despite this, the most accurate digital mapping available was the Shoalhaven and Eurobodalla BioMetric Vegetation Mapping (OEH 2013), and it is this mapping that is used in the assessment. Detailed floristic surveys including condition assessment and soil sampling were not conducted for this assessment.

3 Existing environment

3.1 Topography and geology

The study area falls from a maximum height of approximately 40 m ASL to sea level, with most of the study area being less than 15 m ASL. The study area is undulating, rising over headlands and falling to beaches and includes small drainage lines, all of which are thought to be ephemeral.

Three geological formations are mapped at 1:250,000 for the study area. Murramarang Aboriginal Area is Termeil Essexite from the Mesozoic period. In the central part of the study area, from Merry Beach to Dark Point, the geology is Permian sedimentary beds of siltstone, sandstone and conglomerate. In the southern part of the study area, between Maloneys Beach and Dark Point, the Permian sedimentary beds are over Wagonga Beds of chert, conglomerate, agglomerate, slate, sandstone and phillite of the early Ordovian period. Quaternary soils are mapped for the beaches and other low-lying areas. These soils can also be found on some headlands.

3.2 Flora and plant communities

3.2.1 Vegetation and plant community types

The study area has been subject to logging activities in the past, and there are existing vehicle tracks and walking tracks, some of which are part of the proposed activity. Despite this history, the vegetation is predominantly intact. At a broad formation scale, the vegetation communities of the study area are made up of wet and dry forest, woodland, coastal scrub and littoral rainforest. These formations are relatively common across the locality, with forest communities dominant.

Plant community types observed within the study area regularly intergrade into one another, creating an ecotone between adjacent communities. Determining where one community finishes and another community starts proved complex, and the boundaries on existing community mapping were not consistent with boundaries in the field. Also, some communities that were observed in the field at particular locations were not shown as occurring in that location on the existing mapping.

Without detailed floristic surveys that include condition assessments and soil sampling, the presence and distribution of plant community types in the study area remains approximate. However, the mapping is adequate for the purposes required for this assessment in relation to threatened species and ecological communities. The plant community types and their estimated extent in the study area are shown in tables 3, 4 and 5.

Table 3: Plant community types for new and upgraded trail sections of the study area

Plant Community Type (PCT)	Approx. extent in study area (ha)
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	9.10
Bracelet Honey-myrtle - Coast Tea-tree tall shrubland on headlands, South East Corner Bioregion	5.65
Coast Banksia – Coast Tea-tree low moist forest on coastal sands and headlands, Sydney Basin Bioregion and South East Corner Bioregion	0.02
Coast Banksia - Coast Wattle dune scrub, Sydney Basin Bioregion and South East Corner Bioregion	0.61
Hairpin Banksia – Slender Tea-tree heath on coastal sandstone plateaux, Sydney Basin Bioregion	0.31
Lilly Pilly - Coachwood gully warm temperate rainforest on sandstone ranges of the Sydney Basin Bioregion	0.35
Mountain Grey Gum - Yellow Stringybark moist shrubby open forest in gullies of the coastal ranges, northern South East Corner Bioregion	0.21
Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	4.16
Spotted Gum - White Stringybark - Burrawang shrubby open forest on hinterland foothills, northern South East Corner Bioregion	22.1
Swamp Paperbark – swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	0.12

Note: Areas above rounded to the nearest hundredth of a hectare.

Table 4: Plant community types for the redundant trail sections of the study area

Plant Community Type (PCT)	Approx. extent in study area (ha)
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	1.58
Bracelet Honey-myrtle - Coast Tea-tree tall shrubland on headlands, South East Corner Bioregion	0.28
Coast Banksia - Coast Wattle dune scrub, Sydney Basin Bioregion and South East Corner Bioregion	0.03
Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	1.97
Spotted Gum - White Stringybark - Burrawang shrubby open forest on hinterland foothills, northern South East Corner Bioregion	8.62

Note: Areas above rounded to the nearest hundredth of a hectare.

Table 5: Plant community types for precinct components of the study area

Plant Community Type (PCT)	Approx. extent in study area (ha)
Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin Bioregion and South East Corner Bioregion	0.33
Mountain Grey Gum - Yellow Stringybark moist shrubby open forest in gullies of the coastal ranges, northern South East Corner Bioregion	1.41
Spotted Gum - White Stringybark - Burrawang shrubby open forest on hinterland foothills, northern South East Corner Bioregion	2.46

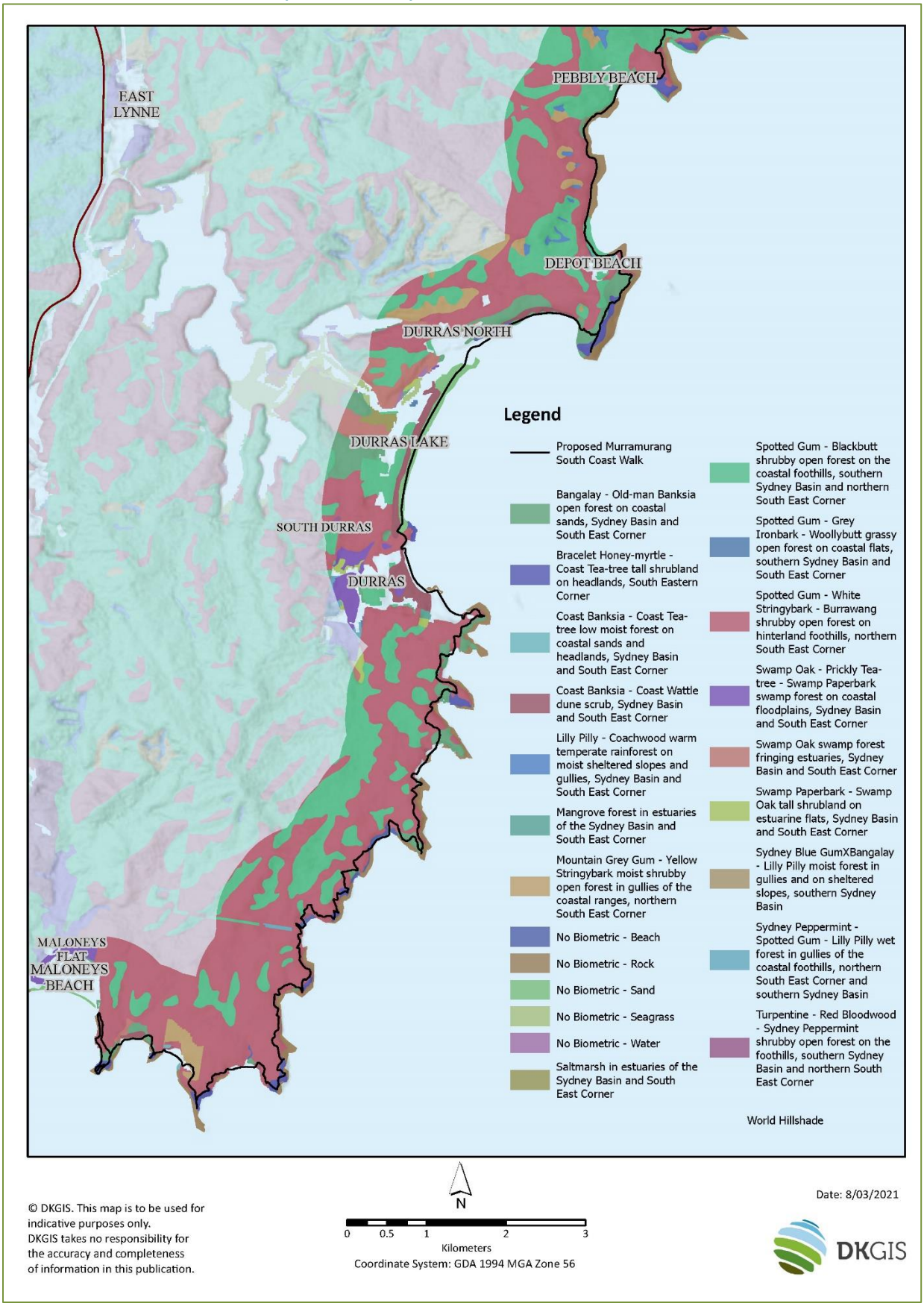
Note: Areas above rounded to the nearest hundredth of a hectare.

Plant communities for the study area shown in maps 8 and 9.

Figures 33 to 35 show images of some of the vegetation within and adjacent to the study area.

Figure 33: Spotted Gum - White Stringybark – Burrawang shrubby open forest

Map 8: Plant communities of the southern parts of the study area



Map 9: Plant communities of the northern parts of the study area

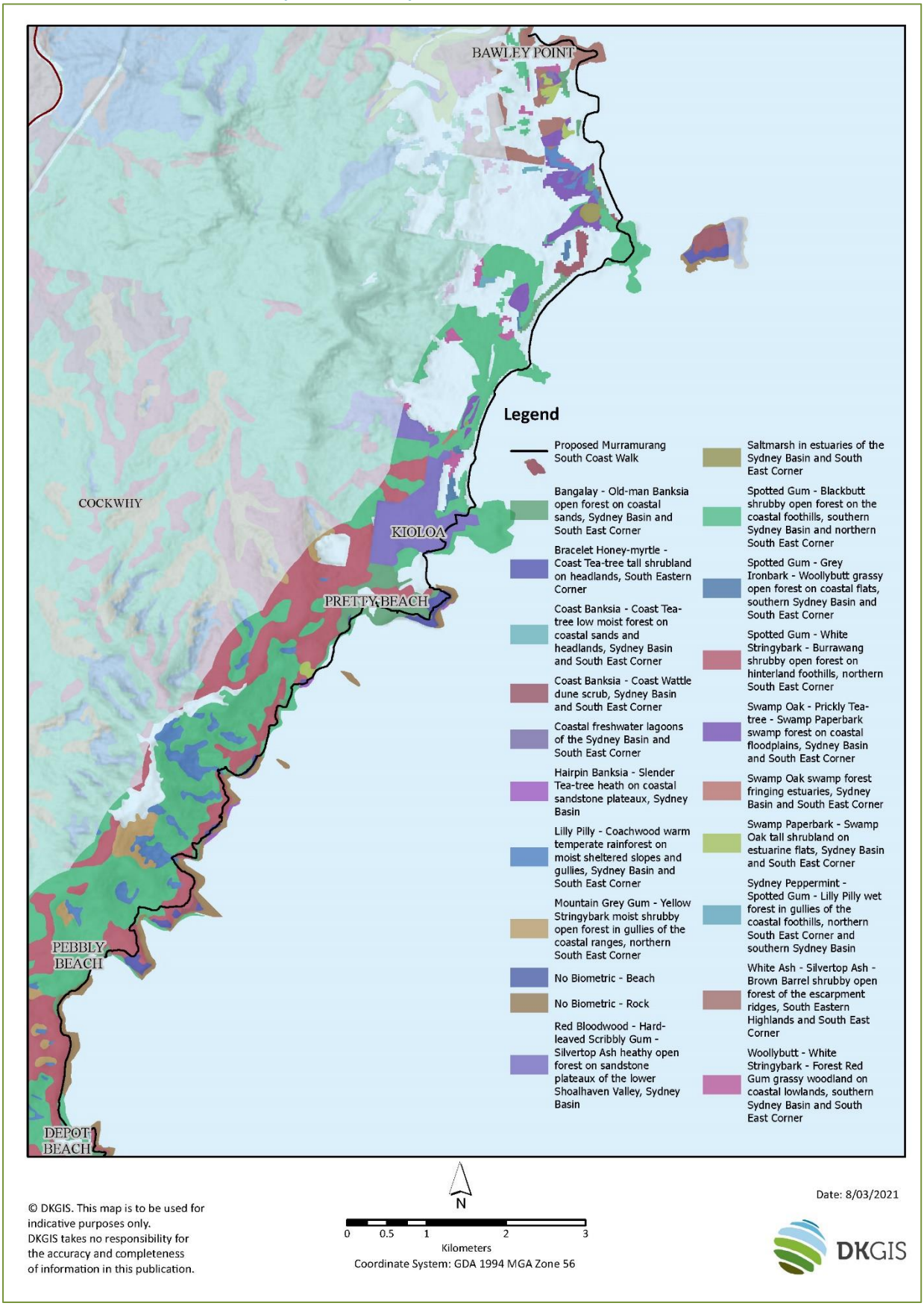


Figure 34: Potential Swamp Oak Floodplain Forest adjacent to study area near Maloneys Beach

Figure 35: Spotted Gum - White Stringybark - Burrawang shrubby open forest integrating with Bangalay - Old-man Banksia open forest on coastal sands - Depot Headland pre-fire

3.2.2 Flora of conservation significance

A report generated from the NSW OEH BioNet Atlas returned a total of three threatened plant species recorded for Murramarang National Park (see Appendix C). A report generated from the NSW OEH BioNet Atlas returned a total of no threatened plant species recorded for Murramarang Aboriginal Area (see Appendix D). A report generated from the Australian Government's Protected Matters Search Tool for matters of national environmental significance and other matters protected by the EPBC Act returned a total of 14 threatened plant species or their habitat that are known, likely or may occur within the locality (see Appendix E).

The field surveys, which included targeted orchid surveys, found no threatened flora in the study area. The likelihood of occurrence evaluation of species of conservation significance (see Appendix H) identified one threatened flora species as occurring or potentially occurring within the study area: *Rhodamnia rubescens* (Scrub Turpentine).

3.3 Ecological communities of conservation significance

A report generated from the NSW OEH BioNet Atlas returned eleven TECs listed under the BC Act for Murramarang National Park (see Appendix F). A report generated from the NSW OEH BioNet Atlas returned ten TECs listed under the BC Act for Murramarang Aboriginal Area (see Appendix G). A report generated from the Australian Government's Protected Matters Search Tool for matters of national environmental significance and other matters protected by the EPBC Act returned a total of seven TECs that are likely to occur in the locality (see Appendix E).

The likelihood of occurrence evaluation of ecological communities of conservation significance (see Appendix I) identified four TECs as potentially occurring within, or associated with, the study area. The occurrence of these communities within the study area cannot be verified without further investigation of condition assessment and soil sampling. However, for the purposes of this assessment they are mapped as potentially occurring.

Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions (NSW TEC)

This TEC potentially occurs in numerous sections of the study area. The environment where it potentially occurs suggests that it prefers undulating slopes, often very close to the coastline. Potential occurrence in the study area was determined by the presence of Bangalay (*Eucalyptus botryoides*), Old-man Banksia (*Banksia serrata*) and Coast Banksia (*Banksia integrifolia* subsp. *integrifolia*). Blackbutt (*Eucalyptus pilularis*), which can be a characteristic dominant canopy species of this community, was rarely observed within the study area during the field surveys. The existing BioMetric mapping did not accurately reflect the presence or absence of this community in some sections of the study area. However, all areas, except for one, shown as Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions TEC on existing BioMetric mapping have been considered as potentially occurring, despite the absence of characteristic canopy species. The one exception is the Maloneys Beach precinct which is mapped as this TEC. The native vegetation in the area that remains has no characteristics species of the TEC yet has characteristics of the Commonwealth's equivalent TEC to Swamp Oak Floodplain Forest TEC (see below). Following the field surveys additional areas of this community have been added as potentially occurring.

Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC)/Littoral Rainforest and Coastal Vine Thicket of eastern Australia (Commonwealth TEC)

This TEC potentially occurs in small patches within or adjacent to the study area. The patches mapped as potential Littoral Rainforest TEC are: east of Three Islet Point near Yellow Rock; Snake Bay; behind Oaky Beach; adjacent to Depot Beach; and adjacent to the Snapper Point Walking Track at Pretty Beach. Potential occurrence of the TEC was determined by landform, a closed forest canopy, the presence of key canopy species such as Lilly Pilly (*Syzygium smithii)* and Cabbage-tree Palm (*Livistona australis*) and Coachwood (*Ceratopetalum apetalum*), and existing mapping. The existing BioMetric mapping did not accurately reflect the presence or absence of this community. However, all areas on the existing BioMetric mapping shown as this TEC have been considered as potentially occurring. In addition, areas mapped as Littoral Rainforest under the SEPP Coastal Management (Department of Planning and Environment 2018) have been considered as potentially occurring.

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC)/Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community (Commonwealth TEC)

This TEC potentially occurs in three locations in the study area in the Maloneys Beach vicinity. These potential occurrences are in low-lying areas close to or behind the beach. Potential occurrence was determined by existing

BioMetric mapping, landform, soil mapping and the presence of *Casuarina glauca* (Swamp Oak) observed during field surveys. One is a stand in the middle of the Maloneys Beach precinct. Another is nearby on a narrow dune terrace east of the commencement of the trail along the shoreline (see Figure 34), with the terrain rising steeply behind the *C. glauca* stand. Neither of these areas are shown as Swamp Oak Floodplain Forest TEC on existing BioMetric mapping. While the vegetation is generally consistent with the TEC determination (NSW Scientific Committee 2011), the soils and landform do not appear to meet NSW criteria. However, the soils and landforms do appear to meet the EPBC Act criteria being a minor occurrance on a dune flat, and meeting the minimum patch size (Commonwealth Threatened Species Scientific Committee 2018). Therefore, in the absence of vegetation condition assessments, including soil sampling, this community is considered as potential Swamp Oak Floodplain Forest for this assessment. The next beach east also has a low-lying area of *C. glauca*. This area is shown as Swamp Oak Floodplain Forest on the BioMetric mapping and extends along drainage lines behind the beach. In the absence of vegetation condition assessments, including soil sampling, this community is also considered as potential Swamp Oak Floodplain Forest TEC for this assessment.

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC)

This TEC is identifed in the BioMetric vegetation mapping as occuring in one location in the study area; near the southern end of Island Beach, above the rock platform. Field surveys could not verify this community as many characteristic species were not observed. However, adopting the precautionary approach, this TEC is considered as potentially occuring.

3.4 Fauna and fauna habitats

3.4.1 Fauna habitats

The potential habitat of the study area, particularly in relation to breeding, foraging, and sheltering habitat for threatened fauna species, is considered in Table 6 below.

Table 6: Habitat evaluation summary

Habitat component	Evaluation	Habitat values or limitations
Logs and debris	Logs are present in the study area. They range in size from small fallen branches of < 20 cm to large logs 50 – 100 cm lying on the ground, the latter of which are uncommon. Some of these are hollowed out. There are also stumps remaining from previous forestry activity.	Large logs, which are limited, provide foraging substrate for vertebrate prey such as small rodents, mammals and reptiles. There is limited sheltering and denning resources for *Dasyurus maculatus* (Spotted-tailed Quoll), *Cercartetus nanus* (Eastern Pygmy Possum) and *Sminthopsis leucopus* (White-footed Dunnart).
Burrowing substrate	The study area generally has sandy soils which appear well drained.	Potential for burrowing species such as bandicoots.
Leaf litter	The leaf litter in the study area ranges from very deep of more than 5 cm in woodlands and forest communities, to absent on rock platforms/rocky shorelines.	Potential to provide sheltering and foraging resources for a range of common species, such as a range of common reptile, amphibian and invertebrate and fungi species.
Groundcover	The ground cover in the study area ranges from very thick, particularly in heath/woodland areas, to absent on rock platforms/rocky shorelines.	Potential to provide cover for small mammals, reptiles, birds and frogs. The areas where there is a mix of patchy ground cover with open spaces may be habitat for granivorous species such as parrots, pigeons, finches, doves, as well as for Long-nosed Potoroo

Habitat component	Evaluation	Habitat values or limitations
		(*Potorous tridactylus tridactylus*) *and* White-footed Dunnart.
Beaches	The study area includes numerous beaches. Some of these are large beaches with areas that would not be subject to regular inundation from high tides.	A number of beaches are known nesting and foraging habitat for threatened shorebirds such as *Haematopus longirostris* (Pied Oystercatcher) and *Thinornis rubricollis* (Hooded Plover).
Rocky outcrops, shelves etc.	The study area includes rock platforms/rocky shorelines. Small rocky outcrops and shelving are also present upstream on some of the small watercourse gullies, but these are limited in their extent.	The rocky shorelines are known foraging habitat for shorebirds like *Haematopus fuliginosus* (Sooty Oystercatcher) and Pied Oystercatcher. Potential sheltering and basking sites for rock-dependent species that can tolerate salt spray.
Culverts, caves, cliffs, abandoned structures	The study area does not incorporate coastal cliffs, or overhangs/caves that are at the back of a few beaches.	Lack of habitat for obligate bats and other species that may use caves for denning e.g. Spotted-tailed Quoll.
Nectar sources	The study area has a range of nectar sources, including: *Banksia ericifolia* (Heath-leaved Banksia), Coast Banksia, Old-man Banksia, *Corymbia maculata* (Spotted Gum), *E. globoidea* (White Stringybark), *E. paniculata* (Grey Ironbark) and *E. tereticornis* (Forest Red Gum).	Range of canopy nectar sources preferred by arboreal mammals including threatened species such as *Petaurus australis* (Yellow-bellied Glider), *Petaurus norfolcensis* (Squirrel Glider), Eastern Pygmy Possum, and *Pteropus poliocephalus* (Grey-headed Flying-fox). Includes key wintering flowering nectar sources for seasonal migrants such as *Lathamus discolor* (Swift Parrot).
Sap, gum and lerp sources	The study area has sap trees e.g. Spotted Gum and Forest Red Gum. Lerps are common in eucalypt species found within the study area.	Preferred sap source trees for Squirrel Glider and Yellow-bellied Glider are present, although no typical incisions were observed during field surveys. Eucalypts with lerps preferred by Swift Parrot.
Koala browse species	Scattered presence of a Primary Koala Feed Tree, Forest Red Gum mostly in the southern sections of the study area, being rare elsewhere. Range of vegetation communities in study area.	Two vegetation communities that occur in the study area (*Spotted Gum - White Stringybark - Burrawang shrubby open forest on hinterland foothills, northern South East Corner* and *Lilly Pilly - Coachwood warm temperate rainforest on moist sheltered slopes and gullies*), are known *Phascolarctos cinereus* (Koala) vegetation communities. However, the study area has only scattered and limited presence of only one primary feed tree species and no records. No sightings or evidence of Koalas observed during field surveys. BioNet search shows limited records for the locality with closest record more than 10 years old.
Woody cones/seeds	*Allocasuarina littoralis* (Black She-oak) and *A. distyla* (Scrub She-oak) present. Numerous *Acacia* species also present in study area.	Foraging resources for *Calyptorhynchus lathami* (Glossy Black-Cockatoo) and *Callocephalon fimbriatum* (Gang-gang Cockatoo). One Allocasuarina feed tree of Glossy Black-Cockatoo with chewed cones was noted in study area near the beginning of the track near Maloneys Beach precinct.

Habitat component	Evaluation	Habitat values or limitations
Fruiting species	Some rainforest patches, mainly in gullies, with fruiting species such as *Syzygium smithii* (Lilly Pilly) and Cabbage Tree Palm.	Resources in study area for foraging for threatened frugivores such as Grey-headed Flying Fox and Eastern Pygmy Possum. However, these foraging resources are very limited in their extent.
Tree hollows and decorticating bark	The canopy tree species that are present in the study area do provide decorticating bark but not extensively. Many hollow-bearing trees are present in the study area (including one hollow-bearing tree at a proposed walk-in camp site at Oakey Beach Camping Area). These trees have a range of aperture sizes, although there are few very large hollows.	The tree hollows in the study area may offer potential roost and nest sites for a range of microbats, but the smaller aperture size of most hollows, the angle, low height and exposed location of most hollows in most areas, limits the suitability for threatened species such as Greater Gliders, Yellow-bellied Gliders, cockatoos and large forest owls.
Passerine bird habitat	Varied shrub layer across study area with some grassy woodland offers passerine bird habitat.	Potential for threatened passerines.
Aquatic	The study area contains a small number of ephemeral freshwater aquatic habitats associated with small drainage lines. Much of the study area is immediately adjacent to, or in some sections e.g. on the beaches and rock platforms, within the Batemans Marine Park – which extends to the mean high-water mark. The study area contains a small section of estuarine aquatic habitat near Maloneys Beach where, under the proposed activity, there is an option for visitors to walk along the foreshore on low tide. The study area includes a number of small an intermittently open and closed lagoons.	Study area has no significant potential breeding habitat for *Litoria aurea* (Green and Golden Bell Frog). Only small ephemeral creeks. No waterfowl habitat or foraging habitat for *Myotis macropus* (Southern Myotis). Threatened shorebird habitat within study area (see above). Limited threatened wader habitat within study area. The study area traverses intertidal area of the Batemans Marine Park - Murramarang Coast Special Purpose Zone from north of Pebbly Beach to O'Hara Island. No fishing is permitted in the Special Purpose Zone, except for commercial abalone collecting.
Prey abundance and diversity	Ground cover ranging from limited to thick in study area suggests constraints for predators for ground dwelling species with arboreal species more like to be prey.	Study area may form part of larger foraging territory for range of species.

Images of potential threatened fauna habitat features within the study area are shown in figures 36 to 40.

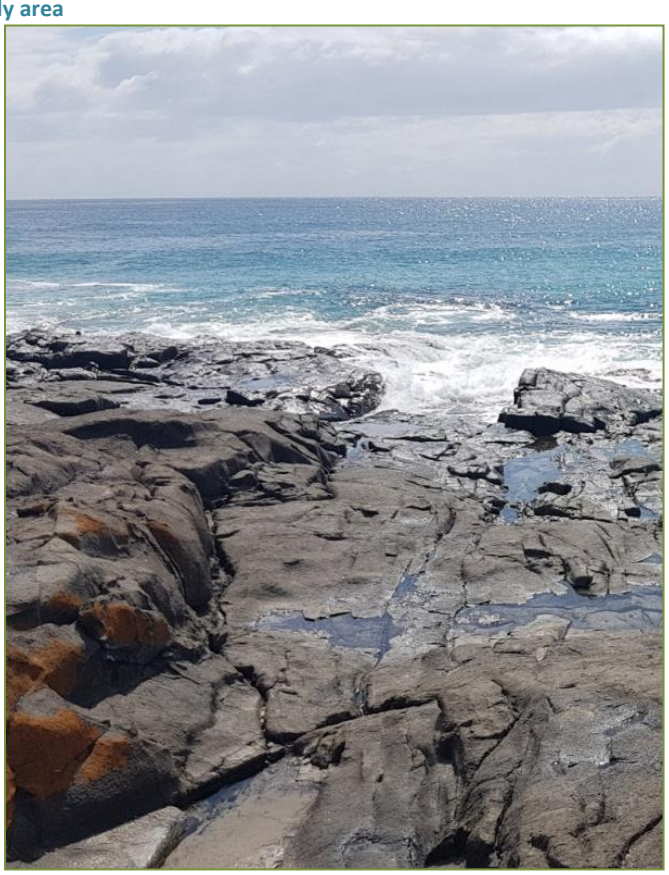
Figure 36: Sandy beach in study area

Figure 37: Hollow-bearing tree in study area

Figure 38: Hollow-bearing tree in study area

Figure 39: Hollowed log in study area

Figure 40: Rocky shoreline in study area



3.4.2 Fauna of conservation significance

A report generated from the NSW OEH BioNet Atlas returned a total of 42 threatened fauna species recorded for Murramarang National Park (see Appendix C). A report generated from the NSW OEH BioNet Atlas returned a total of three threatened fauna species recorded for Murramarang Aboriginal Area (see Appendix D). A report generated from the Australian Government's Protected Matters Search Tool (PMST) for matters of national environmental significance and other matters protected by the EPBC Act returned a total of returned a total of 63 threatened fauna species or their habitat and 61 listed migratory species that are known to occur, are likely to occur or may occur for the locality (see Appendix E). Review of Atlas of Living Australia records and additional mapping showed additional species not included in BioNet or PMST search result reports.

Threatened and migratory fauna recorded or likely to occur in the locality due to suitable habitat were evaluated for potential to occur in the study area (see Appendix H). Species that are solely dependent on marine environments, such as cetaceans, fish and marine turtles, and seabirds that are dependent on marine environments and offshore islands such as shearwaters, albatross and petrels etc, were omitted from the occurrence evaluation due to lack of suitable habitat in the study area. The evaluation identified 37 listed threatened fauna species, one of which is also an endangered population, and eight listed migratory fauna species as occurring or potentially occurring within the study area. These species are listed below in Table 7.

Table 7: Fauna of conservation significance that occur or potentially occur in the study area

Scientific name	Common name	BC Act	EPBC Act
Anthochaera phygia	Regent Honeyeater	CE	CE
Arctocephalus pusillus doriferus	Australian Fur-Seal	V	-
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-
Calamanthus fuliginosus	Striated Fieldwren	E	-
Calidris acuminata	Sharp-tailed Sandpiper	-	M
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-
Cercartetus nanus	Eastern Pygmy Possum	V	-
Charadrius bicinctus	Double-banded Plover	-	M
Cuculus optatus	Oriental Cuckoo	-	M
Daphoenositta chrysoptera	Varied Sittella	V	-
Dasyurus maculatus	Spotted-tailed Quoll	V	E
Esacus magnirostris	Beach Stone-curlew	CE	M
Glossopsitta pusilla	Little Lorikeet	V	-
Haematopus fuliginosus	Sooty Oystercatcher	V	-
Haematopus longirostris	Pied Oystercatcher	E	-
Haliaeetus leucogaster	White-bellied Sea-eagle	V	-
Hieraaetus morphnoides	Little Eagle	V	-
Hirundapus caudacutus	White-throated Needletail	-	M
Lathamus discolor	Swift Parrot	E	CE
Lophoictinia isura	Square-tailed Kite	V	-
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V	-
Monarcha melanopsis	Black-faced Monarch	-	M
Mormopterus norfolkensis	Eastern Freetail Bat	V	-
Myiagra cyanoleuca	Satin Flycatcher	-	M
Ninox connivens	Barking Owl	V	-
Ninox strenua	Powerful Owl	V	-

Onychoprion fuscata	Sooty Tern	V	-
Petauroides volans	Greater Glider	EP	V/EP
Petaurus australis	Yellow-bellied Glider	V	-
Petaurus norfolcensis	Squirrel Glider	V	-
Petroica boodang	Scarlet Robin	V	-
Petroica phoenicea	Flame Robin	V	-
Phascogale tapoatafa	Brush-tailed Phascogale	V	-
Phascolarctos cinereus	Koala	V	V
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	V	V
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Rhipidura rufifrons	Rufous Fantail	-	M
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-
Sminthopsis leucopus	White-footed Dunnart	V	-
Sternula albifrons	Little Tern	E	-
Thinornis rubricollis	Hooded Plover	CE	V
Tyto novaehollandiae	Masked Owl	V	-
Tyto tenebricosa	Sooty Owl	V	-

CE = Critically Endangered; E = Endangered; EP = Endangered population; V = Vulnerable; M = Migratory

3.5 Riparian corridors

Consistent with NPWS policy, and the *Guidelines for controlled activities on waterfront land – riparian corridors* (Department of Industry 2018), this assessment considers riparian corridors within the study area.

A riparian corridor is the zone between the terrestrial environment and a watercourse or aquatic environment. They perform a range of important environmental functions such as providing habitat diversity for terrestrial, riparian and aquatic flora and fauna and connecting fauna habitats. Protecting riparian corridors assists in maintaining the ecological function of a watercourse or aquatic environment. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary (Department of Industry 2018). The width of the riparian corridor buffering waterfront land, including the watercourse channel (bed and banks), and the vegetated riparian zone is pre-determined according to the watercourse order under the Strahler System.

There are numerous watercourses that traverse the study area. These are considered 'rivers' under legislation and hence the adjoining areas are waterfront land. The relevant 1:25,000 topographic map confirms that the

watercourses include 1st, 2nd and 3rd order streams. The riparian corridors for these are streams are 10 m, 20 m and 30 m respectively, either side of the channel plus the channel width.

3.6 Wetlands

Clyde River Estuary, which is adjacent to the study area near the commencement of the proposed walk at Maloneys Beach, is a Nationally Important Wetland. The wetland is considered to be a representative example of estuarine wetland on the south coast. There are no Wetlands of International Importance in or near the study area.

SEPP 14 Wetlands is now covered by the SEPP Coastal Management 2018. An area behind the village of Maloneys Beach, an area inland from the village of South Durras and Lake Durras are mapped as a Coastal Wetland (and/or Proximity of Coastal Wetland). The Maloneys Beach and the South Durras Coastal Wetlands are inland from the study area. The Durras Lake Coastal Wetland is mapped as upstream of the lake opening, above the intertidal zone along the beach. There are no Coastal Wetlands mapped under SEPP Coastal Management 2018 in the study area.

3.7 Post-fire habitat refugia

The Currowan Fire impacted the study area. Unburnt areas of habitat in and around the study area may have experienced an influx of some fauna species from burnt areas. Any such changes are expected to be temporary as habitat in burnt areas recovers and was not obvious in and around the study area during the fieldwork. No areas were recognised as post-fire refugia habitat needing additional protection considering the minimal and linear nature of ground cover and understory habitat to be affected by the proposed activity.

3.8 Marine environment of Batemans Marine Park

The Batemans Marine Park adjoins, and sometimes, overlaps, the study area. The Marine Park extends from the three-nautical-mile offshore limit of NSW waters to the mean high-water mark. The Marine Park has a "large expanses of rocky reef that support a diverse array of fish, invertebrates and algae. Rocky shores, offshore rocky reefs, kelp beds, seagrasses, mangroves, sponge gardens, sandy beaches, estuaries and open waters are key habitats." (Department of Primary Industries n.d.). Zoning applies in the Marine Park. The zoning that applies along the Murramarang coastline is detailed in Table 8.

Table 8: Batemans Marine Park zoning applicable to the Murramarang coastline

Zone	Description	Activity
General Use Zone	Provide for a wide range of environmentally sustainable activities.	Recreational and commercial activities (including recreational and commercial fishing), scientific research and educational activities.
Habitat Protection Zone	Protect physical and biological habitats by reducing high impact activities.	Recreational and commercial activities (including recreational fishing and some forms of commercial fishing), scientific research, educational activities and other activities.
North Head Habitat Protection Zone (Restricted)	Protect physical and biological habitats by reducing some high impact activities.	Shore-based recreational line fishing permitted. No other type of fishing or collecting allowed.

Murramarang Coast Special Purpose Zone	Provide high level of biodiversity conservation whilst allowing for the sustainable commercial harvest of abalone in areas of critical importance to the abalone fishery in the marine park.	No taking or attempting to take fish except harvesting in the course of commercial fishing of abalone.

4 Constraints analysis

Considering the flora and fauna values outlined above, particularly matters of conservation significance, there are several constraints to the proposed activity. There are constraints that are species or habitat specific which apply across much of the study area e.g. hollow-bearing trees, as well as constraints that are specific to certain locations e.g. threatened shorebird habitat. The constraints are described below and, where possible, shown on maps 10 to 33. The study area mapped for these constraints are the main components of the proposed activity. They do not include the redundant trail alignments as these components are already disturbed.

4.1 Hollow-bearing trees and hollowed logs

The field surveys identified many hollow-bearing trees and numerous hollowed logs within the study area. The hollow-bearing trees are predominantly within the forest communities. The majority of these hollow-bearing trees have potential to be used as habitat by a range of fauna. Most of the hollows would not be considered optimal habitat for fauna of conservation significance, such as forest owls, cockatoos, gliders and bats, because of the size of the aperture, the angle of the hollow, low hollow height and hollow exposure/location. However, adopting the precautionary approach, they are considered constraints to the proposed activity. Although mature canopy trees will not be cleared as part of the proposed activity, hollow-bearing trees are still considered a constraint as the fauna that utilise the hollows may be subject to indirect impacts associated with the proposed activity e.g. from anthropogenic disturbances.

Fallen timber and tree stumps with hollows were also observed within the study area, although little in number. The hollows observed in these resources were not considered optimal habitat for threatened species. However, adopting a precautionary approach, they are considered constraints to the proposed activity.

4.2 Threatened fauna feed trees

There are numerous flora species within the study area that are preferred foraging habitat for a number for threatened species. These species include canopy and understory species such as Spotted Gum, various eucalyptus species and banksias. These flora species are considered constraints to the proposed activity.

As well as the above general flora constraints, there are two flora species in particular that occur in the study area which may be important habitat resources for fauna species of conservation significance. During the field surveys one active Glossy Black-Cockatoo feed tree, a Black She-oak, was recorded within the study area. This feed tree is located adjacent to the proposed trail alignment immediately after the commencement of the track at Maloneys Beach. No other Glossy Black-Cockatoo feed trees were observed in the study area. This tree, and any other seed-bearing Black She-oak that are within the study area or nearby, are considered constraints to the proposed activity.

The Koala feed tree, Forest Red Gum, is scattered in low numbers within the study area, mostly in the forest communities in the southern sections. Even though Koala records are in low numbers in the locality, and the

study area is part of a larger area of forest communities with more potential Koala habitat, this flora species is considered a constraint to the proposed activity.

4.3 Threatened shorebird habitat

Threatened shorebirds *Thinornis rubricollis* (Hooded Plover) and *Haematopus longirostris* (Pied Oystercatcher) are known to nest and forage along the Murramarang coastline, including in the study area. Sooty Oystercatchers are known to nest outside of the study area on the Murramarang offshore islands e.g. Brush Island, and forage on rock platforms nearby including those within the study area.

NPWS staff and dedicated local volunteers have carried out a longitudinal monitoring program for the threatened shorebirds during the nesting season between August and February/March. The program has included twice weekly monitoring of the beach sections between Pretty Beach and Dawson Beach from 2006 to 2015, and then once per week; regular, i.e. at least four times per week, monitoring of the Durras Lake Entrance area since the early 2000s; and one season at Oaky Beach. Key metrics collected as part of the monitoring program are: numbers of breeding pairs; number of fledglings; and percentage of breeding pairs impacted by critical threats.

Hooded Plovers have been recorded nesting within the study area at Dawsons Beach and Island Beach, and adjacent to the study area at Durras Lake Entrance. Pied Oystercatchers have been recorded nesting within the study area at Oaky Beach and North Durras Beach, and recorded at Pebbly Beach during the 2020/2021 season. They are also recorded outside the study area at Durras Lake Entrance and areas around the lake. (J Dunn pers. Comm. 2021). Both Hooded Plovers and Pied Oystercatchers may also nest on other beaches along the Murramarang coastline outside of the monitoring program area. Both species are also known to forage within the study area on the beaches and rock platforms.

Consistent with NPWS records and advice, numerous threatened shorebirds were observed within the study area and in adjacent areas during the field surveys.

Shoreline areas containing known or potential nesting or foraging habitat for threatened shorebird species are considered a constraint to the proposed activity.

4.4 Potential threatened ecological communities

As noted earlier, all TECs are considered 'potential' as the available mapping has not been thoroughly ground-truthed, and the assessment did not include soil sampling and condition assessments to verify the presence or absence of the TECs.

Four TECs potentially occur within or immediately adjacent to the study area. These are: *Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions* (NSW TEC); *Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (NSW and Commonwealth TEC); *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (NSW TEC)/*Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* (Commonwealth TEC); and *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions* (NSW TEC).

These TECs are considered constraints to the proposed activity.

4.5 Riparian corridors

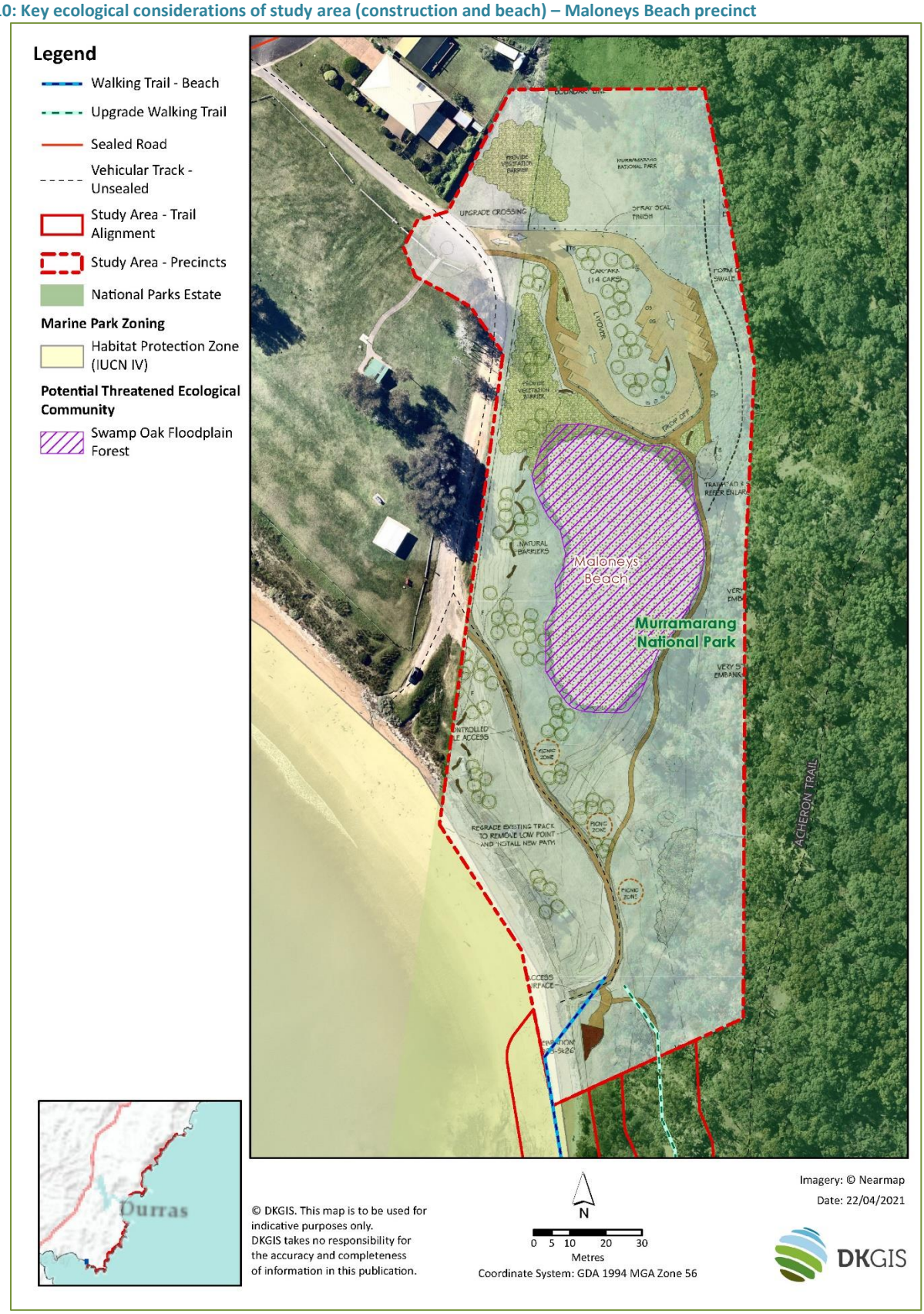
The watercourses and riparian corridors within the study area may provide suitable habitat for threatened species. Clearing or disturbance to the watercourses and associated riparian corridors for the proposed activity may potentially negatively impact on any such threatened species and their associated habitats. They may also provide other ecological functions. Therefore, the riparian corridors and watercourses are considered constraints to the proposed activity.

4.6 Marine environment – Batemans Marine Park

The Batemans Marine Park and associated zoning is aimed at providing different levels of protection to the adjacent marine environment, including species of conservation significance listed under legislation. The marine environment within the Marine Park is considered a constraint to the proposed activity.

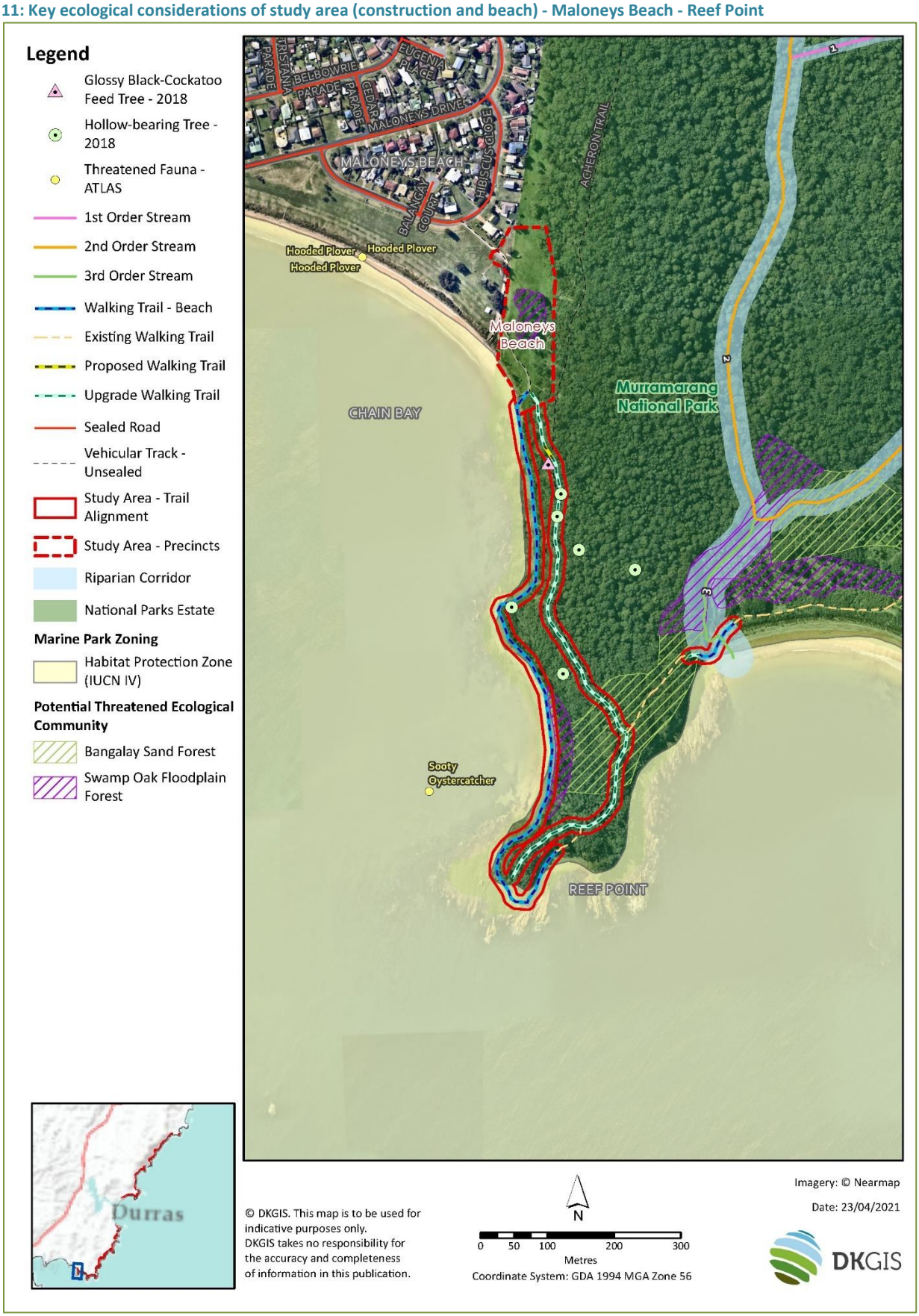
4.7 Maps of key ecological considerations

Map 10: Key ecological considerations of study area (construction and beach) – Maloneys Beach precinct



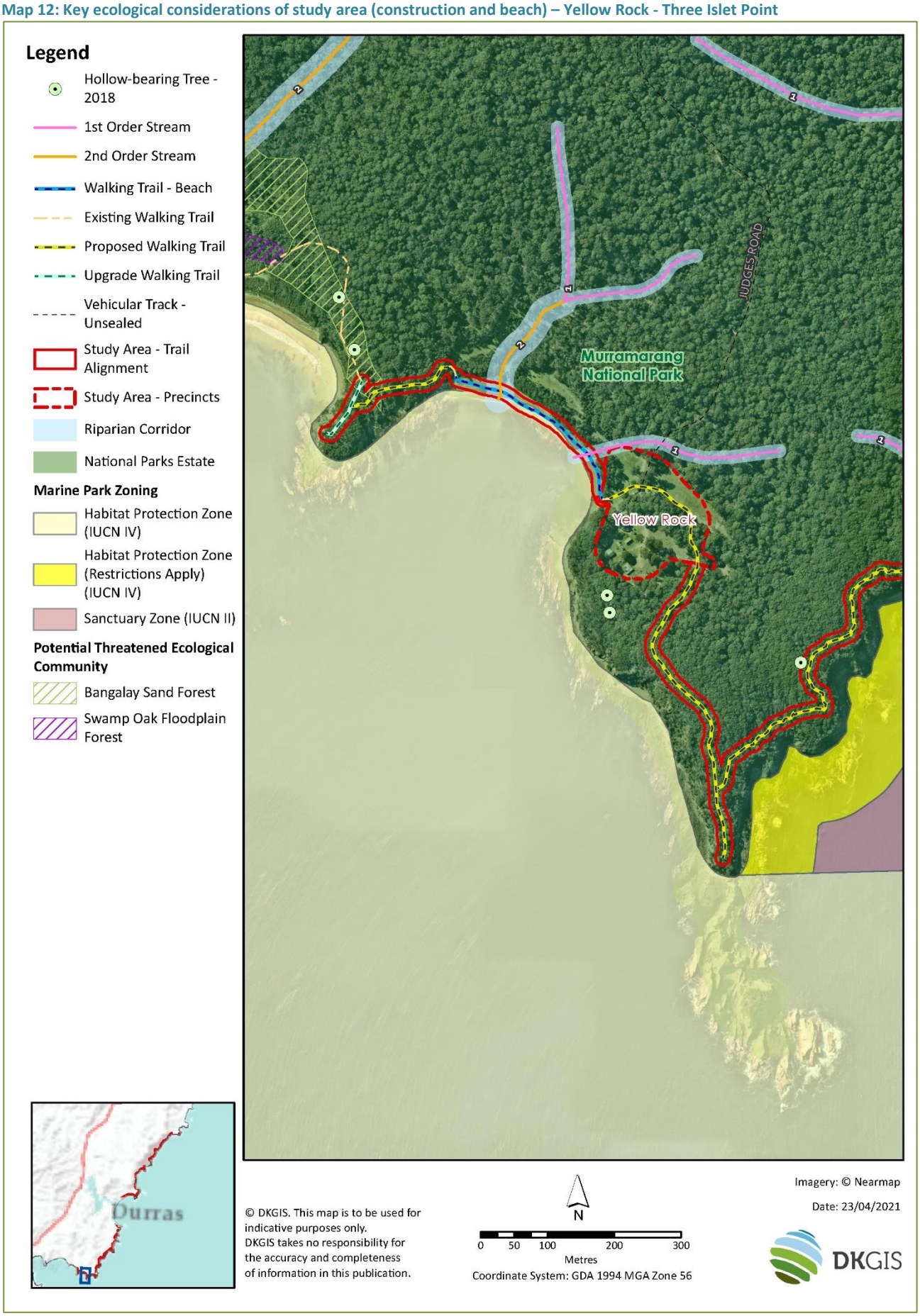
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 11: Key ecological considerations of study area (construction and beach) - Maloneys Beach - Reef Point



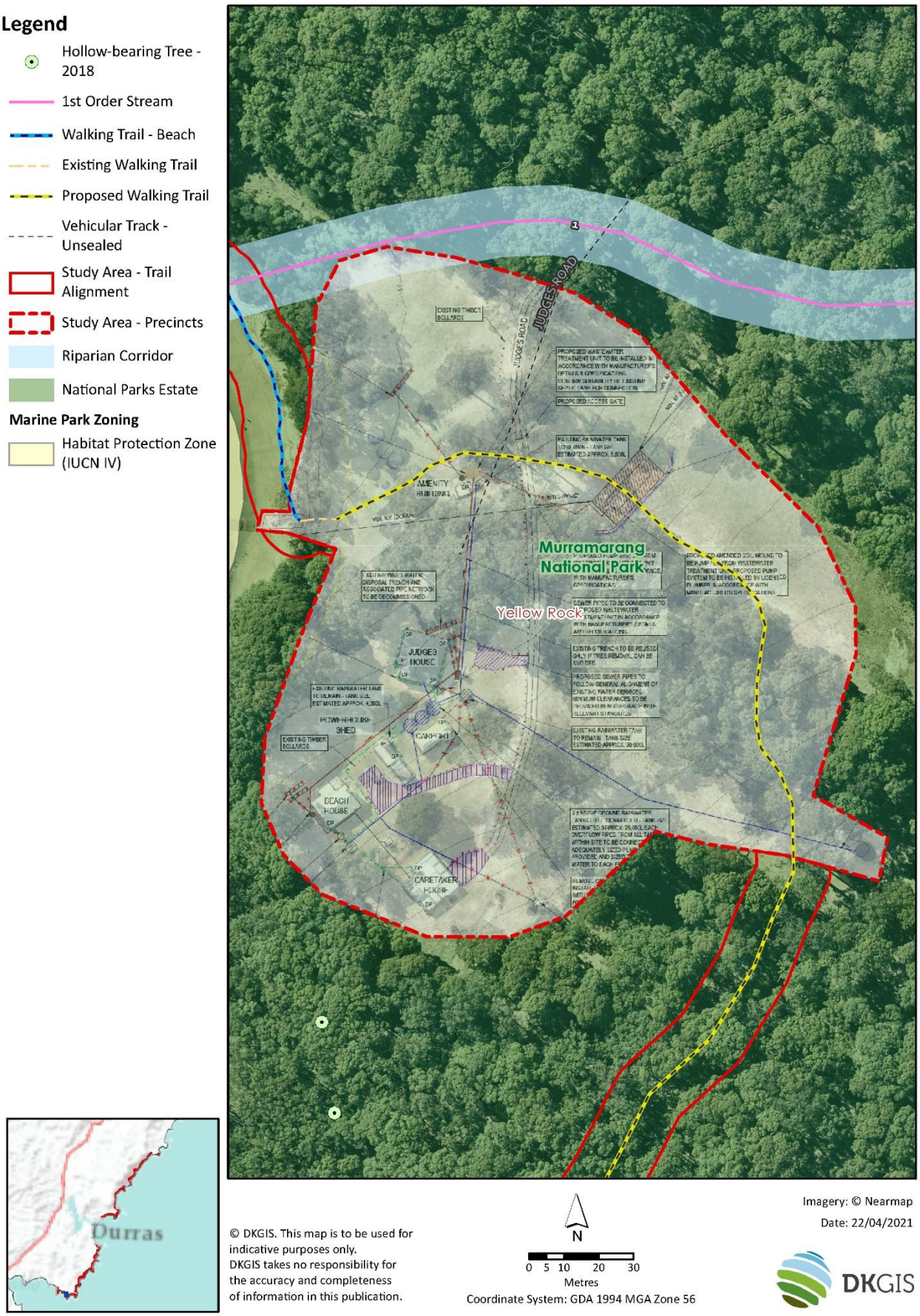
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 12: Key ecological considerations of study area (construction and beach) – Yellow Rock - Three Islet Point



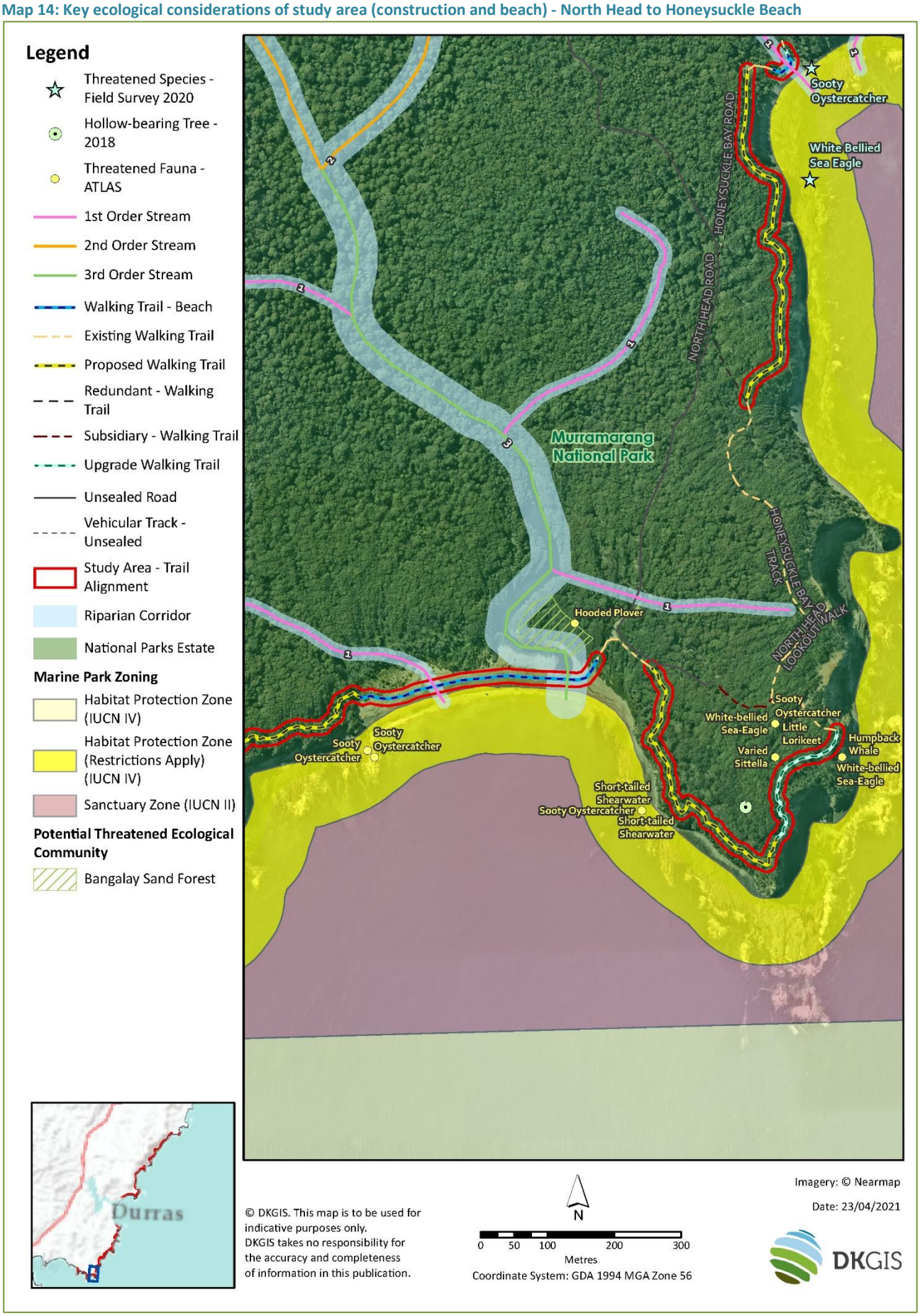
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 13: Key ecological considerations of study area (construction and beach) – Yellow Rock precinct



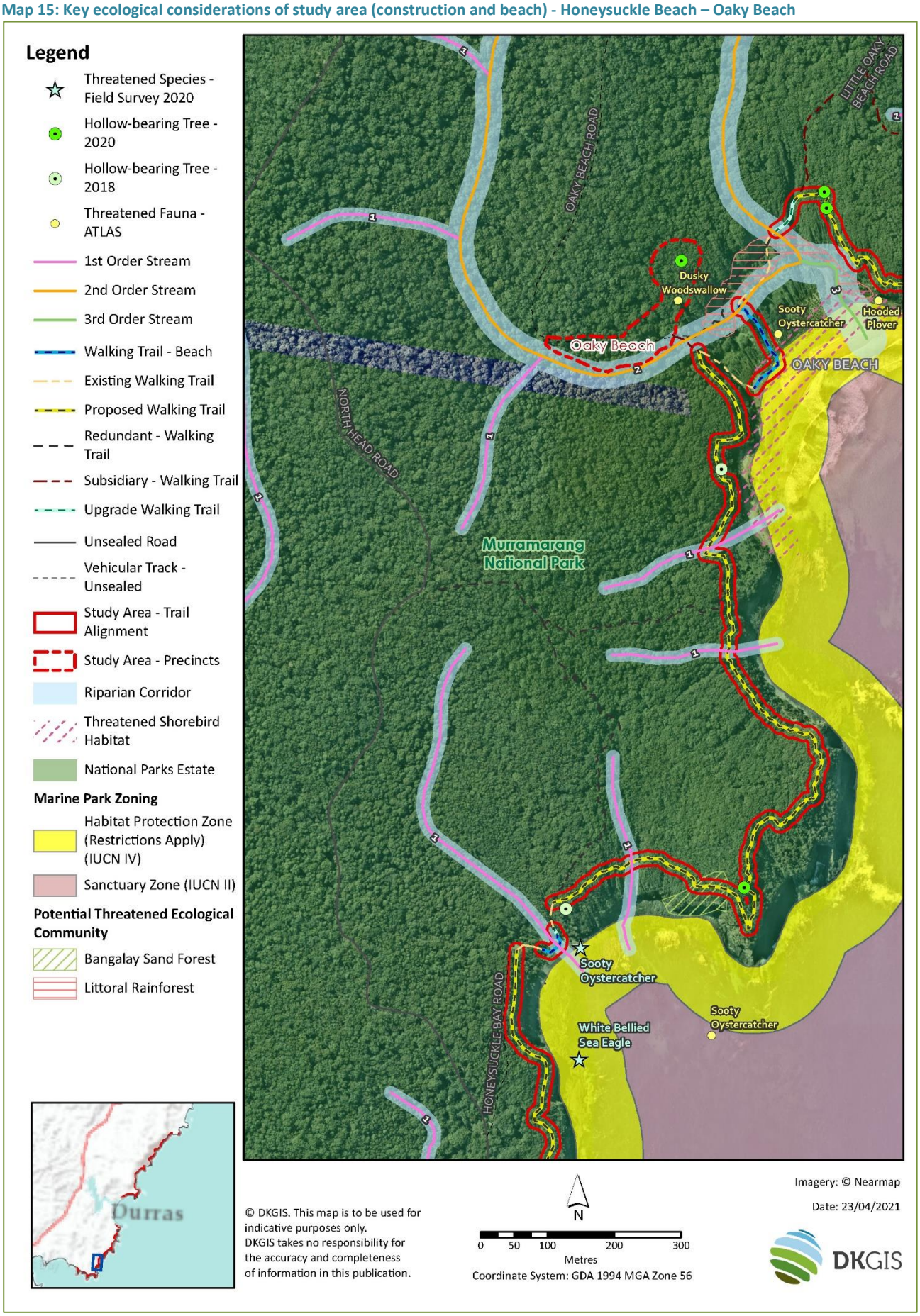
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 14: Key ecological considerations of study area (construction and beach) - North Head to Honeysuckle Beach



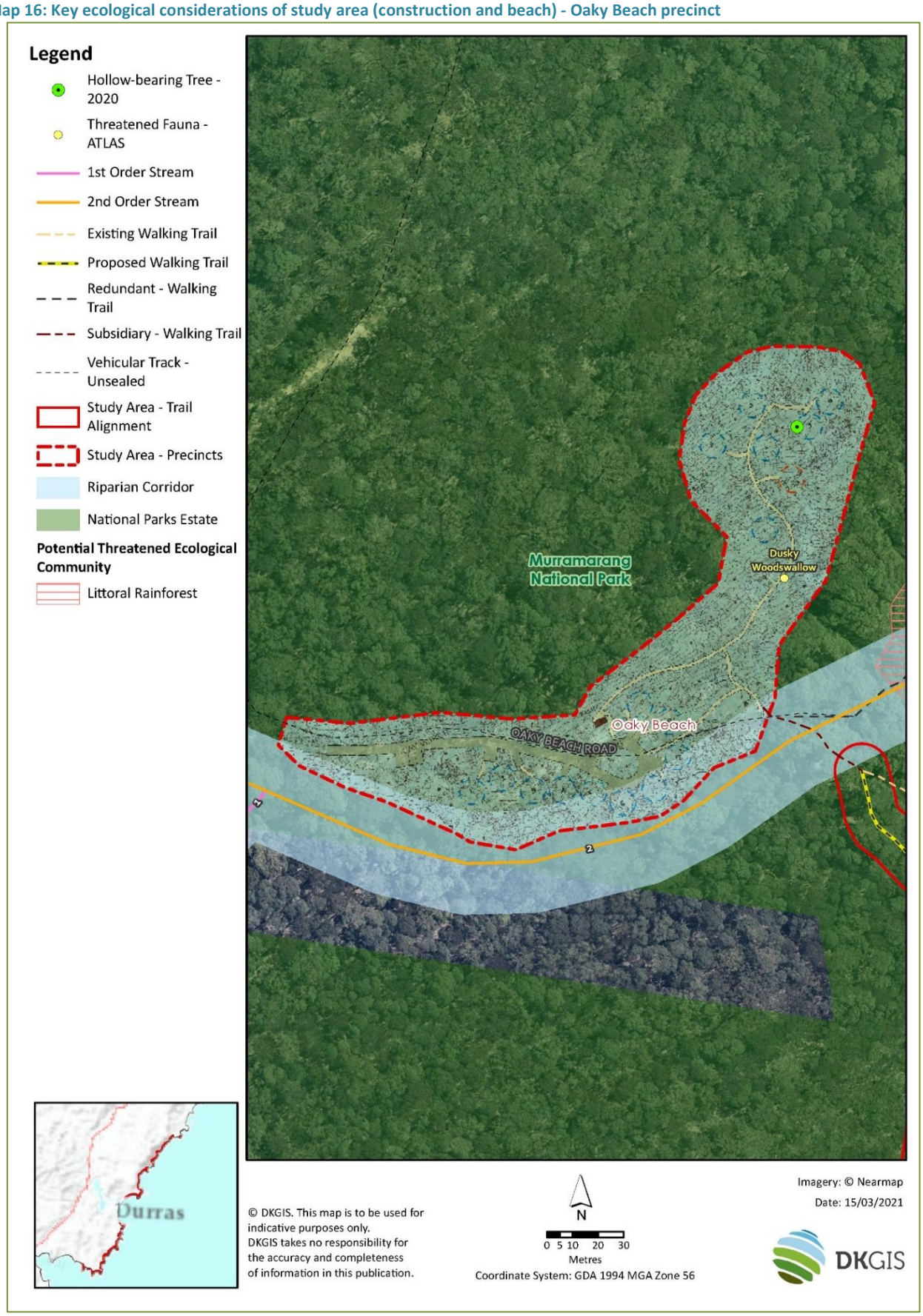
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 15: Key ecological considerations of study area (construction and beach) - Honeysuckle Beach – Oaky Beach



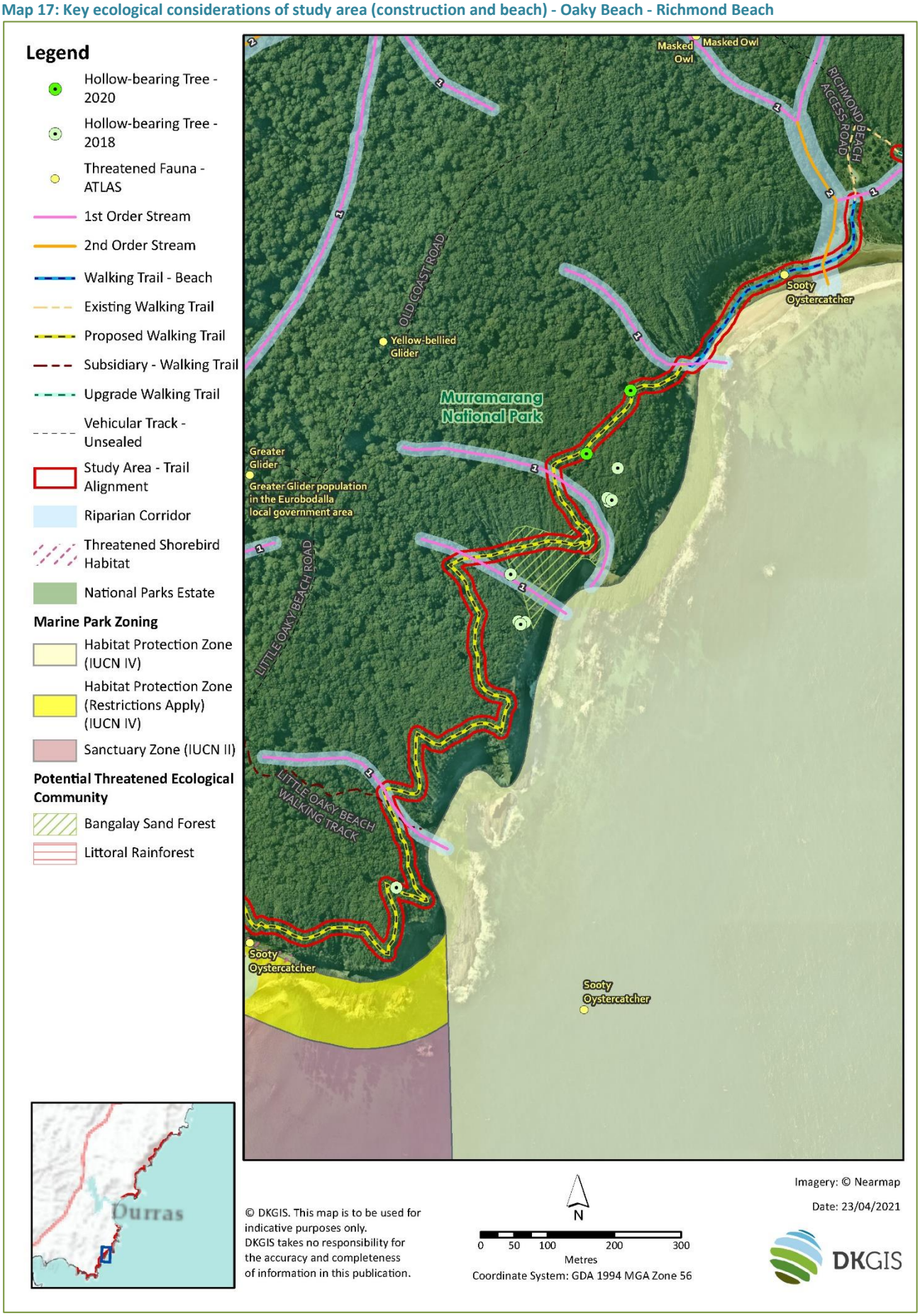
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 16: Key ecological considerations of study area (construction and beach) - Oaky Beach precinct



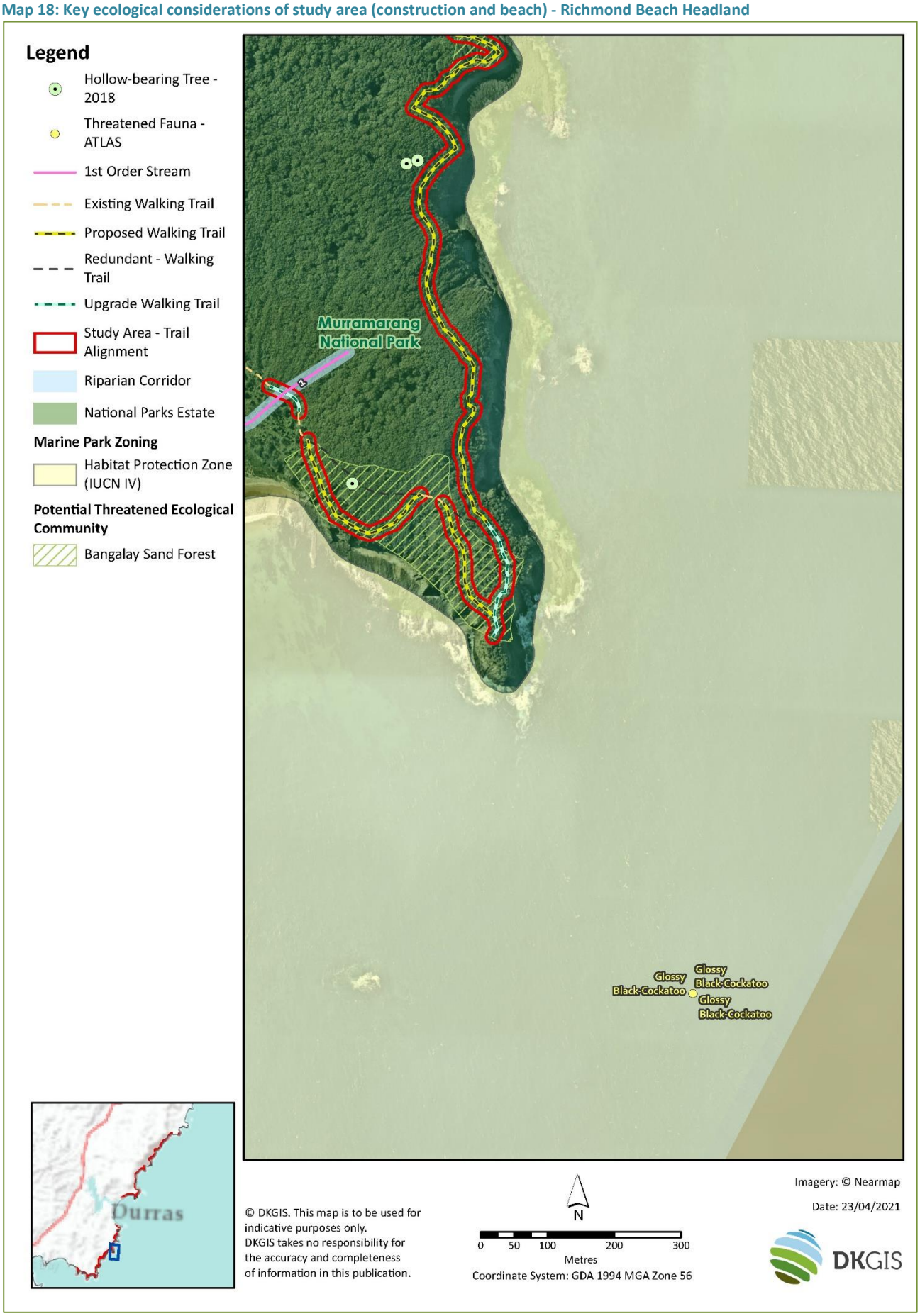
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 17: Key ecological considerations of study area (construction and beach) - Oaky Beach - Richmond Beach



Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 18: Key ecological considerations of study area (construction and beach) - Richmond Beach Headland

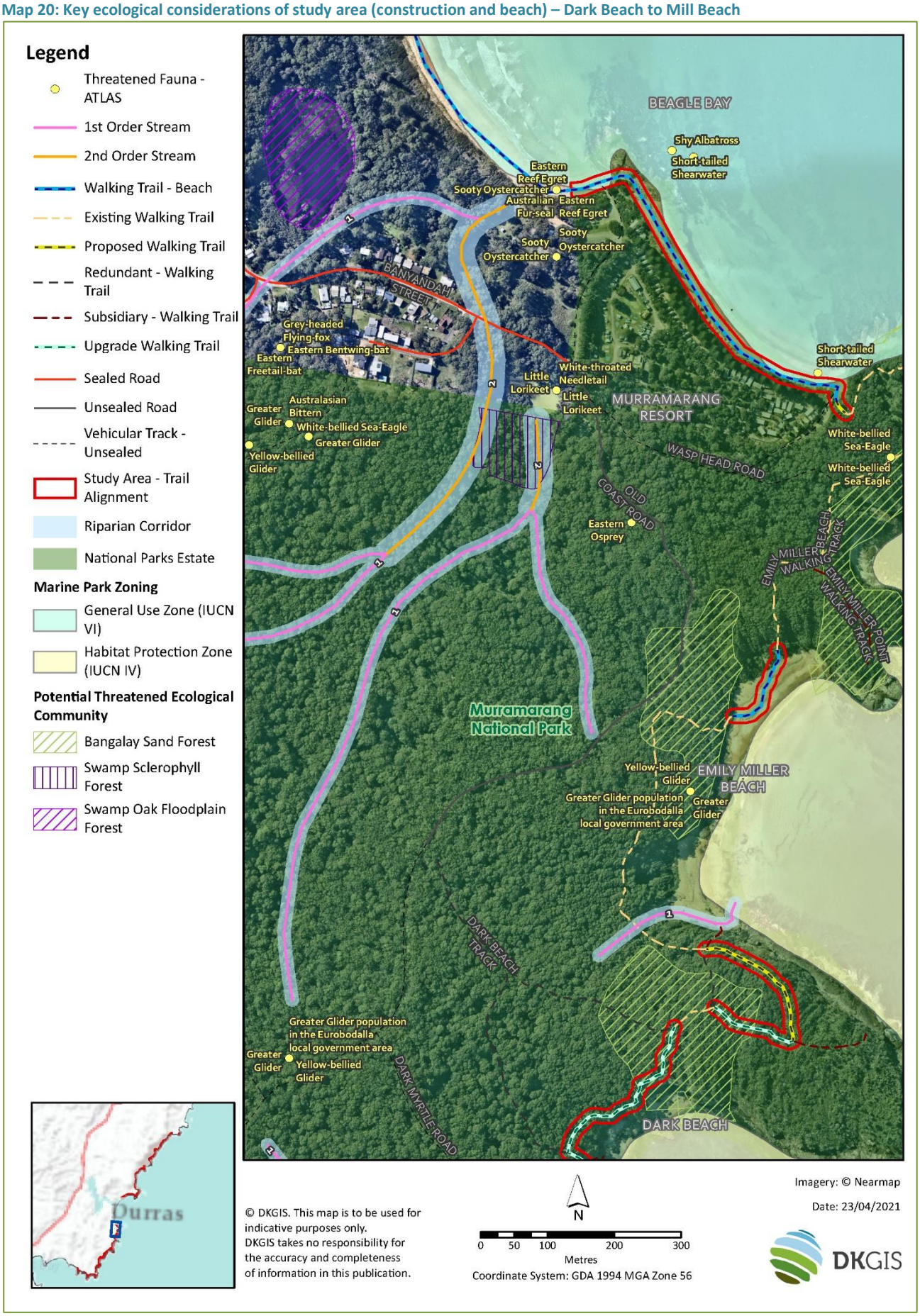


Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 19: Key ecological considerations of study area (construction and beach) - Myrtle Beach – Dark Beach

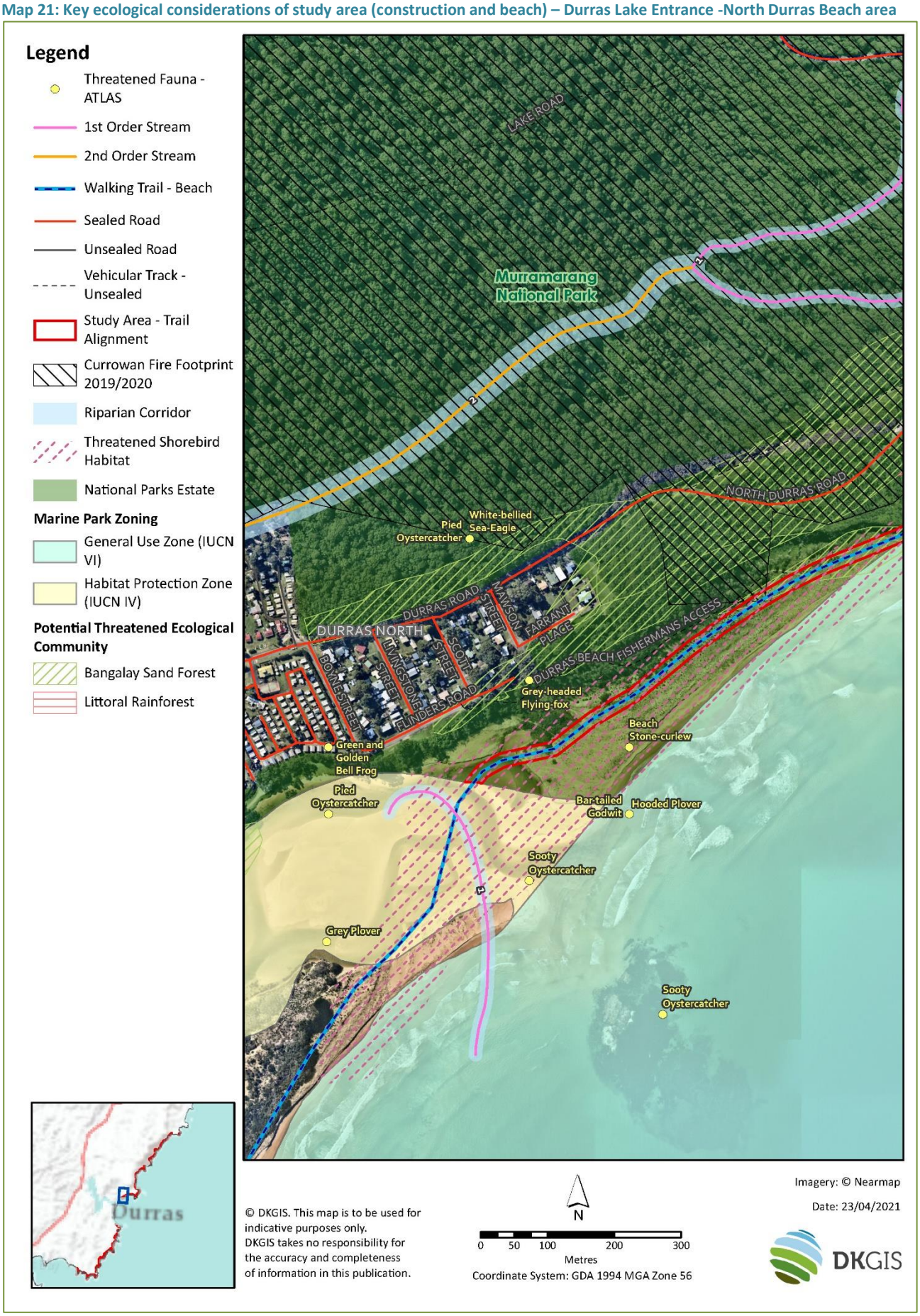
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 20: Key ecological considerations of study area (construction and beach) – Dark Beach to Mill Beach



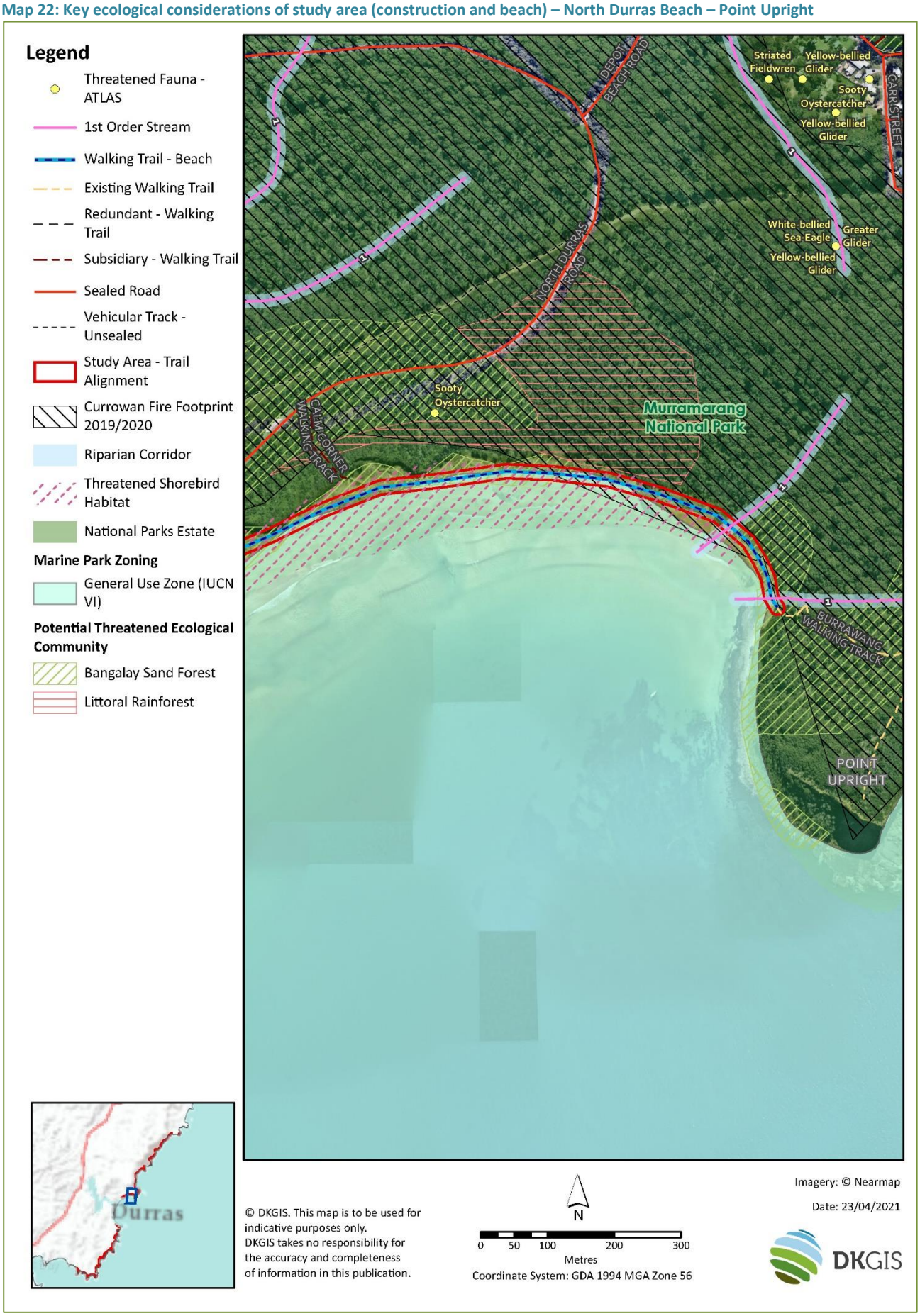
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 21: Key ecological considerations of study area (construction and beach) – Durras Lake Entrance -North Durras Beach area



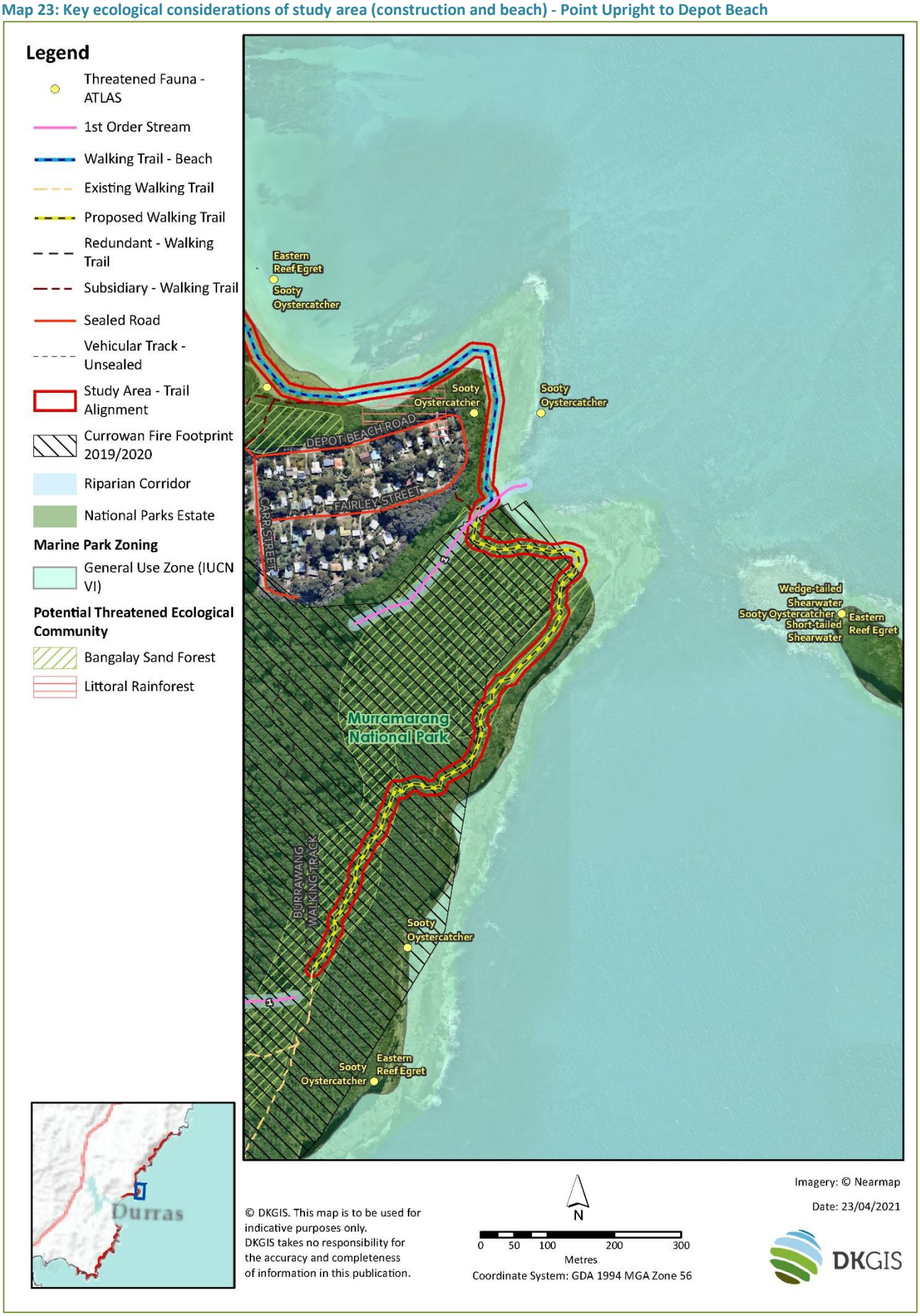
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 22: Key ecological considerations of study area (construction and beach) – North Durras Beach – Point Upright



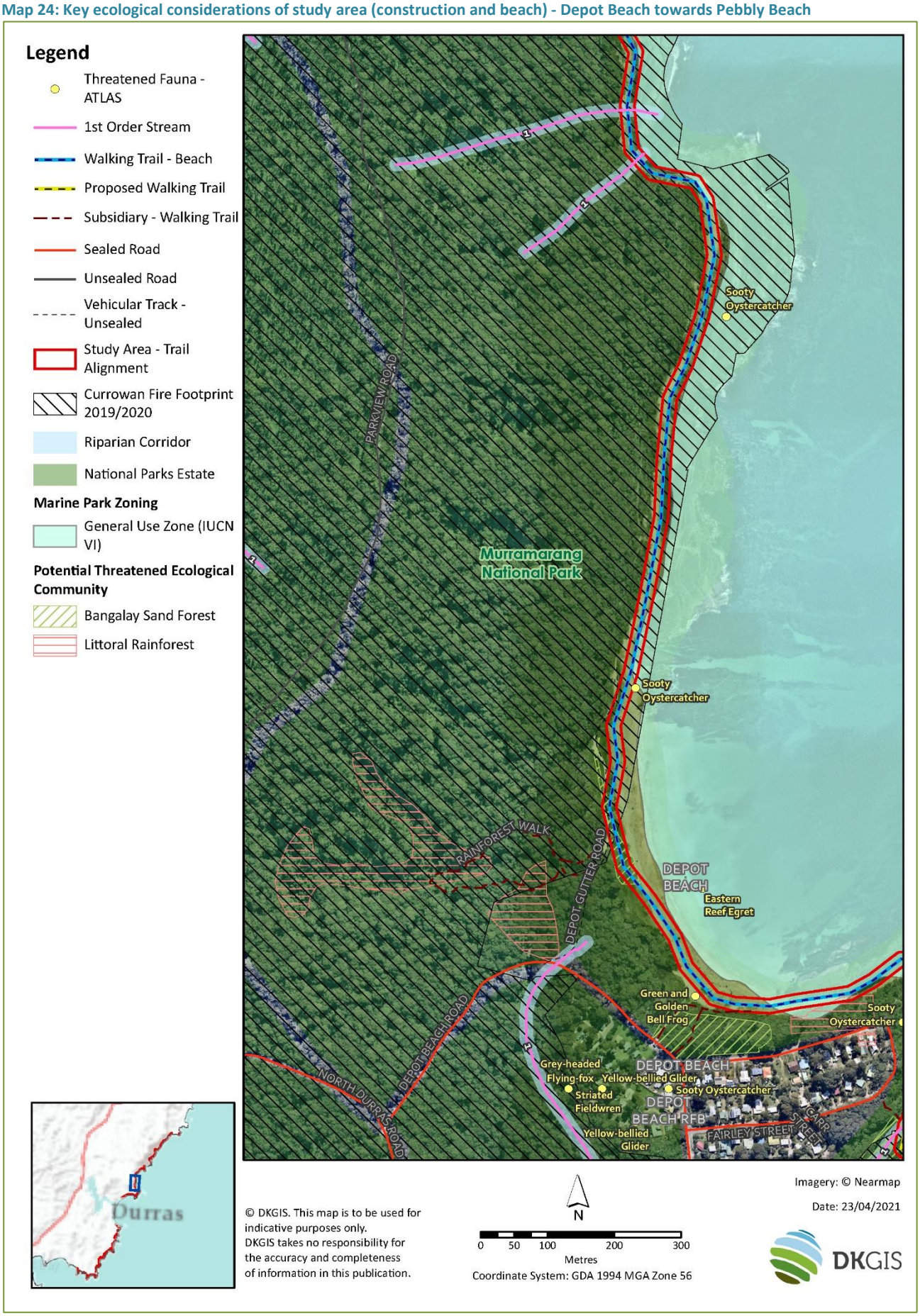
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 23: Key ecological considerations of study area (construction and beach) - Point Upright to Depot Beach



Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 24: Key ecological considerations of study area (construction and beach) - Depot Beach towards Pebbly Beach

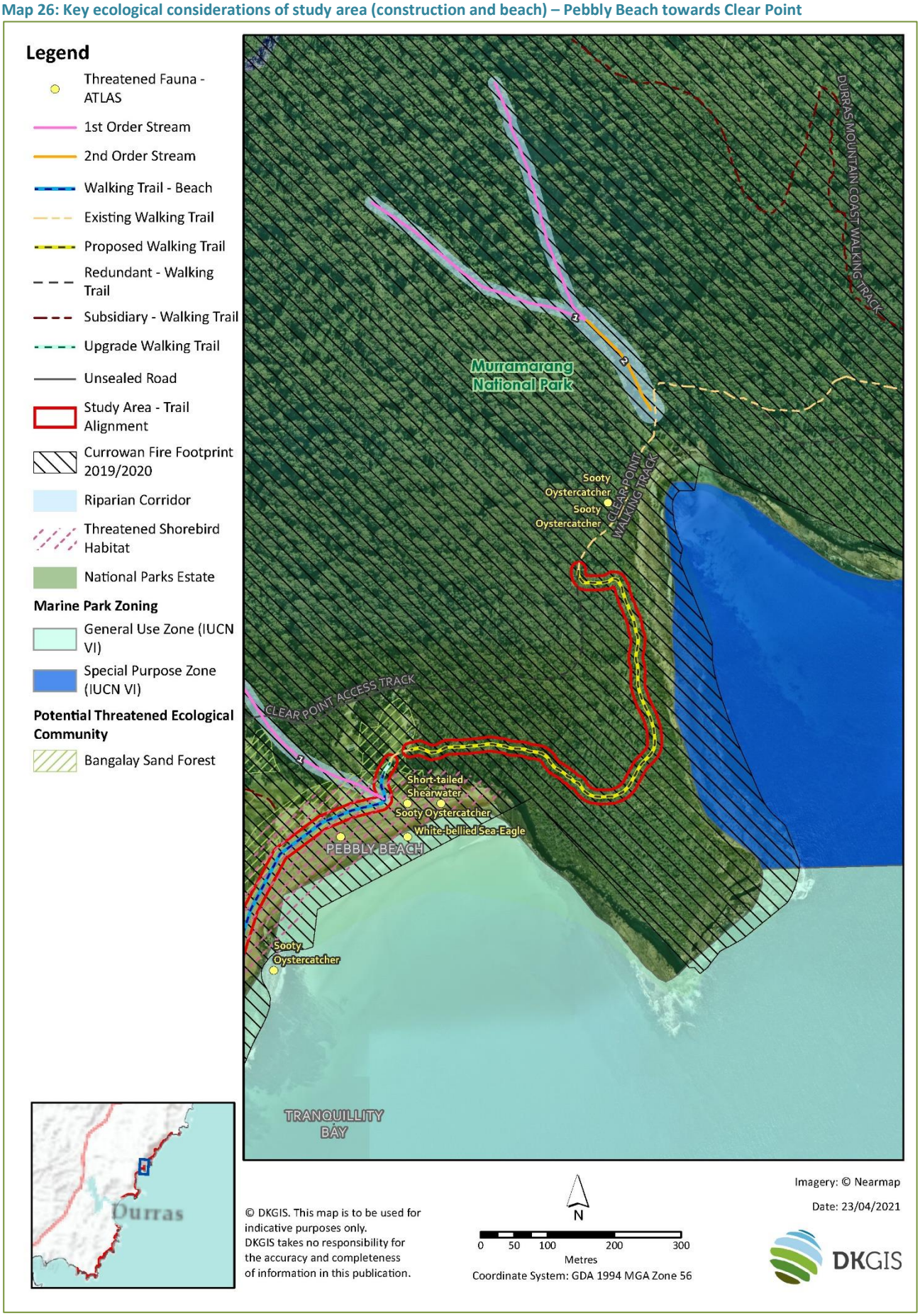


Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 25: Key ecological considerations of study area (construction and beach) - Pebbly Beach area

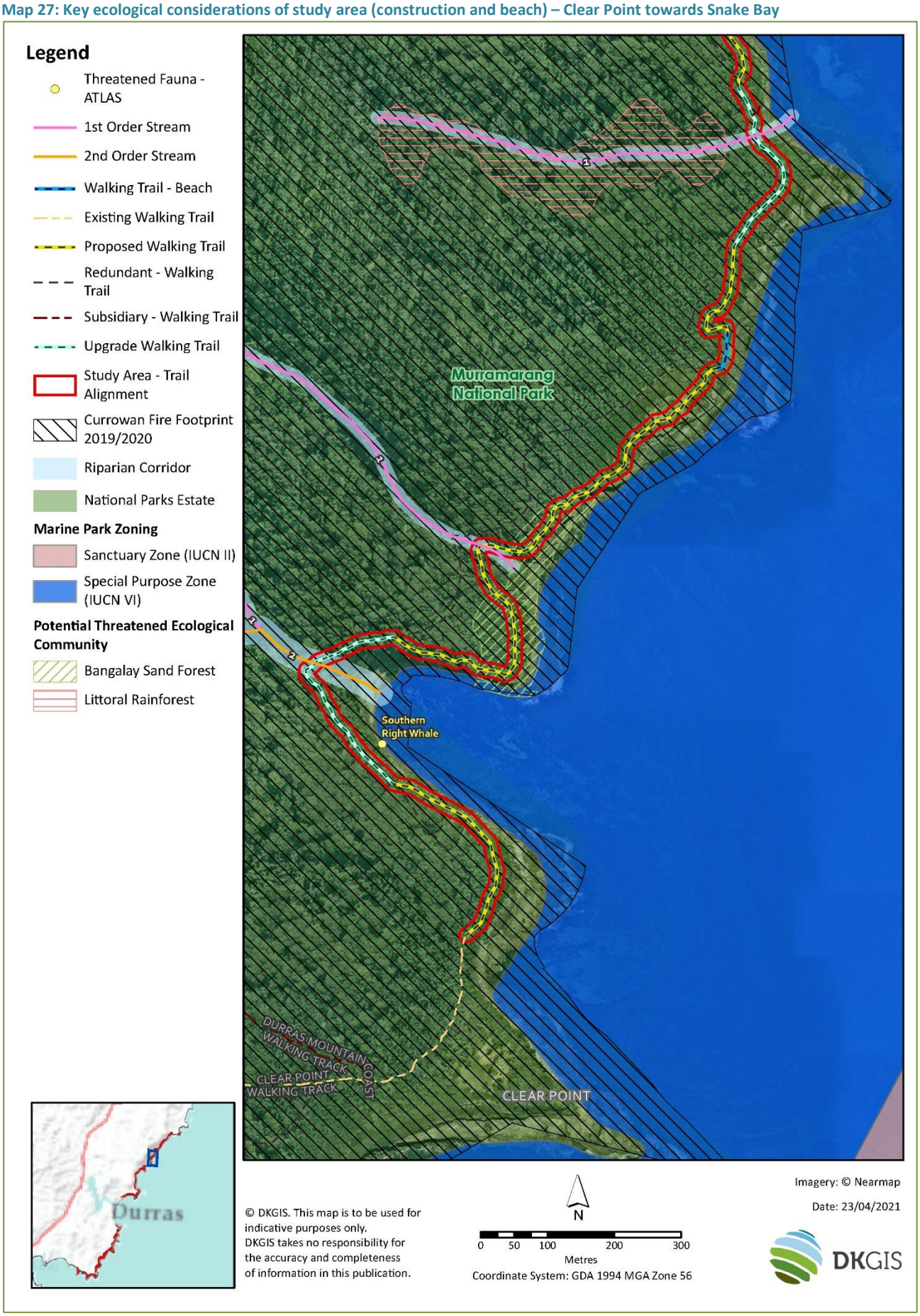
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 26: Key ecological considerations of study area (construction and beach) – Pebbly Beach towards Clear Point



Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 27: Key ecological considerations of study area (construction and beach) – Clear Point towards Snake Bay

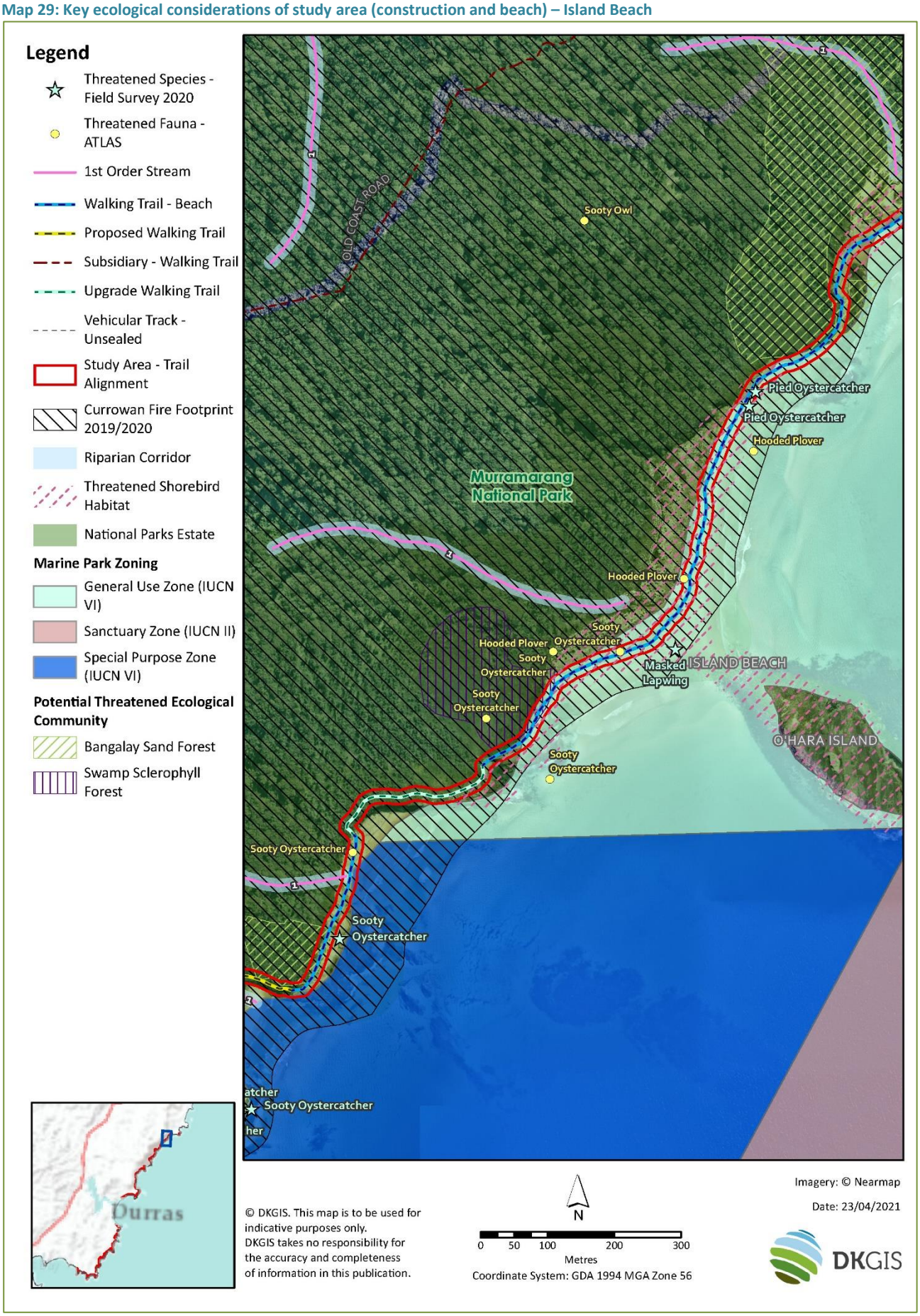


Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 28: Key ecological considerations of study area (construction and beach) – Snake Bay to Dawsons Beach

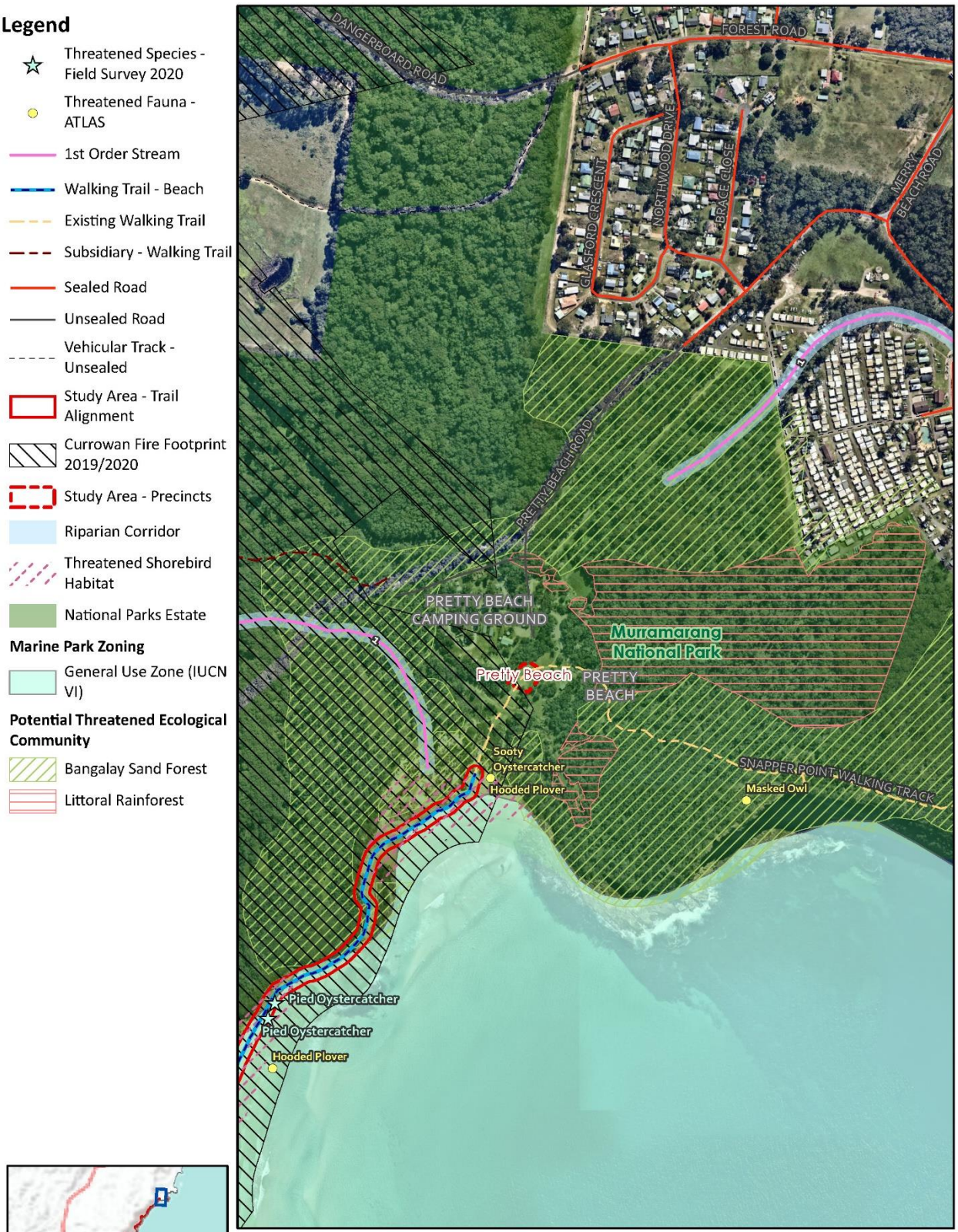
Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 29: Key ecological considerations of study area (construction and beach) – Island Beach



Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 30: Key ecological considerations of study area (construction and beach) – Pretty Beach surrounds



Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

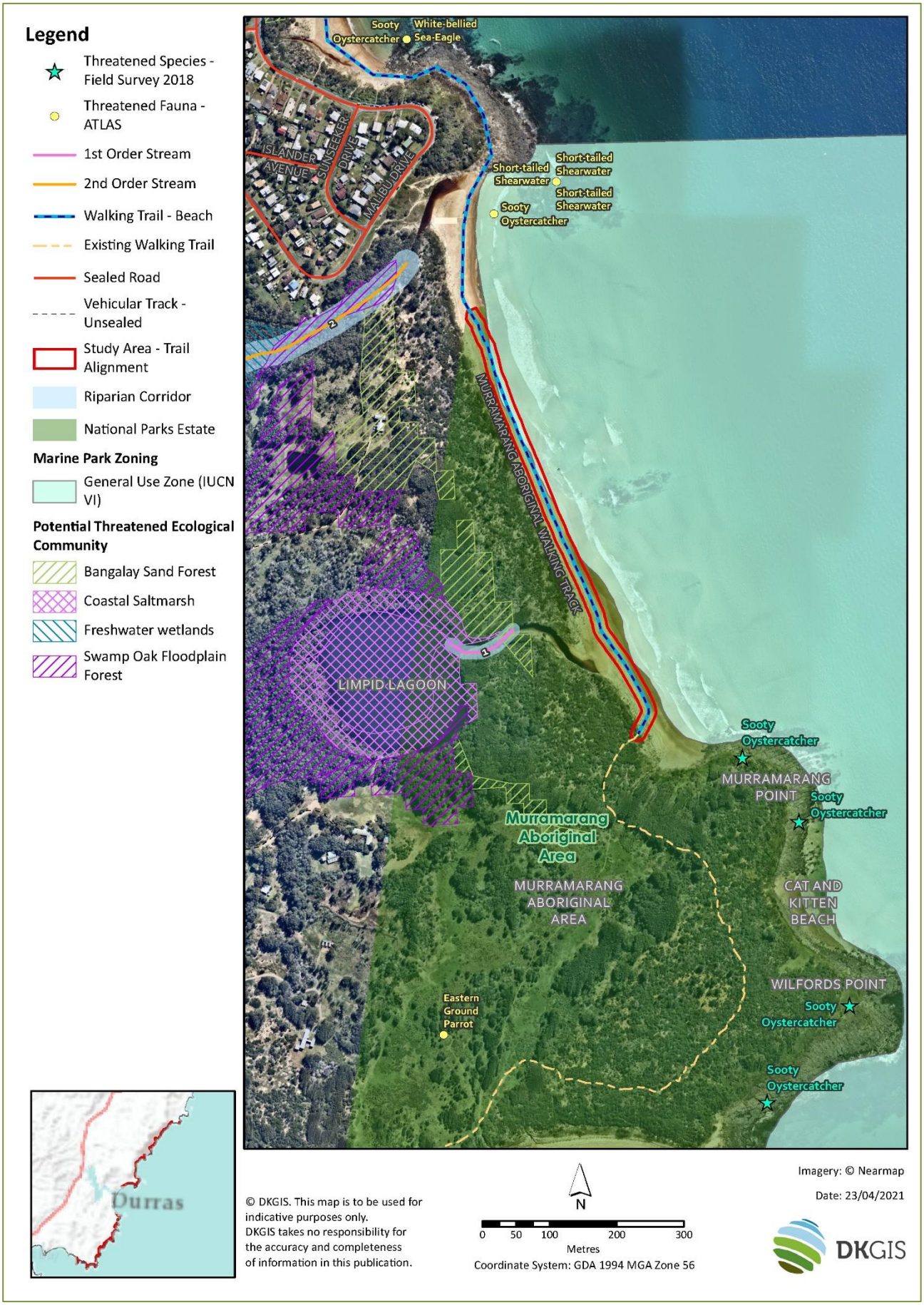
Map 31: Key ecological considerations of study area (construction and beach) – Pretty Beach precinct

Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 32: Key ecological considerations of study area (construction and beach) – Snapper Point

Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

Map 33: Key ecological considerations of study area (construction and beach) – Murramarang Aboriginal Area and Murramarang Beach



Note: The spatial layers used in preparing the above map do not always align with on-ground occurrences.

5 Impact assessment

5.1 Direct impacts

Direct impacts of the proposed activity are modification or clearing of native ground cover and/or understory vegetation, and earthworks.

The proposed activity requires modification or clearing of up to a maximum of 1.95 ha native ground cover and/or understory vegetation with construction of new trail sections (approx. 12.77 km), upgrading of existing trail sections (approx. 3.08 km), and the works associated the precinct upgrades. This impact is spread across 48 km and does not include the removal of mature canopy trees. It is also expected that the trail edges will revegetate over time.

The native forested vegetation to be modified or cleared consists of a number of communities, with the dominant plant community being *Spotted Gum - White Stringybark – Burrawang shrubby open forest on hinterland foothills, northern South East Corner Bioregion*. All vegetation communities directly affected by the proposed activity are relatively widespread elsewhere within Murramarang National Park. The plant communities affected are also common in the locality and the bioregion.

The linear nature of the impacts means that for flora values that transcend the study area, the proposed activity may have minimal impact. However, for flora that is specific to a small number of locations within the study area or involves discrete populations, there is potential for more impact. However, given the extent of similar plant communities in the locality, particularly in the Murramarang National Park and Murramarang Aboriginal Area, the impacts to flora and plant communities are considered relatively minor e.g. low.

The existing trails to be made redundant by the proposed activity will result in up to approximately 0.7 ha of native vegetation being restored from the closure and rehabilitation of redundant track.

A number of riparian corridors within the study area will be impacted by the proposed activity. This impact includes the modification or clearing of a small amount of ground cover and/or understory vegetation in a number of riparian corridors, potentially decreasing the ecological functioning of the corridors and reducing fauna habitat, although at a negligible level. As the riparian corridors connect with the surrounding vegetation, connectivity of the riparian corridors to the surrounding area will remain.

The earthworks are associated with: ground levelling for areas within the Maloney Beach precinct; digging of trenches for water and wastewater pipes at Yellow Rock precinct; general drainage and sediment control; minimal ground levelling at Oaky Beach Camping Area; and benching and the installation of steps and other trail infrastructure in a number of locations along the track alignment.

The proposed activity will result in the modification or clearing of up to approximately 0.23 ha of potential Bangalay Sand Forest TEC. There are 11,200 ha extant of Bangalay Sand Forest TEC (Tozer *et al*. 2010).

The proposed activity will result in an increase of up to approximately 0.08 ha of potential Littoral Rainforest TEC. There are 15,200 ha extant of Littoral Rainforest TEC (Tozer *et al*. 2010).

The proposed activity will result in the modification or clearing of a negligible amount of potential Swamp Sclerophyll Forest TEC and no potential Swamp Oak Floodplain Forest/Coastal Swamp Oak (Casuarina glauca) Forest TEC.

Within the study area there are many hollow-bearing trees as well as logs and tree stumps with hollows. A number of these are within the subject site. Although the hollows are not considered high quality habitat because of their aperture size and angle, and for the hollow-bearing trees their low hollow height and

exposed location in most areas, they could provide potential nesting and/or denning resources for a range of species, including some species of conservation significance. No mature canopy trees are to be removed as part of the proposed activity.

Ground cover and understory vegetation within the study area and subject site may provide sheltering habitat for a range of fauna, including fauna of conservation significance such as the White Footed Dunnart. Some of these potential foraging and sheltering resources would be removed with the proposed activity.

The majority of fauna species of conservation significance that are known to occur, or that have potential to occur, in the study area and subject site are highly mobile and have a range that extends well beyond the study area and into the surrounding conservation estate, and elsewhere. Similar habitats to those affected by the proposed activity occur extensively in surrounding areas. The proposed activity will not present any barriers to fauna movement. Despite this, considering the proposed activity is for a conservation estate, a number of mitigation measures are provided to reduce any impact of the proposed activity on fauna and fauna habitat, including habitat of fauna of conservation significance.

A number of riparian corridors within the study area will be impacted by the proposed activity. This impact includes the clearing or modification of ground cover and/or understory vegetation associated with the riparian corridors, potentially decreasing the ecological functioning of the corridors and reduction in fauna habitat. As the riparian corridors connect with the surrounding vegetation, connectivity of the riparian corridors to the surrounding area will remain. Despite this, considering the proposed activity is for conservation estate, a number of mitigation measures are provided to reduce any impact of the proposed activity on riparian corridors.

5.2 Indirect impacts

The indirect impacts in Table 9 are generally associated with this kind of development.

Table 9: Review of indirect impacts

Threat	Assessment
Erosion and sedimentation	The soils on site may be prone to erosion. Standard mechanisms and controls are recommended to ensure the prevention of erosion and sedimentation during construction and post-construction.
Weed invasion	Materials required for the construction of the proposed activity may increase the opportunities for weed invasion into the adjoining forested areas. A mitigation measure is recommended to reduce the possibility of weed invasion from the proposed activity. As there are no garden plantings planned as part of the proposed activity, weed invasion from garden escapees is unlikely to be an issue during the maintenance stage of the proposed activity.
Introduced species and diseases	The importing of materials for the construction and ongoing maintenance of the proposed activity has the potential to introduce species, pathogens or disease. The proposed activity may increase the occurrence of introduced species in the study area, yet is unlikely to result in a significant increase in predation. A recommendation is provided to monitor for the occurrence of introduced species in the study area. A recommendation is provided to reduce the potential occurrence of introduced species, pathogens and disease.
Stormwater runoff and altered hydrological regimes	Given that there are no major engineering works that may impact the topography, or impact significantly on hydrological regimes are expected to be negligible. A mitigation measure is recommended to reduce impacts on hydrological regimes.

Threat	Assessment
Anthropogenic disturbances e.g. noise, artificial lighting, waste/rubbish, increased human presence	Threatened shorebirds may be disturbed by an increase in visitation to the area. Increased visitor use of the beaches and rock platforms may result in Hooded Plover and Pied Oystercatcher adults staying away from their nests, making the eggs and chicks more vulnerable to predation, and extreme weather. It may also disturb the foraging behaviour of the Sooty Oystercatcher. A number of flora species found within the study area and subject site may provide foraging habitat to a range of fauna, including fauna of conservation significance. Forest and woodland canopy flora species may provide foraging habitat for threatened gliders, Eastern Pygmy Possums, Koala, Grey-headed Flying-fox, Little Lorikeet, Swift Parrot, Glossy Black Cockatoos and Gang Gang Cockatoos. Although mature canopy trees are not to be removed as part of the proposed activity, there may be impacts on these species from increased visitor numbers. Fauna species potentially occurring in the study area are unlikely to be pre-accustomed to the noise that will occur during the construction stage. The fauna occurring in the study area is likely to be pre-accustomed to the noise during the maintenance stage of the proposed activity as much of the study area is part of an existing system of walking tracks. However, the proposed activity is likely to increase the number of people visiting the study area. Light spillage on habitat can impair behaviour of arboreal fauna species. If not managed appropriately, waste materials from the construction and maintenance stages can result in increased rubbish and marine debris, causing injury and sickness to fauna species. Recommendations are provided to reduce the impacts of anthropogenic disturbances of the proposed activity on existing fauna within the study area.

6 Recommendations

Taking into consideration the flora and fauna constraints identified in this report, the following environmental safeguards and mitigation measures are recommended.

6.1 Construction phase

1. An ecologist is to carry out pre-clearing inspection of proposed new trail sections and precincts to:
    - Microsite the track alignment and precinct works to an appropriate distance (i.e. 10 m) from hollow-bearing trees, hollow logs and known feed trees. Alignments are to be marked clearly with bunting or flagging. This recommendation reduces the potential for visitors to adversely impact on any fauna that may be utilising the hollow-bearing trees, hollow logs or feed trees.
    - Identify and realign the track and precinct works away from any Scrub Turpentine trees. This recommendation is to reduce the risk of threatened flora being impacted by the proposed activity.
2. Cleared vegetation is to be stored within already cleared areas. It can be stored adjacent to the subject site for a maximum of one week. After one week the cleared vegetation material should be used to help rehabilitate areas or be strategically disposed of in the surrounding area. This recommendation is to mitigate any potential adverse impacts of the proposed activity on the surrounding environment.
3. Construction works for the proposed activity should seek to minimise the disturbance to riparian corridors. This includes ensuring that any stormwater run-off is managed before discharging into the corridors. This recommendation is to reduce the impact on the ecological functioning of the corridors and the impact on any fauna which may be using the corridor.
4. Construction works are not to be carried out for the proposed activity during or within two days of heavy rainfall of over 30 mm. This recommendation is to avoid or mitigate potential erosion that may occur from the proposed activity.

5. Construction works are not to be carried out for the proposed activity during the evening to avoid or mitigate potential impact on nocturnal fauna species. This recommendation is to reduce potential adverse impacts of the proposed activity on nocturnal fauna.
6. Materials used in the construction and ongoing maintenance stages of the proposed activity are to be free of any potential invasive species, pathogens or diseases. For instance, any fill for the proposed activity is to be certified free from contaminates or weed propagules that could adversely affect adjacent habitats. All imported materials for the proposed activity are to be in accordance with NPWS bio-security management procedures. This recommendation is to mitigate the risk of new weeds, pathogen or diseases establishing in the study area or locality.
7. Any landscaping of the subject site should utilise native species currently growing within the study area. This recommendation is to mitigate the risk of new weeds, pathogen or diseases establishing in the study area or locality, and to maintain flora provenance.
8. Sediment erosion control measures are to be in place prior to any vegetation clearing and site leveling commencing and shall be maintained for the life of the construction stage and until run-off catchments are stabilised. This recommendation is to mitigate potential erosion and sedimentation.
9. Accessing construction areas is to avoid known threatened shorebird habitat during the nesting season between August and February/March.
10. There shall be no storage of machinery, vehicles, materials or equipment in adjacent areas of native vegetation which are not part of the subject site of the proposed activity. Existing cleared areas are to be utilised for this purpose. This recommendation is to minimise the impact footprint of the proposed activity.
11. Any fencing or barriers installed during the construction of the proposed activity are to be of 'wildlife friendly' construction, i.e. shall not contain barbed wire, shall not impede the movement of fauna, through the subject site or adjacent areas. Native vegetation is not to be removed for fence construction. This recommendation is to reduce the risk of fauna injury or mortality, reduce the disruption to fauna behaviour, and to minimise vegetation clearing.

6.2 Operation phase

12. Weed management for the proposed track is to be carried out in accordance with the NPWS standard policy and procedures, as part of routine operations. This recommendation is to mitigate the long-term adverse impact of the proposed activity on the flora and fauna values, the surrounding environment and visitor experiences.
13. There is to be regular pumping out of the waste from the amenity block at Oaky Beach Camping Area. This recommendation is to reduce the risk of excess waste entering the surrounding environment, including the Batemans Marine Park.
14. Any fencing or barriers during the maintenance stage of the proposed activity are to be of 'wildlife friendly' construction i.e. shall not contain barbed wire, shall not impede the movement of fauna, through the subject site or adjacent areas. Native vegetation is not to be removed for fence construction. This recommendation is to reduce the risk of fauna injury or mortality, reduce the disruption to fauna behaviour, and to minimise vegetation clearing.
15. Interpretive material aimed at promoting positive visitor behavior is to be made available to visitors prior to the walk, and as a minimum, advise on:
    - The flora and fauna values of the area and ways that they can help protect these values. This recommendation is aimed at raising visitor awareness of Murramarang.
    - The dangers associated with using the foreshore alignments during high tides. This recommendation is for visitor safety.
    - The requirement to ensure they take appropriate hygiene measures e.g. clean boots and equipment, to reduce the potential dispersal of weeds and other pathogens. This

recommendation is to mitigate the risk of new weeds, pathogen or diseases establishing in the study area or locality.

- The need to limit excessive lighting at night. This recommendation is to reduce the potential impact of the proposed activity on nocturnal fauna.
- The prohibition of hand-gathering and fishing in marine park sanctuary zones. This recommendations is to reduce the impact of the proposed activity on the marine park.

16. In addition to the above, interpretive material is to be made available to visitors prior to the walk and on signs at either end of known threatened shorebird nesting beaches, to help mitigate potential adverse impacts on nesting success. Key messages are to include: no stopping on nesting beaches; keeping to shorelines/intertidal areas; and staying away from fenced areas during the nesting season.
17. The threatened shorebird monitoring program is to continue and will include as a minimum, those areas where there are previous records of nesting. The NPWS will evaluate results to ensure the existing shorebird program maintains or improves shorebird outcomes.
18. The fencing for the threatened shorebird nesting areas is to continue as required. This recommendation is to help protect the threatened shorebirds from visitor disturbance.

7 Statutory assessments

Considering the recommendations in Section 6 of this report, assessments on the impacts of the proposed activity on matters of conservation significance were undertaken in accordance with the relevant NSW and Commonwealth legislation.

7.1 Commonwealth - EPBC Act protected matters

7.1.1 Matters of national environmental significance

The EPBC Act Administrative Guidelines on Significance (Commonwealth of Australia 2013) set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action, a 'proposed activity', is likely to have a significant impact on matters of national environmental significance (MNES). Matters of national environmental significance listed under the EPBC Act include:

- listed threatened species and ecological communities
- listed migratory species
- Wetlands of International Importance
- the Commonwealth marine environment
- World Heritage properties
- National Heritage places
- nuclear actions
- Great Barrier Reef

The EPBC Act listed threatened and migratory species that occur or potentially occur in the study area have been assessed against the relevant significant impact criteria. The assessments are shown in Table 10.

Table 10: Significant impact assessment for MNES

Matters to be assessed	Impact (Commonwealth legislation)
World Heritage Property	The proposed action does not impact on a World Heritage Property. **Conclusion**: Referral not required for this matter.
Wetlands of International Importance (Ramsar Sites)	The proposed action will not affect any part of a Ramsar wetland. **Conclusion**: Referral not required for this matter.
Commonwealth listed critically endangered or endangered species	The study area provides foraging habitat for the following EPBC listed critically endangered and endangered species: Regent Honeyeater, Swift Parrot and Spotted-tailed Quoll. It provides marginal denning habitat for the Spotted-tailed Quoll. Regent Honeyeater The Regent Honeyeater has been previously recorded from the locality, and may seasonally use the study area for foraging e.g. on Spotted Gum, depending on flowering abundance. Swift Parrot The Swift Parrot has been previously recorded from the locality and may seasonally use the study area for foraging depending on flowering abundance. A number of the species preferred winter flowering feed trees are present in the study area e.g. Spotted Gum and Forest Red Gum, and lerp infested trees. Spotted-tailed Quoll The Spotted-tailed Quoll has been previously recorded for the locality and there is suitable foraging habitat in the study area with a range of plant community types and relatively large intact areas of vegetation. The significant impact criteria are assessed below: *a. lead to a long-term decrease in the size of a population* Regent Honeyeater The proposed action will not significantly adversely affect the population size of the Regent Honeyeater as no breeding habitat for this species will be affected. Only up to 1.95 ha of native ground cover and/or understory vegetation is to be cleared or modified with larger flowering canopy trees not being removed. Relative to the extent of habitat within this species local range and its ecology, and with no barriers to movement, the proposed action does not have the capability of leading to a long term decrease of a population. Swift Parrot The proposed action will not significantly adversely affect the population size of the Swift Parrot as no breeding habitat for this species will be affected. Only up to 1.95 ha of native ground cover and/or understory vegetation is to be cleared or modified with larger flowering canopy trees not being removed. Relative to the extent of habitat within this species local range and its ecology, and with no barriers to movement, the proposed action does not have the capability of leading to a long term decrease of a population. Spotted-tailed Quoll The proposed action will not significantly adversely affect the population size of the Spotted-tailed Quoll. The study area offers generic value for foraging with limited and marginal denning resources for this species. Hollow-bearing trees and hollowed fallen logs which may be suitable for denning are not to be removed. There are no rock shelters or caves along the trail alignment. No new roads will be created, and no significant change to current road traffic will be generated, hence risk of vehicle collision should not increase as a result of the proposed action. The surrounding area and remainder of the national park will continue to provide habitat for a population of Spotted-tailed Quoll if one exists in the study area. Relative to the extent of habitat within this species local range and its ecology, and with no barriers to movement, the proposed action does not have the capability of leading to a long term decrease of a population. *b. reduce the area of occupancy of the species* As detailed in part (a), the study area is not likely to contain high quality habitat for the Regent

Matters to be assessed	Impact (Commonwealth legislation)
	Honeyeater, the Swift Parrot or the Spotted-tailed Quoll, with only generic value for foraging and marginal denning habitat for the Spotted –tailed Quoll. Taking into context the area of habitat likely to be used by these species in the locality, particularly in Murramarang National Park, the modification or clearing of up to 1.95 ha of ground cover and/or understory vegetation (mainly low-quality potential foraging habitat) is of no consequence to the long-term viability of these species. The proposed action is not likely to reduce the area of occupancy of these species. *c. fragment an existing population into two or more populations* The proposed action will not fragment existing populations of the Regent Honeyeater, Swift Parrot and the Spotted-tailed Quoll. The Regent Honeyeater and Swift Parrot are highly mobile and may only visit the study area during winter migration. There will be no barriers to the movement of these species by the proposed action. The Spotted-tailed Quoll has a large home range. The proposed action will not create any barriers to movement within the home range of any population of Spotted-tailed Quoll that may exist in the study area. The remaining native vegetation in the Murramarang National Park will be retained. *d. adversely affect habitat critical to the survival of a species* Given the above, it is clear that no habitat within the study area is considered to be critical to the survival of the subject species. *e. disrupt the breeding cycle of a population* <u>Regent Honeyeater and Swift Parrot</u> No potential nesting sites of the Regent Honeyeater or Swift Parrot will be impacted by the proposed action. These species would only visit the study area for foraging. Given this, the proposed action will not disrupt the breeding cycle of a population of these species. <u>Spotted-tailed Quoll</u> The study area is not likely to contain breeding habitat for the Spotted-tailed Quoll given the marginal hollow quality and lack of other denning resources. The proposed action does not have the capability to undermine the carrying capacity to the point of causing breeding failure given the extent of habitat retained within Murramarang National Park. *f. modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline* Given that no known or likely critical habitat is to be cleared or modified by the proposed action, and extensive foraging resources will remain within the wider Murramarang National Park and the locality within the local range of their populations, the proposed action is unlikely to impact on any of these species to the extent of species decline. *g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat* The proposed action is not likely to result in invasive species becoming established given the existing invasive species management in place and the recommended bio-security measures. *h. introduce disease that may cause the species to decline, or* The proposed action is not likely to introduce any diseases that will affect these species given the existing invasive species management in place and the recommended bio-security measures. *i. interfere with the recovery of the species.* Given that no known or likely breeding habitat is to be cleared or modified and breeding resources and extensive foraging resources will remain within the wider Murramarang National Park and the locality within the local range of any populations, the proposed action is unlikely to substantially interfere with the recovery of these species. **Conclusion**: Referral not required.
EPBC Act listed vulnerable species	The study area contains potential or known habitat for the following EPBC Act listed vulnerable species: Greater Glider, Grey-headed Flying-fox, Long-nosed Potoroo and Hooded Plover. <u>Greater Glider</u>

Matters to be assessed	Impact (Commonwealth legislation)
	The Greater Glider is restricted to eucalypt forests and woodlands of eastern Australia. The species is not known from the study area, but there are nearby records and suitable habitat occurs in parts of the study area. The important population for this species would be at least those in the locality, north of the Clyde River. Grey-headed Flying-fox The Grey-headed Flying-fox inhabits a wide range of habitats including rainforest and wet and dry sclerophyll forests. Camps are often located in gullies with dense canopies and close to water. There are no records for the species in the study area. However, suitable foraging habitat is present, and they have been recorded elsewhere in the locality. The important population for this species would be that part of this seasonally nomadic species' population utilising roosts within foraging range of Murramarang National Park. Long-nosed Potoroo There are no records of the species for the locality. However, there is some suitable yet limited habitat in the study area with ecotones of coastal heath/woodland with dense understory and sandy loam soils. The important population for this species would be at least those in Murramarang and the surrounding areas e.g. the locality. Hooded Plover The Hooded Plover is known to occur within and immediately adjacent to the study area. There are numerous records for the species from the locality, including the Murramarang coastline. The species is a *Site managed species* under NSW Saving our Species Program, with Murramarang as a key management site for the species. The important population for this species would be at least those in Murramarang and the surrounding areas e.g. the locality. The significant impact criteria are assessed below: *a. lead to a long-term decrease in the size of an important population of a species* Greater Glider The proposed action will not significantly adversely affect the population size of the Greater Glider as no breeding habitat for this species will be affected. Hollow-bearing trees in the study area, which only provide marginal habitat because of a range of factors including the angle and aperture of the hollows, the low height of the hollows and their exposed locations in most areas, will be maintained. Relative to the extent of habitat within this species' local range and its ecology, and no barriers to movement being created, the proposed action does not have the capability of leading to a long-term decrease of an important population. Grey-headed Flying-fox The proposed action will not significantly adversely affect the population size of the Grey-headed Flying-fox as no breeding or roosting habitat for this species will be affected. Only up to 1.95 ha of native ground cover and/or understory vegetation is to be cleared or modified with mature canopy trees not being removed. Relative to the extent of habitat within this species local range and its ecology, and no barriers to movement being created, the proposed action does not have the capability of leading to a long-term decrease of an important population. Long-nosed Potoroo The proposed action will not significantly adversely affect the population size of any Long-nosed Potoroo. Taking into account the environmental safeguards and mitigation measures on track alignment and definition of clearing limits, the proposed action will have a negligible impact on the species. Relative to the extent of habitat within this species' potential local range and its ecology, and no barriers to movement being created, the proposed action does not have the capability of leading to a long-term decrease of an important population. Hooded Plover The proposed action will not significantly adversely affect the population size of the Hooded Plover. No beach or dune material is to be removed or altered, and no barriers to movement will be created. The proposed action does not involve an increase in predators but does involve an increase in people walking along beaches where the Hooded Plover is known to nest, with the potential for increased disturbance to nesting sites. Potential impact to known nesting sites by beach users are

Matters to be assessed	Impact (Commonwealth legislation)
	already managed by a combination of monitoring, fencing and signage. Taking into account the recommendations of increased monitoring, increased signage and increased visitor information and awareness, the proposed action is very unlikely to a long-term decrease of an important population. *b. reduce the area of occupancy of an important population* The proposed action will affect only a negligible amount of potential foraging habitat in the context of that available in the locality for the Greater Glider and Grey-headed Flying-fox. The proposed action will not remove any potential denning or roosting sites for these species. Therefore, the proposed action will not reduce the area of occupancy of an important population for Greater Glider or the Grey-headed Flying-fox. The proposed action will affect only a negligible amount of potential habitat in the context of that available in the locality for the Long-nosed Potoroo. Taking into account the environmental safeguards and mitigation measures on track alignment and definition of clearing limits, the proposed action will not reduce the area of occupation of an important population for Long-nosed Potoroo. The proposed action will not affect the area of occupancy of the Hooded Plover as no beach or dune material is to be removed or altered, and no barriers to movement are involved. Therefore, the proposed action will not reduce the area of occupancy of an important population of the Hooded Plover. *c. fragment an existing important population into two or more populations* The proposed action will not fragment an existing important population of the Greater Glider or Grey-headed Flying-fox as it will affect only a negligible amount of seasonal foraging habitat. No denning or roosting habitat will be removed or altered. The subject site is well connected to a much broader network of habitat. The proposed action will affect only a negligible amount of potential habitat in the context of that available in the locality for the Long-nosed Potoroo. Taking into account the environmental safeguards and mitigation measures on track alignment and definition of clearing limits, the proposed action will not fragment any existing important population for Long-nosed Potoroo. The proposed action will not fragment an existing important population of the Hooded Plover as no habitat is to be removed or altered, and no barriers to movement are involved. *d. adversely affect habitat critical to the survival of a species* The study area is not considered to be critical to the survival of an important population of Grey-headed Flying-fox, Greater Glider or Long-nosed Potoroo, for reasons detailed above. With the environmental safeguards and mitigation measures in place, impacts on the Hooded Plover are expected to be minimal. *e. disrupt the breeding cycle of an important population* The proposed action will not affect any known breeding habitat for the Greater Glider as no hollow-bearing trees are to be removed and/or modified and any foraging habitat that would be removed and/or modified would only comprise a minute fraction of their dietary needs. The proposed action will not affect any known breeding habitat for Grey-headed Flying-fox as the habitat to be potentially removed or modified is not a camp site, and at best would only comprise a minute fraction of their seasonal needs. The environmental safeguards and mitigation measures relating to clearing limits and micrositing will reduce the amount of Long-nosed Potoroo breeding habitat to be impacted. Any habitat that would be removed and/or modified would only comprise a minute fraction of their needs. The proposed action will not disrupt the breeding cycle of an important population of Hooded Plover as no beach or dune material is to be removed or modified, and environmental safeguards and mitigation measures (including increased monitoring, increased signage and increased visitor awareness) are to be put in place to minimise any potential disturbance by an increased number of visitors to foraging habitat. *f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

Matters to be assessed	Impact (Commonwealth legislation)
	The proposed action would not impact the Grey-headed Flying-fox to the extent that the species is likely to decline, as it will affect only a negligible amount of potential seasonal foraging habitat. Extensive foraging resources would remain available within its local range. The proposed action would not impact the Greater Glider to the extent that the species is likely to decline, as it will affect only a negligible amount of potential foraging habitat and no breeding habitat e.g. hollow-bearing trees are to be retained. Extensive foraging resources would remain available within its local range. The environmental safeguards and mitigation measures relating to clearing limits and micrositing will reduce the amount of Long-nosed Potoroo habitat to be impacted. Any habitat that would be removed and/or modified would only comprise a minute fraction of their needs. The proposed action would not impact the Hooded Plover to the extent that the species is likely to decline, as no habitat is to be modified, destroyed or removed. The environmental safeguards and mitigation measures will minimise the chance of indirect impacts to nesting. *g. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat* The proposed action is not likely to result in invasive species becoming established given the existing invasive species management in place and the recommended bio-security measures. *h. introduce disease that may cause the species to decline* The proposed action is not likely to introduce any diseases that will affect these species. *j. interferes substantially with the recovery of the species.* The proposed action will only affect a negligible amount of occasional general non-breeding foraging habitat so the recovery of these species will not be substantially impacted. **Conclusion**: Referral not required.
EPBC Act listed critically endangered and endangered ecological communities	The following EPBC Act listed TECs potentially occur immediately adjacent to the study area: Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community; and Littoral Rainforest and Coastal Vine Thicket of eastern Australia. The significant impact criteria in terms of listed critically endangered and endangered ecological communities are discussed below in relation to these communities. *a. reduce the extent of an ecological community* The proposed action will not reduce the geographical extent of the TECs. No Coastal Swamp Oak Forest is to be removed by the proposed action. A low number of Littoral Rainforest ground cover and under- story plants may need to be removed, but the proposed action will not reduce the extent of this community. *b. fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines* The proposed action will not fragment, or increase fragmentation of, the ecological communities. No Coastal Swamp Oak Forest is to be removed by the proposed action. A low number of Littoral Rainforest ground cover and understory plants may need to be removed, but the community will not be fragmented by the proposed action. *c. adversely affect habitat critical to the survival of an ecological community* The proposed action will not adversely affect habitat critical to the survival of the ecological communities. No Coastal Swamp Oak Forest is to be removed, and only a tiny amount of Littoral Rainforest ground cover and understory plants will be removed by the proposed action. *d. modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patters* The proposed action will not modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the ecological communities' survival. No Coastal Swamp Oak Forest is to be removed by the proposed action. Only a tiny amount of Littoral Rainforest ground cover and understory plants will be removed by the proposed action. There are limited ground works

Matters to be assessed	Impact (Commonwealth legislation)
	associated with the proposed action. There are recommendations to mitigate anthropogenic impacts. *e. cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting* The proposed action will not cause a substantial reduction in the quality or integrity of an occurrence of the ecological communities. The proposed action will not cause a decline or loss of functionally important species. No Coastal Swamp Oak Forest is to be removed by the proposed action. Only a tiny amount of Littoral Rainforest will be removed by the proposed action. There are recommendations in place to mitigate anthropogenic impacts. *f. cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to:* • *assisting invasive species, that are harmful to the listed ecological community, to become established, or* • *causing regular mobilization of fertilizers, herbicides or other chemicals or pollutants into the ecological community which kills or inhibit the growth of species in the ecological community, or* The proposed action will not cause a substantial reduction in the quality or integrity of an occurrence of the ecological communities due to invasive species, fertilizers, herbicides or pollutants. No Coastal Swamp Oak Forest is to be removed by the proposed action. Only a tiny amount of Littoral Rainforest will be removed by the proposed action. There are recommendations in place to avoid pollutants and reduce the risk of invasive species becoming established by the proposed activity. *g. interfere with the recovery of an ecological community* The proposed action will not interfere with the recovery of the ecological communities. No Coastal Swamp Oak Forest is to be removed by the proposed action. Consistent with the objectives and strategies under the National Recovery Plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community, the recommendations which form part of the proposed activity, are consistent with the objectives and strategies under the National Recovery Plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community (Commonwealth of Australia 2019) e.g. avoid all impacts to patches of Littoral Rainforest. There is no recovery plan for the Coastal Swamp Oak Forest.
EPBC Act listed migratory species	The study area provides some generic foraging habitat for the following EPBC listed migratory species: Black-faced Monarch; Satin Flycatcher; Rufous Fantail; Oriental Cuckoo; White-throated Needletail; Beach Stone-curlew; Sharp-tailed Sandpiper; and Double-banded Plover. The first five species are included in the *Draft referral guidelines for 14 birds listed a migratory species* under the EPBC Act (Australian Government 2015). The significant impact criteria in terms of migratory species are discussed below in relation to these species. *a. substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species* The proposed action will not substantially modify, destroy or isolate an area of important habitat as only up to 1.95 ha of native ground cover and/or understory vegetation, across the 48 km of the proposed walk, is to be cleared or modified. Mature canopy trees will not be removed. The proposed action affects significantly less habitat than the area defined in the threshold guidelines for the first five species. No habitat for the remaining species is to be removed or modified. Therefore, the proposed action is unlikely to substantially modify, destroy or isolate an area of important habitat for any of these migratory species. *b. result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or* The proposed action is not likely to result in invasive species becoming established with measures in place to mitigate this threat during construction and operation phases of the proposed action.

Matters to be assessed	Impact (Commonwealth legislation)
	c. seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species. The proposed action does not impact breeding habitat for these species; only non-breeding foraging habitat, which would at most form a minute fraction of their range. The proposed action affects substantially less than the ecologically significant proportion of the population given in the guidelines for the first five species, so is unlikely to result in a significant impact. No habitat of the remaining species is to be removed so it is highly unlikely that the lifecycle of these species will be disrupted. **Conclusion**: Referral not required.
Nuclear Action	N/A. The proposed action does not involve a Nuclear Action.
Commonwealth Marine Area	N/A. The proposed action will not impact on a Commonwealth Marine Area.
Commonwealth lands	N/A. The proposed action will not directly or indirectly impact on Commonwealth land.
Water resource in relation to coal seam gas and large coal mining development	N/A. The proposed action does not involve coal seam gas and large coal mining development.

7.1.2 EPBC Act Koala referral assessment

As the study area falls within the coastal geographic context of the modelled distribution of the Koala, an assessment of impact on the Koala needs to be carried out to determine if a referral under the EPBC Act is required. In accordance with the *EPBC Act referral guidelines for the vulnerable koala* (Australian Government 2014), the assessment involves a staged process. This staged assessment is detailed below.

Critical Koala Habitat assessment

The habitat of the study area has been assessed in accordance with the tool from the Commonwealth referral guidelines (Australian Government 2014). The Critical Koala Habitat assessment is to determine if the impact area, in this case the study area, contains habitat critical to the survival of the Koala. To qualify as critical habitat, it must score 5 or more in the assessment. The assessment is shown in Table 11 below.

Table 11: EPBC Act Critical Koala Habitat assessment

Attribute	Score	Reason
Koala occurrence	0	• EPBC Act PMST report identified Koala as 'known to occur' in the locality. • The Atlas of Living Australia has one Koala record approximately 0.75 km of the study area from between 2004-2006. • The NSW OEH BioNet Atlas has six records of Koala for the locality, with three records between 0.75 km – 1 km from the study area and none within the subject site or study area. • Field surveys found no evidence (direct or indirect) of Koala within study area.
Vegetation structure and composition	+1	Vegetation mapping and field survey investigations confirmed forest community in the study area with the presence of Forest Red Gum, mostly in the southern sections. This species is a Primary Food Tree for the South Coast Koala Management Area (OEH 2018).
Habitat connectivity	+2	The study area forms part of a contiguous landscape > 500 ha within the National Park.
Key existing threats	+2	NPWS advise that are there are no records of Koala mortality from vehicle strike or dog attack (score of 0 for Koala occurrence). Field surveys found no evidence of Koala mortality.
Recovery value	+2	The study area habitat is likely to be important for achieving interim recovery objectives for the relevant context.
Total	7	
Conclusion		**Study area contains habitat critical to the survival of the Koala. An assessment of significance of the impact of the proposed action is required.**

Impact on Critical Koala Habitat assessment

The critical habitat assessment above determined that the study area contains habitat critical to the survival of the Koala as defined by the *EPBC Act referral guidelines for the vulnerable koala* (Australian Government 2014). Therefore, the proposed action needs to be assessed to determine whether there will be adverse effects on the habitat critical to the survival of the Koala.

In accordance with the *EPBC Act referral guidelines for the vulnerable koala* (Australian Government 2014) the proposed action is assessed in Table 12 below to determine if there will be adverse effects on habitat critical to the survival of the Koala.

Table 12: EPBC Act - Impact of proposed action on habitat critical to the survival of the Koala

Impact criteria to be assessed	Proposed action impact
Clearing ≤ 2 ha of habitat containing known Koala food trees in an area with a habitat score of 5.	Yes
Clearing ≥ 20 ha of a habitat containing known Koala food tress in an area with a habitat score of ≥ 8.	No
Score calculated for the impact area (higher score = greater risk of significant impact).	Score of 7 = medium risk
Amount of Koala habitat being cleared (more habitat cleared = great risk of significant impact).	Only up to 1.95 ha of ground cover and/or understory vegetation over 48 km = low risk
Method of clearing (i.e. clear-felling has great risk of significant impact than selective felling with understory and Koala food tree retention).	Selective clearing with preferred food tree species retention.
Density or abundance of Koala (relatively high density or abundance for the region means greater risk of significant impact).	Low density and abundance.
Level of fragmentation caused by the clearing (greater degree of fragmentation has greater risk of significant impact).	Negligible fragmentation.
Conclusion	**The proposed action will not adversely affect habitat critical to the survival of the Koala.**

Impact on recovery assessment

As well as the assessments above, an assessment on the potential of the proposed action to interfere substantially with the recovery of the Koala is required. This assessment is detailed in Table 13 below.

Table 13: EPBC Act Assessment of proposed action to interfere substantially with recovery of the Koala

Impact criteria to be assessed	Proposed action impact
Increase in fatalities due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.	No increase in fatalities from dog attacks predicted as within national park where dogs are not permitted, and wild dogs are controlled.
Increase in fatalities due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities.	No increase in fatalities from vehicle strikes predicted as vehicle use in study area will be restricted to management purposes only.
Facilitate the introduction or spread of diseases or pathogens that are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat.	No facilitation of introduction or spread of disease of pathogens predicted as construction and operation phases of proposed action are subject to quarantine and bio-security measures.
Create a barrier to movement to, between or within habitat that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the Koala.	No barriers will be created during construction and operation phases of the proposed action.
Change hydrology which degrade critical habitat to the extent that the carrying capacity of the habitat is reduced in the long-term.	Only negligible change to hydrology predicted with construction of step risers and small drainage lines. However, mitigation measures will be in place to control erosion.
Conclusion	**The proposed action will not interfere substantially with the recovery of the Koala.**

Koala referral assessment conclusion

The conclusion of the EPBC Act Koala referral assessment is that the proposed action will not result in a significant impact on critical Koala habitat and therefore does not need to be referred to the Commonwealth Minister for the Environment.

7.2 NSW Threatened species and ecological communities five-part test

Under s. 7.3 of the BC Act, a test for determining whether the proposed activity is likely to significantly affect threatened species or ecological communities, or their habitats is carried out. The test, known as the five-part test, is applied to species, populations and ecological communities listed on schedules of the BC Act. All factors are considered and an overall conclusion made based on all factors in combination. An environmental impact statement is required if, through application of the five-part test, an action is considered likely to have a significant impact on a threatened species, population or ecological community.

Taking into account the recommendations in Section 6, NSW listed threatened species, including threatened populations, and ecological communities that occur or potentially occur in the study area are subject to the five-part test.

a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Table 14: Likelihood of proposed activity to place viable populations of threatened species at risk of extinction

Name	BC Act listing	Assessment of proposed activity on threatened species
Anthochaera phygia Regent Honeyeater	CE	There is suitable foraging habitat e.g. Spotted Gum, for this species in the study area and three records for the locality. Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will not remove or modify the species' foraging resources for the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Arctocephalus pusillus doriferus Australian Fur-Seal	V	This species may occasionally haul out on the limited rock platforms or beaches of the study area. There are five records of this species for the locality. The study area does not contain any known colonies for the species. No modification or disturbance to the habitat resources in the study area for this species will result from the proposed activity. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Artamus cyanopterus cyanopterus Dusky Woodswallow	V	There are numerous records of this species for the locality, including some in Murramarang National Park. There is some low value generic potential habitat in the study area. Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will only remove a negligible amount of habitat for the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Calamanthus fuliginosus Striated Fieldwren	E	A limited amount of habitat for this species occurs in the study area; at Snapper Point and in a few patches along the proposed activity as Bracelet Honey-myrtle - Coast Tea-tree tall shrubland on headlands, South East Corner Bioregion. There is only one record of the species near the study area adjacent to Depot Beach Camping Area, which is forest. This record is from 2001. Under the proposed activity, the section of the study area with suitable habitat is mapped for upgrading of existing track as well as proposed new track development. The areas for track upgrade are regularly used by visitors, particularly the area close to Merry Beach. An increase in visitation to the study area may result from promotion of the walk, however any such impact is unlikely to be significant.

Name	BC Act listing	Assessment of proposed activity on threatened species
		Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will only remove a negligible amount of habitat for the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Callocephalon fimbriatum Gang-gang Cockatoo	V	There are many records for this species for the locality including one near the study area. The species may use the study area as a minor part of its foraging range. The species would need to spend most of its life cycle outside the study area to meet ecological requirements due to ecology and study area limitations. An increase in visitation to the study area may result from promotion of the walk, however any such impact is unlikely to be significant. Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will only remove a negligible amount of habitat for the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Calyptorhynchus lathami Glossy Black-Cockatoo	V	There are many records for this species for the locality. The preferred feed tree *Allocasuarina* spp. occurs within the study area. One active feed tree was observed during the field surveys, close to the track head at Maloneys Beach. An increase in visitation to the study area may result from promotion of the walk; however, taking into consideration the recommendation to miscrosite the track away from such habitat resource, any such impact from this is unlikely to be significant. Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will only remove a negligible amount of habitat for the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Cercartetus nanus Eastern Pygmy Possum	V	There are no records on the databases of this species occurring in the study area. NPWS advised that there is anecdotal evidence of one record for the species on the northern end of North Durras Beach/south-western Depot Headland, outside the study area. The study area does contain preferred habitat of woodlands and heath and there are potential sheltering resources with hollowed logs and stumps which could be impacted. Taking into consideration no mature canopy trees and hollowed logs will be removed, the environmental safeguards and mitigation measures on trail alignment, definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Daphoenositta chrysoptera Varied Sittella	V	There are numerous records for this species for the locality and there is suitable habitat within the study area with eucalypt forests and woodlands, including rough-barked species and mature smooth-barked gums with dead branches. Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Dasyurus maculates Spotted-tailed Quoll	V	There are numerous records of the species for the locality. However, the study area has low quality potential foraging habitat. Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Name	BC Act listing	Assessment of proposed activity on threatened species
Esacus magnirostris Beach Stone-curlew	CE	There is one record of the species for the locality and the study area has some suitable habitat. However, the range of this species has contracted, and it is rarely observed in southern NSW. The preferred habitat in the study area of coastline and littoral zone will not be disturbed by the proposed activity. An increase in visitation to the study area may result from promotion of the walk, however any such impact is unlikely to be significant. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Glossopsitta pusilla Little Lorikeet	V	There are numerous records of this species for the locality and a few near the study area. There is suitable foraging and nesting habitat in the study area within Eucalyptus forest and woodland canopies and vegetated riparian corridors, including Allocasuarina. Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Haematopus fuliginosus Sooty Oystercatcher	V	The study area includes important habitat for this species, particularly on the shoreline at Murramarang Aboriginal Area. However taking into consideration the recommendations to keep the walking track to the headland of Murramarang Aboriginal Area, walkers will be steered away from this area. The promotion of the walking track will direct visitors to the landward edge of other shore platforms. These areas are regularly visited by walkers already and it is not anticipated that the proposed activity will have an impact above what currently exists, nor will it impact upon rocky headlands and shelves of other known nesting sites. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Haematopus longirostris Pied Oystercatcher	E	Murramarang is a key management site for this species under the OEH Saving our Species Program. The study area includes important nesting habitat for the species with known nesting beaches along the coastline. The species also nests on the dunes at the entrance to Durras Lake, near the study area. These areas are regularly visited by walkers already and it is not anticipated that the proposed activity will have an impact above what currently exists, nor will it impact upon rocky headlands and shelves of other known nesting sites. Taking into consideration the recommendations on monitoring, fencing and additional information on shorebird avoidance provided to walkers, the proposed activity is expected to have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Haliaeetus leucogaster White-bellied Sea-eagle	V	This species is known to occur in the study area or immediate surrounds and was observed flying close to the study area during field surveys. The species has potential to use canopy trees in the study area for nesting although no nests were observed during the surveys. The species forages on wing at sea. Taking into consideration no mature canopy trees are to be removed, and the recommendations track alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Hieraaetus morphnoides Little Eagle	V	There are numerous records of the species from locality. There is suitable habitat in the study area although marginal and limited with the species preferring more open forest and woodland. Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Lathamus discolor	E	The species has been previously recorded from the locality, and may seasonally use the study area for foraging depending on flowering abundance. A number of the species preferred winter

Name	BC Act listing	Assessment of proposed activity on threatened species
Swift Parrot		flowering feed trees are present in the study area e.g. Spotted Gum and Forest Red Gum, and species susceptible to lerp infestations. Taking into consideration no mature canopy trees are to be removed, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Lophoictinia isura Square-tailed Kite	V	There are numerous records for the species for the locality. There is suitable nesting habitat in the study area woodlands and open forests, and timbered watercourses. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Miniopterus schreibersii oceanensis Eastern Bent-wing Bat	V	There are numerous records for the species for the locality. There is suitable habitat in study area with a range of vegetation types where it can forage for insects above and below the tree canopies. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Mormopterus norfolkensis Eastern Freetail Bat	V	There are numerous records for the species for the locality. There is suitable foraging and roosting habitat in the study area with rainforest and sclerophyll forest and woodland, and numerous tree hollows. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Ninox connivens Barking Owl	V	There are numerous records of the species for the locality. There is suitable habitat in the study area including with woodland and forest communities with hollow-bearing trees, as well as roosting habitat of Acacia and Casuarina species. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the nesting and roosting habitat for the species. The proposed activity will require the removal of understory vegetation, which may provide for habitat for prey of this species. The area of understory to be cleared or modified is insignificant relative to the remaining intact vegetation in Murramarang National Park. An increase in visitation to the study area may result from promotion of the walk. However, any impacts from an increase in visitation would be insignificant. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Ninox strenua Powerful Owl	V	There are numerous records of the species for the locality. In the study area there is limited generic potential foraging habitat with forest types which may carry a high density of prey, such as arboreal mammals, large birds and flying-foxes. There is also limited suitable breeding and sheltering habitat with limited large hollows. The area behind Snake Bay may provide suitable roosting habitat, although no evidence of roosting was found during surveys. The study area could overlap with multiple pairs/territories. An increase in visitation to the study area may result from promotion of the walk. However, any impacts from an increase in visitation would be insignificant. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the

Name	BC Act listing	Assessment of proposed activity on threatened species
		proposed activity will have a negligible impact on any nesting and roosting habitat for the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Onychoprion fuscata Sooty Tern	V	The species is known from the locality however would only visit the study area on rare occasions. The species does not breed in the locality. An increase in visitation to the study area may result from promotion of the walk. However any impacts from an increase in visitation would be insignificant. Taking into consideration the environmental safeguards and mitigation measures on trail alignment, the proposed activity will have a negligible impact on any habitat the species may visit. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Petauroides volans Greater Glider	EP	A BioNet search resulted in numerous records of the species for the locality. A number of these are mapped as Eurobodalla Greater Glider Endangered Population. However, official OEH advice is that the Endangered Population is south of the Moruya River, with the river acting as a barrier to dispersal, isolating the population from other occurrences of the species. A search of the Atlas of Living Australia records found numerous records in the locality. Adopting a precautionary approach, the assessment concludes that the species may potentially occur and will assess the species as Vulnerable under the EPBC Act, and as part of the Endangered Population in the Eurobodalla LGA under NSW BC Act. There is suitable foraging habitat in the study area with mature eucalypt forest. Hollow-bearing trees in the study area only provide marginal shelter and nesting habitat because of a range of factors including the angle and aperture of the hollows, the low height of the hollows and their exposed locations in most areas. All mature native canopy trees are to be maintained. The species home range would mean that they would spend some of their life cycle outside study area to meet ecological requirements due to ecology and study area limitations. An increase in visitation to the study area may result from promotion of the walk. However, any impacts from an increase in visitation would be insignificant. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on any habitat the species may visit. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Petaurus australis Yellow-bellied Glider	V	There are many records for the species for the locality and there is suitable foraging habitat in the study area with mature eucalypt forest. However, there are limited suitable hollows for roosting or breeding. The species large home range would mean that they would need to spend most of life cycle outside study area to meet ecological requirements due to ecology and study area limitations. An increase in visitation to the study area may result from promotion of the walk. However, any impacts from an increase in visitation would be insignificant. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on any habitat the species may visit. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Petaurus norfolcensis Squirrel Glider	V	There are numerous records of the species from the locality, although no recent ones. There is marginal habitat in the study area with minimal forest/woodland with heath understory. An increase in visitation to the study area may result from promotion of the walk. However, any impacts from an increase in visitation would be insignificant. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

Name	BC Act listing	Assessment of proposed activity on threatened species
Petroica boodang Scarlet Robin	V	The species is recorded for the locality with higher numbers in the hinterland than near the coast. The species prefers open forests and woodlands where it can forage on or near the ground. There is limited foraging habitat in the study area. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Petroica phoenicea Flame Robin	V	The species is recorded on the edge of the locality with higher numbers in the hinterland than on the coast. The species may use the study area for foraging. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Phascogale tapoatafa Brush-tailed Phascogale	V	There are a few records of the species for the locality and suitable habitat in the study area with open forest with sparse ground cover of herbs, grasses, shrubs or leaf litter and some heath and rainforest. There is suitable foraging habitat with rough barked trees and limited nest and sheltering habitat of small tree hollows. An increase in visitation to the study area may result from promotion of the walk. However, any impacts from an increase in visitation would be insignificant. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Phascolarctos cinereus Koala	V	There are a few records of the species for the locality. One feed tree species, Forest Red Gum, is present in study area. It is however found mostly scattered in the southern sections of the study area, being rare elsewhere. *Spotted Gum - White Stringybark - Burrawang shrubby open forest on hinterland foothills*, and *Lilly Pilly - Coachwood warm temperate rainforest on moist sheltered slopes and gullies*, which occur in the study area, are known Koala vegetation communities. An increase in visitation to the study area may result from promotion of the walk. However, any impacts from an increase in visitation would be insignificant. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland)	V	There are no records of the species for the locality. However, there is some suitable yet limited habitat in the study area with ecotones of coastal heath/woodland with dense understory and sandy loam soils. An increase in visitation to the study area may result from promotion of the walk. However, any impacts from an increase in visitation would be insignificant. Taking into consideration the lack of records for the locality, and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Pteropus poliocephalus Grey-headed Flying-fox	V	There are numerous records of the species for the locality. The study area has seasonal foraging habitat only relative to the extent of habitat within this species local range and its ecology, and there will be no barriers to movement created. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species.

Name	BC Act listing	Assessment of proposed activity on threatened species
		It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Scoteanax rueppellii Greater Broad-nosed Bat	V	There are a few records of the species for the locality. There is some suitable habitat in the study area with the presence of gullies in eucalypt forest, woodland and rainforest, and tree hollows. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Sminthopsis leucopus White-footed Dunnart	V	There are a few records of the species for the locality. There is suitable habitat in the study area as the species is found in a range of habitat types although optimal habitat is drier vegetation communities with open understory, so it can feed on invertebrates and small lizards. The proposed activity does involve the modification or clearing of ground cover and/or understory vegetation that may provide habitat for prey species. However, the linear area to be cleared, up to 1.95 ha over a geographical range of 48 km for the proposed walk, is considered insignificant. The removal of small proportions of habitat from individual home ranges is also considered insignificant. The study area does contain potential sheltering resources with hollowed logs and stumps which could be impacted, although wherever possible these resources will be avoided or moved to adjacent areas. An increase in visitation to the study area may result from promotion of the walk. However, any impacts from an increase in visitation would be insignificant. Taking into consideration the retention of hollowed logs and the recommendation on track alignment, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Sternula albifrons Little Tern	E	There are records in the proximity of the locality for the species. There is very limited suitable habitat in study area. Taking into consideration the recommendation on track alignment the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Thinornis rubricollis Hooded Plover	CE	Murramarang is a key management site for the species under the OEH Saving our Species Program. Hooded Plovers nest above the high-water mark at Pretty Beach and there are numerous records of the species along the coastline of Murramarang National Park. The species is also recorded on the beach in Murramarang Aboriginal Area. Known nesting sites are currently protected from beach visitors by temporary fencing, signage and monitoring. Taking into consideration the recommendations on monitoring, fencing and additional information on shorebird avoidance to be made available to walkers, the proposed activity is expected to have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Tyto novaehollandiae Masked Owl	V	There are numerous records of the species for the locality. Generic potential foraging habitat in study area. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.
Tyto tenebricosa Sooty Owl	V	There are numerous records of the species for the locality. Generic potential foraging habitat in study area. The proposed activity requires the removal of understory vegetation, which may

Name	BC Act listing	Assessment of proposed activity on threatened species
		provide for habitat for prey of this species. The area of understory to be cleared or modified is insignificant relative to the remaining intact vegetation in Murramarang National Park. Taking into consideration no mature canopy trees are to be removed and the environmental safeguards and mitigation measures on trail alignment and definition of clearing limits, the proposed activity will have a negligible impact on the species. It is unlikely that the proposed activity will impact upon the life cycle of this species such that a viable population of the species is likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Four NSW TECs potentially occur within or immediately adjacent to the study area. These are: *Bangalay Sand Forest of the Sydney Basin Bioregion and South East Corner Bioregion*; *Littoral Rainforest in the New South Wales North Coast, Sydney Basin Bioregion and South East Corner Bioregion*; *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast Bioregion, Sydney Basin* Bioregion and South East Corner Bioregion; and *Swamp Oak Floodplain Forest of the New South Wales North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion*. As detailed in Section 2.5, without detailed floristic surveys that include condition assessments and soil sampling, the presence and distribution of these TECs in parts of the study area remains potential and approximate.

Taking into consideration the restorative actions with the rehabilitation of redundant trail sections, and the environmental safeguards and mitigation measures, the proposed activity may result in the modification or clearing of ground cover and/or understory vegetation of up to 0.23 ha of potential Bangalay Sand Forest TEC, a negligible amount of potential Swamp Sclerophyll Forest TEC, a net gain of up to 0.08 ha of potential Littoral Rainforest TEC and no direct impact on potential Swamp Oak Floodplain Forest TEC. No mature canopy trees and hollowed logs etc are to be removed.

The DECC (2007) guidelines define 'local occurrence' as the extent of a TEC within the study area but may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated. In addition to these adjacent areas of the TEC, Keith *et al*. (1997) ascertain that genetic discontinuity between flora populations is > 1 km, which is the general limit for dispersal of propagules of most plants. Considering these criteria, the local occurrences of these TECs is more extensive than the community associated with the study area. The amount of potential TECs to be affected by the proposed activity represents an insignificant amount of the local occurrence of these TECs. The local occurrences of the TECs will remain within the conservation estate and surrounding areas.

Therefore, the assessment finds that it is unlikely that the proposed activity will have an adverse effect on the extent of the potential TECs such that local occurrences of TECs are likely to be placed at risk of extinction.

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The proposed activity will require the modification or clearing of up to 1.95 ha of native ground cover and understory vegetation. No mature canopy trees are to be removed. The proposed activity may result in the modification or clearing of ground cover and/or understory vegetation of up to 0.23 ha of potential Bangalay Sand Forest TEC, a negligible amount of potential Swamp Sclerophyll Forest TEC, a net gain of up to 0.08 ha of potential Littoral Rainforest TEC and no direct impact on potential Swamp Oak Floodplain Forest TEC. No mature canopy trees and hollowed logs etc are to be removed. The vegetation to be removed or modified by the proposed activity includes limited foraging habitat for a number of wide ranging and mobile threatened fauna species. The vegetation to be removed or modified is unlikely to be breeding habitat for these threatened species areas. There is extensive and preferable habitat beyond the study area.

The proposed activity will not remove any shorebird habitat but may increase the number of walkers on beaches where shorebirds are known to nest, potentially leading to increased disturbances. While the shorebird nesting areas are important to the long-term survival of these species in the locality, they are already managed by a combination of fencing, signage, monitoring and public awareness, and recommendations have been made to increase these protective measures as part of the proposed activity. The alignment for the proposed activity avoids the breading areas of the higher dunes, and is along the intertidal area.

The proposed activity will not fragment or isolate habitat for any threatened fauna species or any threatened ecological communities considered in this assessment.

Therefore, the assessment finds that the habitat to be removed or modified is not considered important for the long-term survival of any of the threatened fauna species or the threatened ecological communities that may potentially occur.

d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

There are no Areas of Outstanding Biodiversity Values listed under the BC Act for the study area.

e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The key threatening processes *Clearing of native vegetation* and *Removal of dead wood* will be involved with the proposed activity as it will involve modification or clearing of up to 1.95 ha of native ground cover and/or understory vegetation. Taking into account the recommendations in this report, the extent and impact of these key threatening processes is minimal, particularly in the context of the linear impact area with the length of the proposed track and the extent of native vegetation and dead wood within the conservation estate in the locality.

Therefore, it is considered that the contribution of the proposed activity to these key threatening processes is unlikely to increase the impact of the processes.

7.3 SEPP (Koala Habitat Protection) 2020

At the time of this assessment, the *State Environmental Planning Policy (Koala Habitat Protection) 2020* (SEPP Koala Habitat Protection) applies in New South Wales. Although this SEPP does not apply to land dedicated under the *National Parks and Wildlife Act 1974* or the *Forestry Act 1916*, in accordance with NPWS policy, it is considered in this assessment.

Both the Shoalhaven and Eurobodalla LGAs are listed on Schedule 1 of the SEPP. The identification of an area of land as SEPP Potential Koala Habitat is determined by the presence of Koala feed tree species listed within Schedule 2 of the policy. Potential Koala Habitat is defined as areas where the tree species listed under Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. An area of land to which the policy applies must be at least 1 ha in area (and may include adjoining land in the same ownership). If Potential Koala Habitat is present, then it must be further evaluated to determine whether it represents Core Koala Habitat.

The study area is greater than 1 ha. One tree species listed under Schedule 2 of the SEPP occurs in the study area: Forest Red Gum. This species is scattered mostly in the southern sections of the study area, being rare elsewhere. However, the study area does not contain Potential Koala Habitat as defined under Schedule 2 of the SEPP 44 Forest Red Gum does not constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. Therefore, an assessment on the impact of the proposed activity on the SEPP koala habitat is not required.

8 Conclusion

In accordance with relevant assessment guidelines, it is concluded that the proposed activity, taking into consideration the recommendations detailed in Section 6 of this report, is unlikely to have a significant effect on the threatened species, threatened ecological communities, or their habitats; and that none of the local populations of the threatened species or TECs listed under the BC Act that occur or potentially occur within the study area were likely to be placed at risk of extinction, or otherwise significantly impacted. A Species Impact Statement is not required for the proposed activity.

Following consideration of the administrative guidelines for determining significance under the EPBC Act, it is concluded that the proposed activity, taking into consideration the recommendations detailed in Section 6 of this report, is unlikely to have a significant impact on matters of national environmental significance or any other matter protected by the Act, and a referral to the Commonwealth Environment Minister is not necessary.

References

Australian Government (2013). Matters of National Environmental Significance. Significant impact guidelines 1.1. *Environment Protection and Biodiversity Conservation Act 1999*. Available at: https://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nes-guidelines_1.pdf (last accessed 5 April 2021).

Australian Government (2014). EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory). Available at: http://www.environment.gov.au/system/files/resources/dc2ae592-ff25-4e2c-ada3-843e4dea1dae/files/koala-referral-guidelines.pdf (last accessed 5 April 2021).

Australian Government (2015). Draft referral guideline for 14 birds listed as migratory species under the EPBC Act. Available at: https://www.environment.gov.au/system/files/resources/c05f5b87-0a99-4998-897e-7072c236cf83/files/migratory-birds-draft-referral-guideline.pdf (last accessed 5 April 2021).

Australian Government (2019a). National Recovery Plan for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological Community. Available at: https://www.environment.gov.au/system/files/resources/15aceb61-f751-4e7c-8a87-59e07a635072/files/recovery-plan-littoral-rainforest-coastal-vine-thickets.pdf (last accessed 5 April 2021).

Australian Government (2019b). Species Profile and Threats Database, Department of the Environment, Canberra. Available at: http://www.environment.gov.au/sprat (last accessed 5 April 2021).

Birdlife Australia (n.d.). Australia's birds. Available at: https://www.birdlife.org.au/all-about-birds/australias-birds (last accessed 5 April 2021).

Commonwealth Threatened Species Scientific Committee (2018). Conservation advice (incorporating listing advice) for the Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community. Available at: https://www.environment.gov.au/biodiversity/threatened/communities/pubs/141-conservation-advice.pdf (last accessed 5 April 2021).

Cropper S C (1993). Management of Endangered Plants, CSIRO Publishing, Melbourne.

Department of Environment and Conservation (2004). Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft). NSW Department of Environment and Conservation, Hurstville, NSW. Available at: https://www.environment.nsw.gov.au/research-and-publications/publications-search/threatened-biodiversity-survey-and-assessment (last accessed 5 April 2021).

Department of Environment and Climate Change (2007). Threatened species assessment guidelines. The assessment of significance. Department of Environment and Climate Change NSW, Sydney South, NSW. Available at: https://www.environment.nsw.gov.au/research-and-publications/publications-search/threatened-species-assessment-guidelines (last accessed 5 April 2021).

Department of Environment, Climate Change and Water (2010). Southeast NSW Native Vegetation Classification and Mapping - SCIVI VIS_ID 2230 20030101S

Department of Industry (2018). Guidelines for controlled activities on waterfront land – riparian corridors. Natural Resources Access Regulator. Available at: https://www.industry.nsw.gov.au/ data/assets/pdf_file/0004/156865/NRAR-Guidelines-for-controlled-activities-on-waterfront-land-Riparian-corridors.pdf (last accessed 5 April 2021).

Department of Planning and Environment (2018). State Environmental Planning Policy (Coastal Management) 2018 *Coastal wetlands and littoral rainforest map.*

Department of Planning, Industry and Environment (2020). Surveying threatened plants and their habitats. Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/surveying-threatened-plants-and-habitats-nsw-survey-guide-biodiversity-assessment-method-200146.pdf (last accessed 5 April 2021).

Department of Primary Industries (2018). Water Management (General) Regulation 2018 Hydroline spatial data 1.0 for stream orders. Available at: https://www.industry.nsw.gov.au/water/licensing-trade/hydroline-spatial-data (last accessed 5 April 2021).

Department of Primary Industries (n.d.). Batemans Marine Park. Available at: https://www.dpi.nsw.gov.au/fishing/marine-protected-areas/marine-parks/batemans-marine-park (last accessed 5 April 2021).

Ehmann H (1997). *Wallum Sedge Frog. In Threatened Frogs of New South Wales: Habitats, Status and Conservation, pp 182-187*. Frog and Tadpole Study Group of New South Wales Inc. Sydney, NSW.

Keith D A, Chalson J M and Auld T D (1997). *Assessing the status of threatened plants: a new methodology and an application to the vascular flora of New South Wales*. Final Report to Environment Australia, Endangered Species Program Project No. 450.

Marchant S and Higgins P J (1993). *Handbook of Australian, New Zealand and Antarctic Birds*. Oxford University Press, Melbourne.

Moorcroft (2019). *Murramarang South Coast Walk (NPWS Estate) - Flora and fauna constraints analysis and assessment*. Report to the NSW National Parks and Wildlife Service.

Morcombe M (2004). *Field Guide to Australian Birds*. Steve Parish Publishing.

Newscape (2017). *Murramarang South Coast Walk. Track & Facilities Upgrade Concept*. Report prepared for NSW National Parks and Wildlife Service, Office of Environment and Heritage.

NGIS (2017). *Coastal Risk Australia Predicted Coastal Flooding Resulting from Climate Change* 2100 mapping. Available at: http://www.coastalrisk.com.au (last accessed 5 April 2021).

Nicholas Graham Higgs Pty Ltd (2002). *Murramarang National Park, Brush, Belowla & Tollgate Islands Nature Reserves Vegetation Survey and Mapping*. Report prepared for NSW National Parks and Wildlife Service.

NSW National Parks and Wildlife Service (1998). *Murramarang Aboriginal Area Plan of Mana*gement.

NSW National Parks and Wildlife Service (2002a). *Murramarang National Park, Brush Island Nature Reserve, Belowla Island Nature Reserve and Tollgate Islands Nature Reserve Plan of Management*.

NSW National Parks and Wildlife Service (2002b). *Review of Environmental Factors. Coastal walking track works. Murramarang National Park, Murramarang Aboriginal Area, Meroo National Park, Barnunj State Recreation Area.*

NSW Scientific Committee (2008). *Caladenia tessellata* Fitzg. (Orchidaceae). Review of Current Information in NSW. May 2008. Available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/sc-caladenia-tessellata-fitzg-review-report.pdf?la=en&hash=1F5167A9C4E836913A2057F51F15F66C46CC59C8 (last accessed 5 April 2021).

NSW Scientific Committee (2011). Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community listing. NSW Scientific Committee - final determination. Available at: https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10945 (last accessed 5 April 2021).

Office of Environment and Heritage (1998). Acid Sulfate Soils Risk. Available at: https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU&runWorkflow=AppendLayerCatalog&CatalogLayer=SEED_Catalog.106 (last accessed 5 April 2021).

Office of Environment and Heritage (2013). Compilation map: BioMetric vegetation types and endangered ecological communities of the Shoalhaven, Eurobodalla & Bega Valley local government areas. A living map. Version 2.0. Technical Report. NSW Office of Environment & Heritage, Queanbeyan

Office of Environment and Heritage (2016). *Park Facilities Manual*.

Office of Environment and Heritage (2017a). *Park Signage Manual*.

Office of Environment and Heritage (2017b). *Threatened Species*. Available from: http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species (last accessed 10 February 2019).

Office of Environment and Heritage (2018). *Koala habitat and feed trees*. Available at: https://www.environment.nsw.gov.au/topics/animals-and-plants/native-animals/native-animal-facts/koala/koala-habitat (last accessed 5 April 2021).

Office of Environment and Heritage (2019). Soil profile mapping under eSPADE. Available at: https://www.environment.nsw.gov.au/topics/land-and-soil/information/espade (last accessed 5 April 2021).

Pyke G H and White A W (1996). Habitat requirements for the Green and Golden Bell Frog *Litoria aurea* (Anura: Hylidae). *Australian Zoologist* 30: 224-232.

Robinson M (1998). *A field guide to frogs of Australia*. Australian Museum/Reed publication, Port Melbourne, NSW.

Rose G (1966). Ulladulla 1:250 000 Geological Sheet SI/56-13, 1st edition, Geological Survey of New South Wales, Sydney.

Stephenson A (2011). *Orchid Species of the Shoalhaven*. Blue Star Print NSW, Silverwater.

Tozer, M G, Turner C, Keith D A, Tindall D, Pennay C, Simpson C & MacKenzie B (2010). Native Vegetation of South East NSW: a revised classification and map for the coast and eastern tablelands, *Version 1.0. Cunninghamia* 11(3): 359-406.

Troedson A L and Hashimoto T R (2013a). Shoalhaven 1:100 000 and 1:25 000, Coastal Quaternary Geology Map Series. Geological Survey of New South Wales, Maitland.

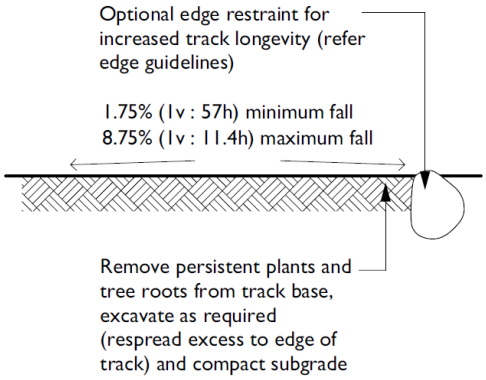
Troedson A L and Hashimoto T R (2013b). Eurobodalla 1:100 000 and 1:25 000, Coastal Quaternary Geology Map Series. Geological Survey of New South Wales, Maitland.

Van der Ree (2002). *Review of information to guide the management of the Squirrel Glider Petaurus norfolcensis population in Murramarang National Park*. A report to the NSW NPWS.

Appendices

Appendix A: Park Facilities Manual – relevant sections

5.3.3 Natural surface



Typical section

Location
Suitable for class 4–5 tracks

See also *5.1.5 Track siting and alignment*

Principles
- Least costly and simplest form of track construction
- With adequate drainage this will often be adequate to carry normal intermittent foot traffic
- If the natural soil is deemed unsuitable due to structural weakness or unacceptable slipperiness etc. then some form of surfacing will be required
- Existing soil profile can be stabilised (optional)

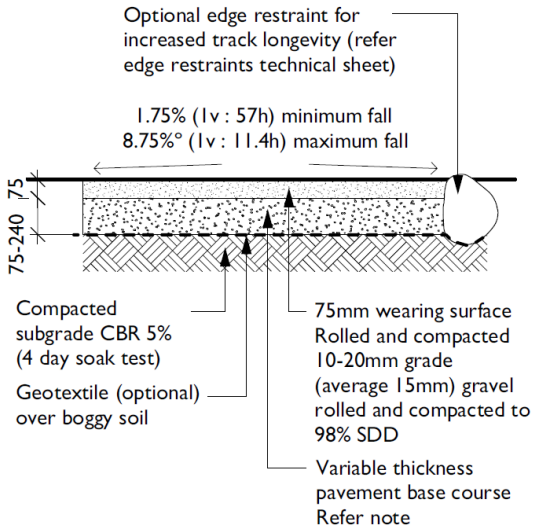
Technical
Track surface
- Natural soil found in situ

Edging
Should be minimal, but can be provided to minimise erosion:
- Timber
- Rock

Stabilisation of wearing surface (optional)
- Variety of stabilisation mixes can be added – refer *5.3.8 Lime stabilisation* and *5.3.9 Cement stabilisation*

All dimensions in millimetres unless otherwise noted

5.3.4 Gravel



Base course thickness:

- Pedestrian – 75mm compacted thickness fine crushed rock (DGS20) or equivalent
- Light vehicle (ute) – 160mm compacted thickness fine crushed rock (DGS20) or equivalent (80% confidence)
- Heavy vehicle (single axle) – 240mm compacted thickness fine crushed rock (DGS20) or equivalent (80% confidence)
- Site-specific engineering advice required in areas of problem soil condition, steep grades, etc

Typical section

Using geotextile

Geotextile is a non-woven polyester semi-permeable membrane cloth that separates the gravel surfacing material (or fill) from the soft soil below.

Geotextile material can be easily placed directly on a weakly structured soil surface to create an initial base layer to improve track stability.

The cloth acts to allow free movement of water but inhibits the downward movement of gravel into the boggy soil below. Consequently hard setting gravel can be laid directly over geotextile on soft clay soils, however adequate drainage must first be provided.

Installation of geotextile onto ground as base layer in track construction allows for removal of track at a later date without disturbance to the site soil below. This is particularly useful for archaeological sites.

Location

Suitable for class 3–5 tracks

See also *5.1.5 Track siting and alignment*

Principles

- Blends well with natural environment
- Use of locally occurring gravel preferred
- Can be susceptible to erosion from surface water especially on tracks with longitudinal gradients steeper than 1vertical to 8 horizontal
- Can be stabilised with additives to improve longevity
- Track surface should be compacted and profiled to minimise surface depressions and ponding
- Integrate turnpiking of alignment where appropriate to more effectively manage drainage to steeply sloping sites

Technical

Gravel

- Gravel to be well graded material of nominal size range as listed and of uniform colour including:
  - crushed rock
  - decomposed granite
  - shell grit

Edging

- Stone
- Rock
- Timber edge (200x38mm)

Geotextile (optional)

- A24 BIDIM geotextile (or equal) for most general applications – consider heavier fabric for sharp irregular sub base or base course (over 50mm ø)

Base course

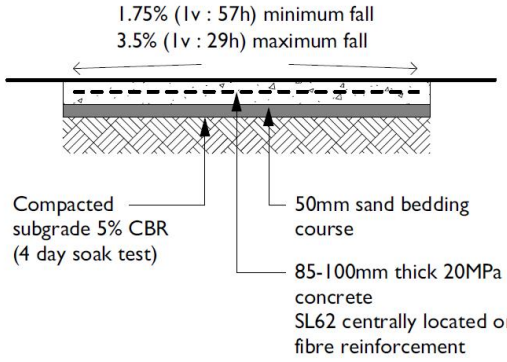
- Fine crushed rock
- Recycled concrete or brick

Stabilisation of wearing surface (optional)

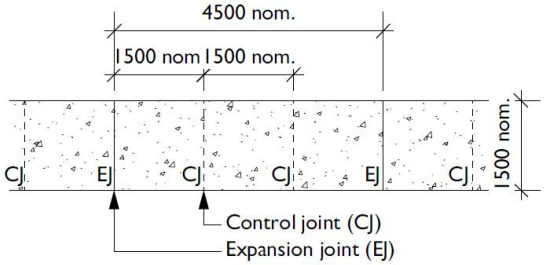
- Variety of stabilisation mixes can be added – refer *5.3.9 Lime stabilisation* and *5.3.9 Cement stabilisation*

All dimensions in millimetres unless otherwise noted

5.3.10 Concrete

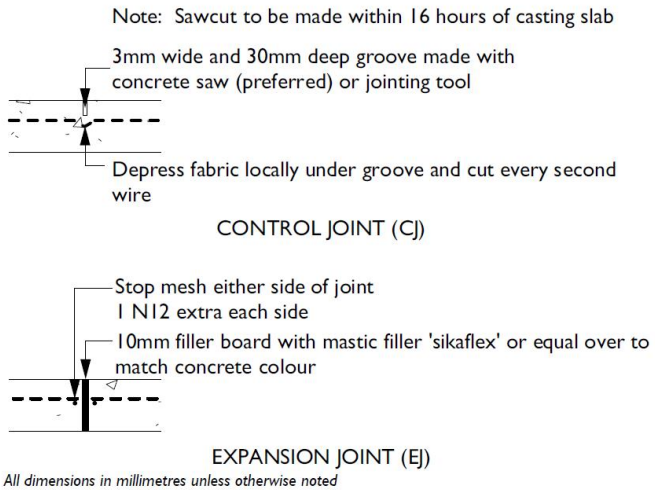


Typical section



The distance between concrete joints varies, generally depending on the width of the path. As a general rule aim to make squares with concrete joints, with every third joint being an expansion joint and all in between joints being control joints
Eg. For a 1500mm wide concrete path (shown above – joints should be at 1500 nom. centres. Therefore each expansion joint is 4500mm apart.

Typical plan – jointing example



All dimensions in millimetres unless otherwise noted

Exposed aggregate surface at Meeting Place Precinct, Botany Bay NP

Breadcrumb oxide colour used at Three Sisters Walking Track, Blue Mountains NP

Location
Suitable for class 1 and 2 tracks, generally high-use tracks adjoining park focal points such as visitor centres, lookouts etc.

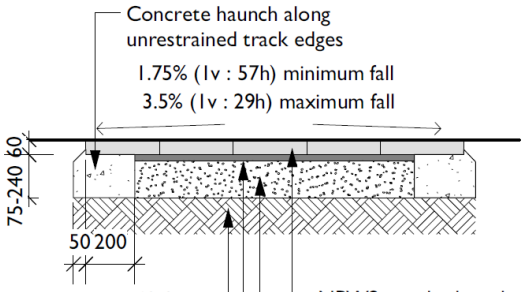
See also *5.1.5 Track siting and alignment*

Principles
- Hard-wearing path with long life expectancy and low ongoing maintenance requirements
- Suitable for wheelchair use
- Consider visibility from adjoining areas – if critically viewed and likely to be of visual impact, consider asphalt or other track surface

Technical
- Concrete and reinforcement in accordance with Australian Standards
- Monitor joints to avoid settlement causing deflections greater than 5mm

Finishes
Range of approved finishes – refer *10.2.8 Concrete* for details:
- Exposed aggregate by light 'washing' or 'honing' of concrete surface
- Broom finish (tooled edges followed by broom finish over top)
- Cove (wood float) finish provides a good non-directional finish
- Coloured oxide may be added to any of the above finishes, however only a few colours are approved for use in park areas

5.3.13 Paver

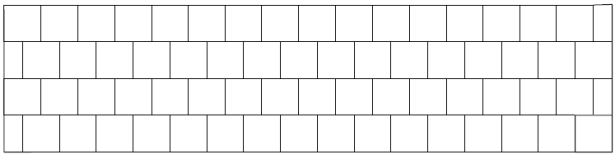


Base course thickness:

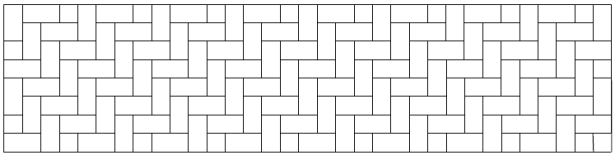
- Pedestrian – 75mm compacted thickness fine crushed rock (DGS20) or equivalent
- Light vehicle (ute) – 160mm compacted thickness fine crushed rock (DGS20) or equivalent (80% confidence)
- Heavy vehicle (single axle) – 240mm compacted thickness fine crushed rock (DGS20) or equivalent (80% confidence)
- Site-specific engineering advice required in areas of problem soil condition, steep grades, etc

Typical section

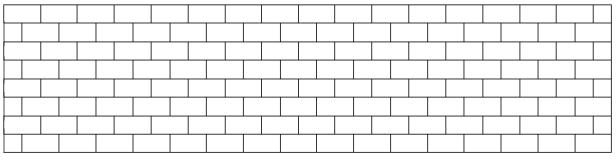
Typical laying patterns



300x300 stretcher bond pattern



300x150 herringbone pattern



300x150 stretcher bond pattern

All dimensions in millimetres unless otherwise noted

Location
Suitable for class 1 and 2 tracks

Principles

- Standard size paver that is easily tranportable and can be laid in a curved alignment
- Concrete paver with dark grey colour to blend with a range of natural settings
- A custom made paver with rippled surface has been made previously for NPWS to provide extra grip in slippery condtions
- Smooth surface shall be compliant with class V of AS/NZS 4586 and provide adequate slope resistance for gradients up to 1:14 in general applications (i.e. not damp)
- Clay brick pavers commonly used in domestic landscapes are not to be used due to the need to promote an image identifiable from other open space managers, the limited colour range, and potential to lose slip resistance over time.

Technical

Paver colour

- Dark grey / charcoal colour

Paver size

- 300x300x60mm or
- 300x150x60mm

Rippled finish

- Optional custom rippled surface on top face

Base course

- Fine crushed rock
- Recycled concrete or brick

Maintenance

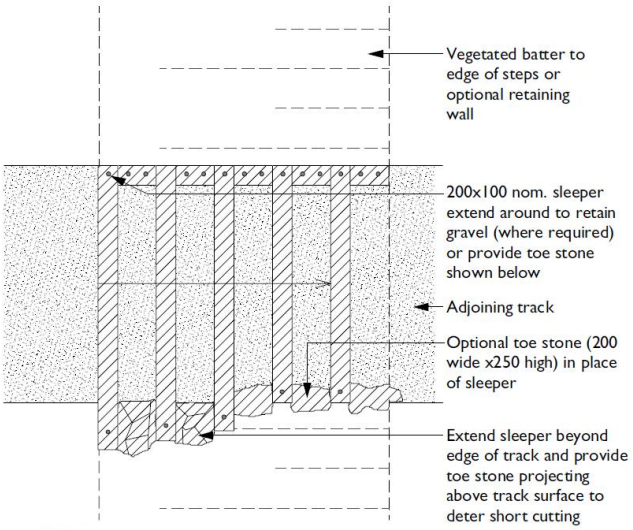
- Monitor joints to avoid settlement/ deflections greater than 5mm

5.5.5 Sleeper

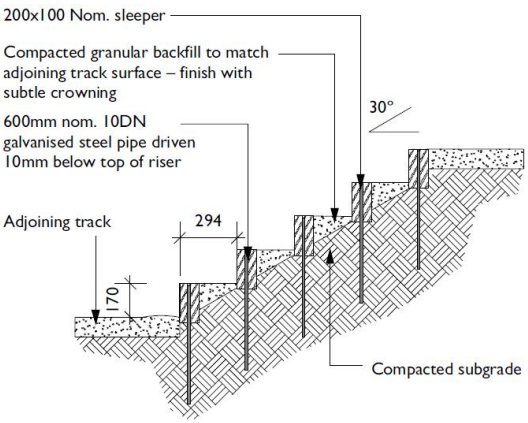
1200 long half rounds are typically used in the Blue Mountains

600 long rectangular profile at Sublime Point

Rectangular profile at Royal NP



Plan



Cross section

Location

Class 3,4 and 5 tracks

Principles

- Traditional construction technique that blends well with most natural setting
- Concrete riser provides hard wearing treatment with long life expectancy – not affected by bushfires
- Suitable for use with bitumen, gravel and mulch tracks (refer technical sheets – *5.3 Tracks*)
- Gravel step treads should be finished level (no cross fall) to minimise erosion
- Return riser at step edges where required, or install with toe stone to reduce erosion of tread material

Technical

Sleeper

- Timber riser or precast concrete step riser
- Fix with galvanised steel pipe driven through precast hole in riser
- 200 high x 1200 long half rounds typically used in Blue Mountains
- 200 high x 100 wide x 600 long sleepers used in Illawarra Area
- Timber to be class 1–2 hardwood or preservative-treated softwood (e.g. Copper Azole, ACQ)

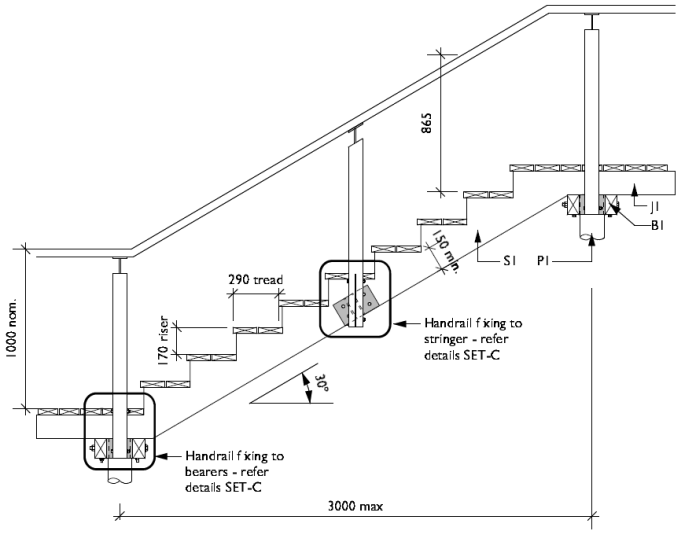
Maintenance

- Top up gravel treads periodically
- Check stability of risers and make sure that pipe is not projecting above track surface
- Check condition of riser top edge – can be turned upside down when it becomes worn

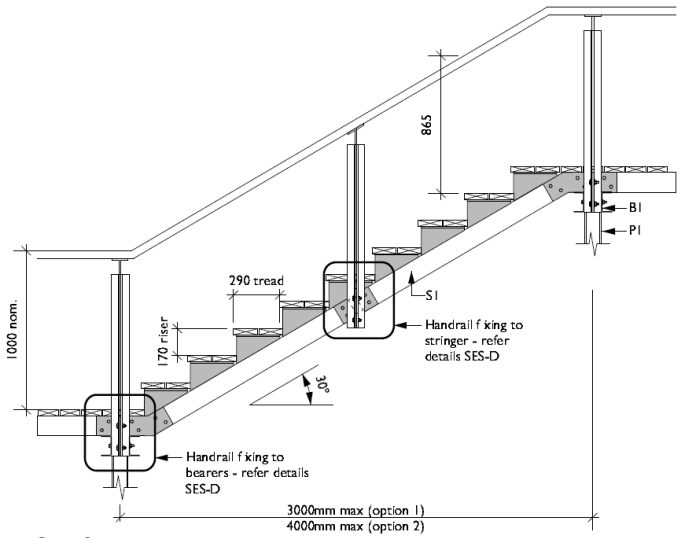
Riser/going dimensions

- The stair slope (30°) and riser/going dimensions shown on detail are indicative. Refer *Steps and stairways / 5.5.1 General requirements / Preferred step ratios* for a number of predefined ratios compliant with AS 2156 and the BCA

5.5.6 Elevated stairs



Timber



Steel

Location
Class 1–3 tracks in all park areas

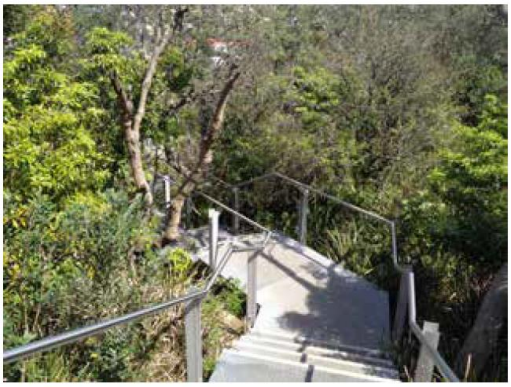
Principles
- Provides minimal-impact access through natural areas once installed
- Provides smooth and consistent walking surface for safe and easy access
- Post height can be modified to provide greater flexibility in response to undulating ground
- Stairs must conform to the BCA where they form part of access to or between buildings
- Stairs must conform to *AS 2156 Walking Track* for all applications in national parks
- Provide 2.5m vertical clearance free from obstructions (e.g. tree branches etc.) above deck level

Technical
- Timber or steel posts, beams and joists
- Decking material options:
  - 125x38 hardwood
  - 125x50 recycled plastic
  - galvanised steel mesh grate
  - fibreglass mesh grate

Riser/going dimensions
- The stair slope (30°) and riser/going dimensions shown on detail are indicative.
- Refer *Steps and stairways / 5.5.1 General requirements / Preferred step ratios* for a number of predefined ratios compliant with AS 2156 and the BCA

Refer A3 technical sheets:
SET for timber
SES for steel

5.5 Steps and stairways



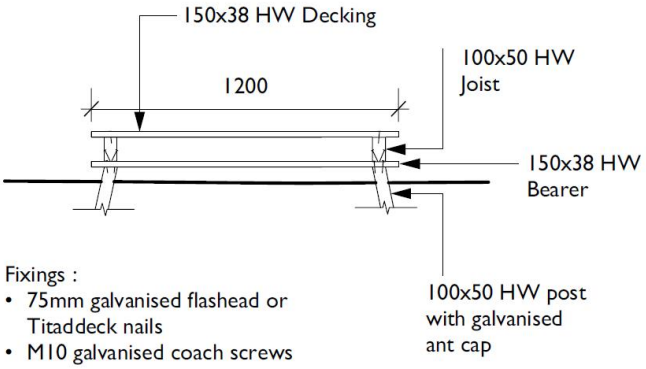
Gap Bluff

- Access upgrade to cliff top lookouts at Sydney's South Head
- Stainless steel structure that incorporates woven wire mesh balustrade and FRP micro mesh decking
- Refer Gap Bluff drawings

Grand Canyon Walk

- Steel frame structure with timber posts and step treads, and uni-fit barrier system
- Long stair flight was required to fit within existing track limitations at top and bottom of the stairs
- Refer Grand Canyon drawing

5.9.2 Duck board



Fixings :
- 75mm galvanised flashead or Titaddeck nails
- M10 galvanised coach screws

Location
- Class 2–4 tracks in all duck areas

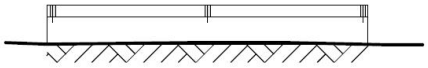
Principles
- Relatively cheap and quick to install
- Used extensively in Tasmania's World Heritage national parks
- Simple construction with traditional materials
- Timber blends well with a range of park settings
- Can be slippery – needs a non-slip surface in wet, shady and icy locations, for example chicken wire or asphalt

Technical
- Class 1–2 Australian hardwood (HW) or treated softwood
- Hot-dip galvanised nails and bolts
- Grade 316 stainless steel nails and bolts in marine environments

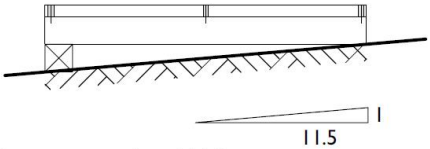
Refer A3 technical sheet:
BDB

All dimensions in millimetres unless otherwise noted

5.9.3 Floating grate

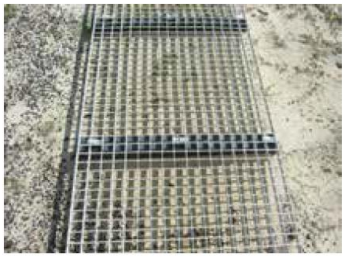


Minimal cross slope



Maximum cross slope 1:11.5

Typical sections



Location
- Class 2–4 tracks in all park areas

Principles
- Reduces environmental impacts of bush walking
- Relatively cheap and quick to install
- No footing or penetration of the ground surface required
- Can be easily removed and relocated
- Grate allows light and water to penetrate through the deck
- Fibreglass grate is quiet to walk on and corrosion resistant
- Grate surface prevents goats entering sensitive areas such as Aboriginal art sites

Technical
- Galvanised steel mesh grate
- Fibreglass mesh grate (colored grey)
- Recycled plastic bearers

Refer case study:
5.2.6 Henry Head, Botany Bay NP (La Perouse) case study

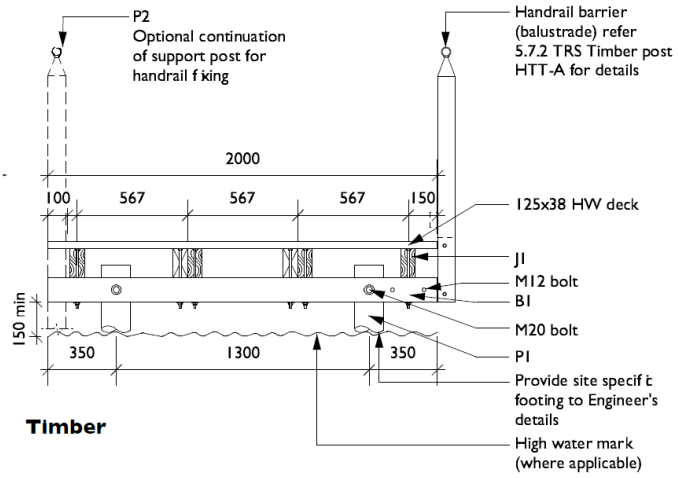
Refer A3 technical sheet:
BFG

Design by Peter Donahoe (NPWS Illawarra Area)

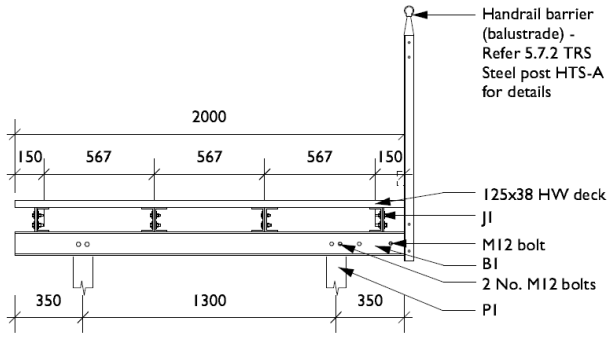
All dimensions in millimetres unless otherwise noted

5.9 Boardwalks and bridges

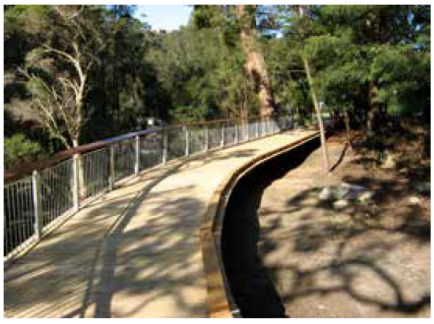
5.9.5 Elevated boardwalk



Timber



Steel



Steel frame and timber deck boardwalk at the Weir Precinct, Lane Cove NP

Location

Class 1–3 tracks in all park areas

Principles

- Provides minimal-impact access through natural areas once installed
- Provides smooth and consistent walking surface for safe and easy access
- Post height can be modified to provide greater flexibility in response to undulating ground
- Where boardwalks cross water the beams should be above the high water mark
- Provide 2.5m vertical clearance free from obstructions (e.g. tree branches, etc.) above deck level
- Timber deck can be slippery – needs a non-slip surface in wet, shady and icy conditions, for example chicken wire or asphalt

Technical

Building codes and standards

- Can extend over water
- Boardwalks must conform to the BCA where they form part of access to or between buildings
- Boardwalks must conform to *AS 2156 Walking Track* for all applications in national parks
- Boardwalks on class 1 tracks must comply with *AS 1428 Design for Access and Mobility*

Materials

- Timber or steel posts, beams and joists
- Decking material options:
  - 125x38 hardwood
  - 125x50 recycled plastic
  - galvanised steel mesh grate
  - fibreglass mesh grate

Refer A3 technical sheets:

BET for timber

BES for steel

MMB for mini mesh

5.9 Boardwalks and bridges

Royal NP Coast Walk

- Composite frame boardwalk with FRP decking
- 2.4m spans between post
- Doesn't require concrete for footings
- Refer Coast Walk technical package

Hermitage Foreshore Walk, Sydney Harbour NP

- Composite frame with timber decking
- Closely follows the ground surface
- Can incorporate steps and curved timber handrail (laminated)

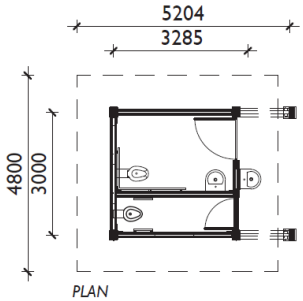
Floating elevated boardwalk, Maddens Plains (Illawarra)

- Sits on timber sleepers and doesn't require footings
- Removable
- Refer Maddens Plains technical package

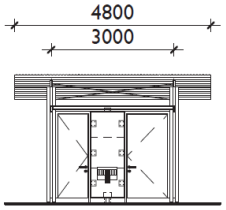
6.4.7 Skillion double stall

Timber frame

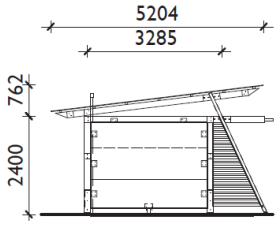
Steel frame



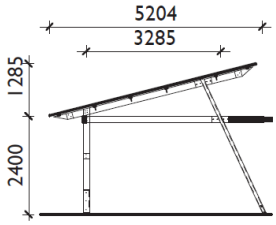
PLAN



FRONT ELEVATION



7° roof pitch



14° roof pitch

Location
Park areas where a double-stall toilet is required

Principles
- Designed to accommodate various sewage treatment systems
- Vehicle access required for pumpout and/or servicing
- Install with a range of ancillary elements to suit site-specific physical and character requirements
- Two buildings can be installed side by side to create a central breezeway which can be used for outdoor showers etc.
- Select frame materials based on suitability for environmental conditions, visual settings, existing structures etc.
- Select roof pitch based on visual settings, level of exposure, views etc.
- Toilets, showers and taps (where applicable) should be 4-star WELS rated
- Where possible, rainwater tanks should be plumbed to toilets

Technical
- Refer *6.1.8 Shelters & toilets drawing matrix* for guidance in assembling A3 technical drawing packages
- Refer *6.5 Shelter & buildings ancillaries* for structural components and engineering considerations required for shelters and buildings and optional fixtures that supplement the function, usage and look of the standard shelters
- Refer *10.2 Colours and finishes* for coating systems, corrosion protection, graffiti protection, external paint, internal paint, timber, corrugated steel and concrete technical sheets

A3 technical sheets
SSD for steel stall
SSDC for steel conc stall
TSD for timber stall

All dimensions in millimetres unless otherwise noted

6.3.5 Skillion standard

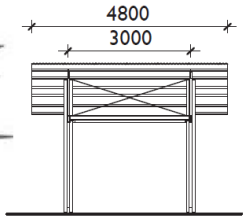
Timber frame

A3 technical sheets

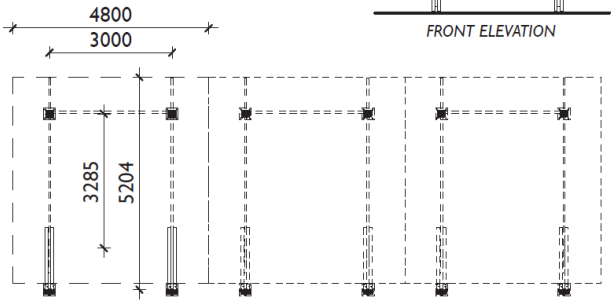
SS7 for steel 7°
SS14 for steel 14°
TS7 for timber 7°
TS14 for timber 14°

Steel frame

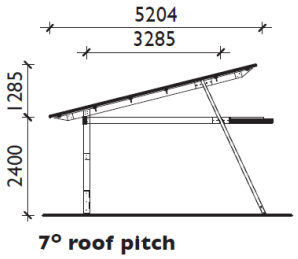
Extended shelter



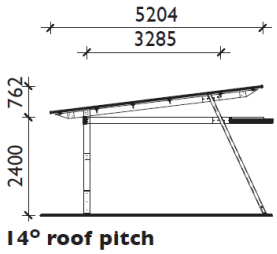
FRONT ELEVATION



PLAN



7° roof pitch



14° roof pitch

All dimensions in millimetres unless otherwise noted

Standard timber skillion at Bonnie Vale campground, Royal NP

Location

Park areas where a standard size shelter is required

Principles

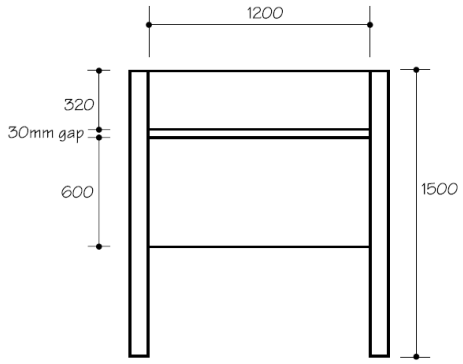
- Standard-size shelter for family and small-party use when installed with a picnic table
- Can also be used as a centralised cooking facility when installed with BBQs
- Join several shelters together to create a larger shelter
- Install with a range of ancillary elements to suit site-specific physical and character requirements
- Select frame materials based on suitability with environmental conditions, visual settings, existing structures etc.
- Select roof pitch based on visual settings, level of exposure, views etc. – e.g. 7° roof for flatter landscapes with dominant horizon, 14° roof for undulating landscapes and semi-enclosed settings

Technical

- Refer *6.1.8 Shelters & toilets drawing matrix* for guidance in assembling A3 technical drawing packages
- Refer *6.5 Shelter & buildings ancillaries* for structural components and engineering considerations required for shelters and buildings and optional fixtures that supplement the function, usage and look of the standard shelters
- Refer *10.2 Colours and finishes* for coating systems, corrosion protection, graffiti protection, external paint, internal paint, timber, corrugated steel and concrete technical sheets

Appendix B: Park Signage Manual – relevant sections

7.3.4 Track head sign – standard



All dimensions in millimetres unless otherwise noted – not to scale

Function
Used to signpost an entrance to a smaller precinct or inform visitor of destinations and distances, track difficulty rating, directions to points of interest and amenities. May also be combined with a map of the walking track system or precinct.

Location
Locate at the beginning of a track and when the number of destinations required within a smaller precinct area is less than required for a track head sign.

Content / message
Header panel: name of park or precinct and NPWS logo.
Body panel: directional arrows, information symbols, destinations, distances, difficulty and time estimates (for walking tracks).
Symbol bar: may indicate hazard warnings, where the warnings are precinct-wide and not site-specific, and can be adequately explained by a symbol and few words. Danger messages require a stand-alone sign.

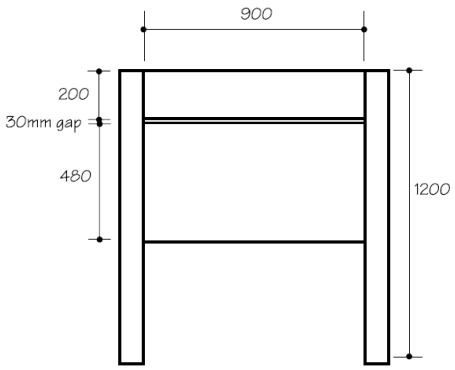
Design guidelines
Construction principles: refer to Section 10.1
Graphics rules: refer to Section 6.2
Messages and text rules: refer to Section 6.4
Printing options: refer to Section 10.2
Siting and locating principles: refer to Section 2.6
Materials information: refer to Section 10.5
Symbol catalogue: refer to Section 9.1

.

Refer to A3 technical sheets

Construction	
timber posts	
fixed aluminium panels	PPT – C1 PPT2 – C1 PPTF – C1, C2 PPTF2 – C1
changeable aluminium panels	PPT – C1 PPT2 – C1 PPTC – C1, C2 PPTC3 – C1
footing	PPT – F1, F2
aluminium posts	
fixed/changeable aluminium panels	PPA – C1, C2 PPA3 – C1
footing	PPA – F1, F2
Layouts	PPH12 – G1 PPB12 – G1, G2, G3, G4

7.3.5 Track junction sign



All dimensions in millimetres unless otherwise noted – not to scale

Function
Inform and direct visitors to destinations, provide distances, track difficulty rating, and directions to points of interest and amenities. Symbol bar to inform of hazards.

Location
Located at track junctions and in areas where there may be limited space without compromising viewing distance and legibility.

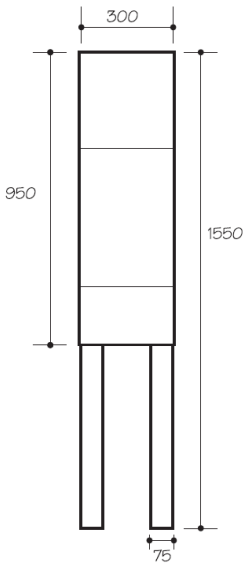
Content / message
Header panel: Name of park, precinct or track and NPWS logo.
Body panel: directional arrows, information symbols, destinations, distances, difficulty and time estimates (for walking tracks).
Symbol bar: may indicate hazard warnings, where the warnings are precinct-wide and not site-specific, and can be adequately explained by a symbol and few words. Danger messages require a stand-alone sign.

Design guidelines
Construction principles: refer to Section 10.1
Graphics rules: refer to Section 6.2
Messages and text rules: refer to Section 6.4
Printing options: refer to Section 10.2
Siting and locating principles: refer to Section 2.6
Materials information: refer to Section 10.5
Symbol catalogue: refer to Section 9.1

Refer to A3 technical sheets

Construction	
timber posts	
fixed aluminium panels	PPT – C1 PPT2 – C2 PPTF – C1, C2 PPTF2 – C1
changeable aluminium panels	PPT – C1 PPT2 – C2 PPTC – C1, C2 PPTC3 – C1
footing	PP T – F1, F2
aluminium posts	
fixed/changeable aluminium panels	PPA – C1, C2 PPA3 – C1
footing	PP A – F1, F2
Layouts	PP H9 – G1 PP B9 – G1, G2, G3, G4

7.3.6 Minor directional sign



All dimensions in millimetres unless otherwise noted – not to scale

Function
Additional navigational signs along walking tracks and within pedestrian circulation areas where there is little space but users may be able to access and look closely at the maps and messages.

Location
Track junctions.

Content / message
Detailed maps may be contained on these signs. The precinct name is shown on the header and is combined with messages, information symbols and directional arrows.

Changeable panels are recommended particularly for map sections.

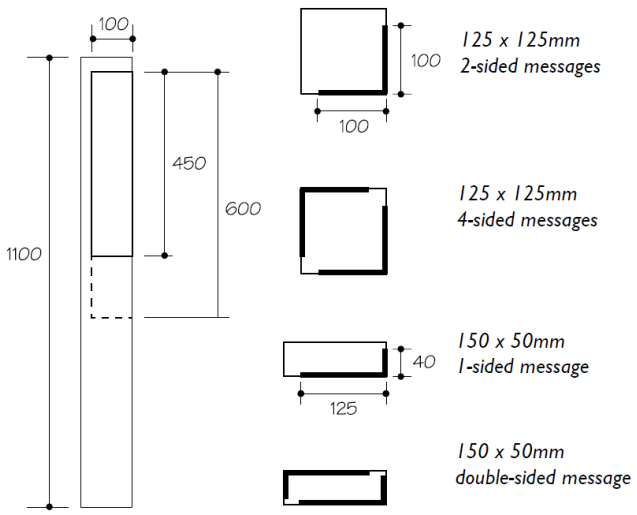
Symbol bar: may indicate hazard warnings, where the warnings are precinct-wide and not site-specific, and can be adequately explained by a symbol and few words. Danger messages require a stand-alone sign.

Design guidelines
Construction principles: refer to Section 10.1
Graphics rules: refer to Section 6.2
Messages and text rules: refer to Section 6.4
Printing options: refer to Section 10.2
Siting and locating principles: refer to Section 2.6
Materials information: refer to Section 10.5
Symbol catalogue: refer to Section 9.1

Refer to A3 technical sheets

Construction	DIR 6 – C1, C2
Footing	PP A – F1
Layouts	DIR 6 – G1 DIR 6M – G1

7.3.7 Standard totem



Options

All dimensions in millimetres unless otherwise noted – not to scale

Function
Used in small precinct areas and along walking tracks to assist pedestrians with locating amenities or on walking tracks to reinforce direction, track names and distances to destinations.

Location
To be located at relevant decision points and junctions. The contrast of the lettering and symbol colour on the dark background make it easy to recognise a totem from a distance. However the totems should not be located too far away from the track or route edge.

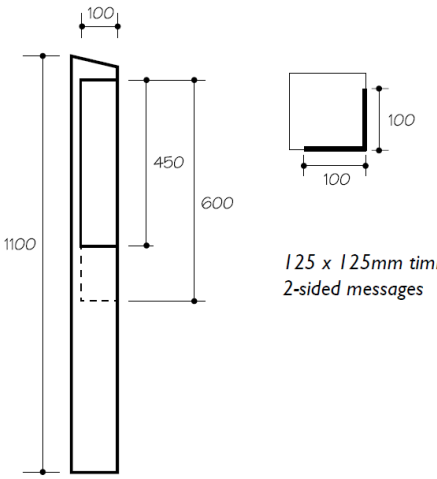
Content / message
NPWS logo always portrayed on totems to reinforce location; background colour reinforces park type. Arrow followed by symbol followed by message, if required, on a vertical format. As there is limited space only essential information should be provided. Using symbols and arrows may be more appropriate than too many words. Totems are not to be used for hazard or regulatory symbols.

Design guidelines
Construction principles: refer to Section 10.1
Graphics rules: refer to Section 6.2
Messages and text rules: refer to Section 6.4
Printing options: refer to Section 10.2
Siting and locating principles: refer to Section 2.6
Materials information: refer to Section 10.5
Symbol catalogue: refer to Section 9.1

Refer to A3 technical sheets

Construction	
timber totem	TOTT – C1, C2, C3
footing timber totem	PPT – F1, F2
steel totem (square)	TOTS – C1 TOTSS – C1
steel totem (rectangular)	TOTS – C1 TOTSR – C1
footing steel totem	P – F1, F2
Layouts	TOT 1 – G1 TOT 2 – G1

7.3.8 Map totem



125 x 125mm timber post
2-sided messages

All dimensions in millimetres unless otherwise noted – not to scale

Function
Used in small precinct areas and along walking tracks to assist pedestrians find amenities or on walking tracks to reinforce direction, track names and distances to destinations. Visitors are further assisted by a map fixed to the top of the totem.

Location
To be located at relevant decision points and junctions. The contrast of the lettering and symbol colour on the dark background make it easy to recognise a totem from a distance. However the totems are not to be located too far away from the track or route edge.

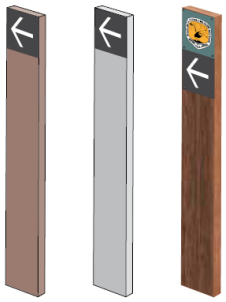
Content / message
NPWS logo always portrayed on totems to reinforce location; background colour reinforces park type. Arrow followed by symbol followed by message, if required, on a vertical format. As there is limited space, only essential information should be provided. Using symbols and arrows may be more appropriate than too many words. Totems are not to be used for hazard or regulatory symbols.

Design guidelines
Construction principles: refer to Section 10.1
Graphics rules: refer to Section 6.2
Messages and text rules: refer to Section 6.4
Printing options: refer to Section 10.2
Siting and locating principles: refer to Section 2.6
Materials information: refer to Section 10.5
Symbol catalogue: refer to Section 9.1

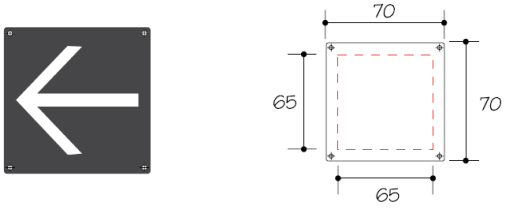
Refer to A3 technical sheets

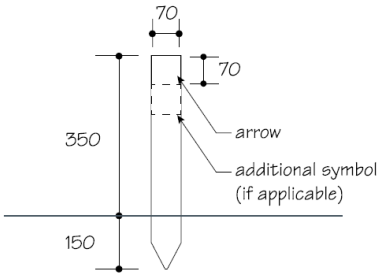
Construction	
timber totem	TOTM1 – C1 TOTM2 – C1 TOTTM1 – C1 TOTTM2 – C1
footing timber totem	PPT – F1, F2
steel totem	TOTM1 – C1 TOTM2 – C1
footing steel totem	P – F1, F2
Layouts	TOT 1 – G1 TOT 2 – G1

7.3.9 Walking track marker



Shown with optional logo panel, with background colour matching park type.





Dimensions are recommendations only. The above-ground height of post is dependant on the environment.

All dimensions in millimetres unless otherwise noted – not to scale

Function
This sign is specifically designed for use in areas where it is impractical to carry in the heavier totems. It can be used in conjunction with totems at the beginning of a track.

Location
Used as a reassurance guide for visitors that they are following the correct track.

Content / message
Simply an arrow reinforcing the direction of the path. An arrow may be used on both sides of the sign if required.

Design guidelines
Construction principles: refer to Section 10.1
Graphics rules: refer to Section 6.2
Printing options: refer to Section 10.2
Siting and locating principles: refer to Section 2.6
Materials information: refer to Section 10.5

New designs suitable for producing in recycled plastic are in development.

Construction
Posts

Timber
Closest size to 70x20x500mm timber slat. Trim one end to a triangle to aid in embedding the sign.

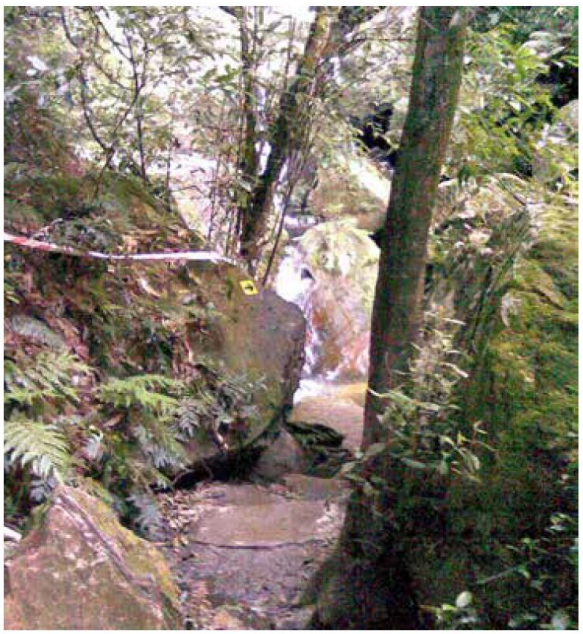
Aluminium
Closest size to 76x25mm rectangular hollow section cut into 500mm lengths. Trim one end to a triangle to aid in embedding the sign.

Recycled plastic
Closest size to 70x20x1500mm post cut into three equal lengths (500mm long). Trim one end to a triangle to aid in embedding the sign.

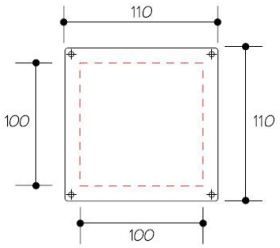
Symbols
1.6mm thick aluminium plate cut to 70x70mm square. Background colour to match Dulux 'Namadji' PG1.F8, arrow to be white. Screw fixed to post. Screws not to cover symbol artwork. Symbol size 65x65mm.

Printing can be one of three options: mask and spray, vinyl arrow on a painted background arrow or a digital print fixed to the sign plate.

7.3.10 Waymarker - plaque



Shown attached to rock where no other markers are appropriate.



Function
This arrow marker is intended for remote grade 4 amd 5 tracks and wilderness areas where it is impractical or impossible to install totems in the ground and/or where visibility may be poor.

Location
Used as a safety measure for visitors in remote areas to ensure they are following the correct route, or areas with poor visibility.

An arrow marker applied correctly to rock (where appropriate and available) may be less intrusive than the installation of a totem or marker. Cannot be attached to trees or other objects which constitutes vandalism

Content / message
AS 2156 walking track directional arrow to be used instead of triangular markers.

Design guidelines
Construction principles: refer to Section 10.1
Graphics rules: refer to Section 6.2
Printing options: refer to Section 10.2
Siting and locating principles: refer to Section 2.6
Materials information: refer to Section 10.5

The design is currently being tested for future endorsed state-wide applications

Construction
1.6mm thick aluminium plate cut to either 110x110mm or 90x90mm square depending on placement. The arrow should be on a square background of minimum size 90x90mm.

Background colour AS 2156 specified golden yellow. Arrow black for greatest contrast. Screw fixed to post. Screws not to cover symbol artwork..

Printing can be one of three options: mask and spray, vinyl arrow on a painted background or a digital print fixed to the sign plate.

All dimensions in millimetres unless otherwise noted – not to scale

7.3.11 Waymarker - post

Function
This marker is intended for remote grade 4 amd 5 tracks and wilderness areas where it is preferrable to install totems in the ground and/or where visibility may be poor.

The sign type is currently in progress and is proposed to be developed for future endorsed state-wide applications

All dimensions in millimetres unless otherwise noted – not to scale

Appendix C: NSW BioNet Atlas search results – threatened species in Murramarang National Park

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) or Commonwealth listed Entities in Murramarang NP NPWS Reserve returned a total of 708 records of 47 species.

Report generated on 2/04/2021 10:16 AM

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm status	Records
Animalia	Amphibia	Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E1,P	V	2
Animalia	Aves	Apodidae	*Hirundapus caudacutus*	White-throated Needletail	P	V,C,J,K	7
Animalia	Aves	Diomedeidae	*Thalassarche melanophris*	Black-browed Albatross	V,P	V	1
Animalia	Aves	Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	1
Animalia	Aves	Ardeidae	*Ixobrychus flavicollis*	Black Bittern	V,P		1
Animalia	Aves	Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		24
Animalia	Aves	Accipitridae	*Hieraaetus morphnoides*	Little Eagle	V,P		7
Animalia	Aves	Accipitridae	*^^Pandion cristatus*	Eastern Osprey	V,P,3		13
Animalia	Aves	Burhinidae	*Esacus magnirostris*	Beach Stone-curlew	E4A,P		1
Animalia	Aves	Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		48
Animalia	Aves	Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher	E1,P		9
Animalia	Aves	Charadriidae	*Thinornis cucullatus cucullatus*	Eastern Hooded Dotterel	E4A	V	12
Animalia	Aves	Cacatuidae	*^^Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3		37
Animalia	Aves	Cacatuidae	*^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		28
Animalia	Aves	Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V,P		23
Animalia	Aves	Psittacidae	*^^Lathamus discolor*	Swift Parrot	E1,P,3	CE	6
Animalia	Aves	Strigidae	*^^Ninox connivens*	Barking Owl	V,P,3		1
Animalia	Aves	Strigidae	*^^Ninox strenua*	Powerful Owl	V,P,3		50
Animalia	Aves	Tytonidae	*^^Tyto novaehollandiae*	Masked Owl	V,P,3		23
Animalia	Aves	Tytonidae	*^^Tyto tenebricosa*	Sooty Owl	V,P,3		55
Animalia	Aves	Climacteridae	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V,P		1
Animalia	Aves	Acanthizidae	*Calamanthus fuliginosus*	Striated Fieldwren	E1,P		1

Animalia	Aves	Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	E4A,P	CE	1
Animalia	Aves	Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V,P		10
Animalia	Aves	Pachycephalidae	*Pachycephala olivacea*	Olive Whistler	V,P		1
Animalia	Aves	Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		12
Animalia	Aves	Petroicidae	*Petroica boodang*	Scarlet Robin	V,P		4
Animalia	Mammalia	Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	5
Animalia	Mammalia	Dasyuridae	*Phascogale tapoatafa*	Brush-tailed Phascogale	V,P		1
Animalia	Mammalia	Dasyuridae	*Sminthopsis leucopus*	White-footed Dunnart	V,P		2
Animalia	Mammalia	Phascolarctidae	*Phascolarctos cinereus*	Koala	V,P	V	1
Animalia	Mammalia	Burramyidae	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		2
Animalia	Mammalia	Petauridae	*Petaurus australis*	Yellow-bellied Glider	V,P		154
Animalia	Mammalia	Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V,P		16
Animalia	Mammalia	Pseudocheiridae	*Petauroides volans*	Greater Glider	P	V	50
Animalia	Mammalia	Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	2
Animalia	Mammalia	Vespertilionidae	*Myotis macropus*	Southern Myotis	V,P		7
Animalia	Mammalia	Vespertilionidae	*Phoniscus papuensis*	Golden-tipped Bat	V,P		1
Animalia	Mammalia	Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		1
Animalia	Mammalia	Miniopteridae	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P		1
Animalia	Mammalia	Otariidae	*Arctocephalus pusillus doriferus*	Australian Fur-seal	V,P		1
Animalia	Mammalia	Balaenidae	*Eubalaena australis*	Southern Right Whale	E1,P	E	1
Animalia	Mammalia	Balaenopteridae	*Megaptera novaeangliae*	Humpback Whale	V,P	V	2
Animalia	Mammalia	Physeteridae	*Physeter macrocephalus*	Sperm Whale	V,P		1
Plantae	Flora	Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	E4A		59
Plantae	Flora	Orchidaceae	*^Cryptostylis hunteriana*	Leafless Tongue Orchid	V,P,2	V	1
Plantae	Flora	Orchidaceae	*^Genoplesium vernale*	East Lynne Midge Orchid	V,P,2	V	21

Appendix D: NSW BioNet Atlas search results - threatened species in Murramarang Aboriginal Area

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) Entities in Murramarang AA NPWS Reserve returned a total of 5 records of 3 species.

Report generated on 1/02/2021 7:31 PM

Kingdom	Class	Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Animalia	Aves	Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		2
Animalia	Aves	Charadriidae	*Thinornis rubricollis*	Hooded Plover	E4A,P	V	2
Animalia	Aves	Psittacidae	*^^Pezoporus wallicus wallicus*	Eastern Ground Parrot	V,P,3		1

Appendix E: Australian Government EPBC Act Protected Matters Search Report

Australian Government
Department of Agriculture, Water and the Environment

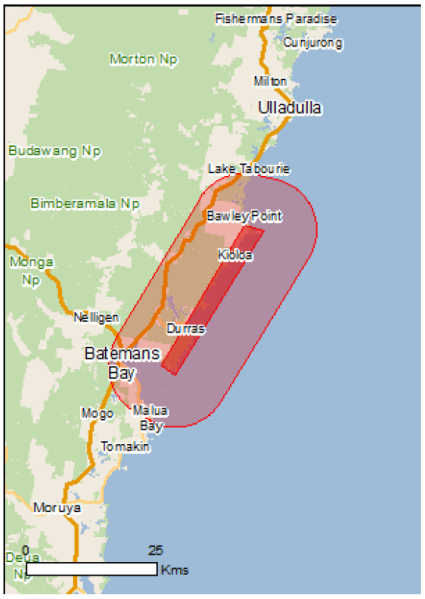
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

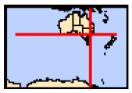
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 01/02/21 18:23:32



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	77
Listed Migratory Species:	61

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	81
Whales and Other Cetaceans:	27
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	9
Regional Forest Agreements:	1
Invasive Species:	43
Nationally Important Wetlands:	7
Key Ecological Features (Marine)	1

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name

EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name

Temperate East

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Illawarra and south coast lowland forest and woodland ecological community	Critically Endangered	Community likely to occur within area
Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Grassy Woodland in the South East Corner Bioregion	Critically Endangered	Community likely to occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur

Name	Status	Type of Presence within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus Hooded Plover (eastern), Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Mammals		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Isoodon obesulus obesulus		
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus		
Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Caladenia tessellata		
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Correa baeuerlenii		
Chef's Cap [17007]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana		
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
Genoplesium baueri		
Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Genoplesium vernale East Lynne Midge-orchid [68379]	Vulnerable	Species or species habitat known to occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat known to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat known to occur within area
Prasophyllum affine Jervis Bay Leek Orchid, Culburra Leek-orchid, Kinghorn Point Leek-orchid [2210]	Endangered	Species or species habitat may occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Breeding known to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian National University
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Trading Bank of Australia

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Breeding known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area

Name	Threatened	Type of Presence
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Cosmocampus howensis Lord Howe Pipefish [66208]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area

Name	Threatened	Type of Presence
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Berardius arnuxii		
Arnoux's Beaked Whale [70]		Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis		
Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Globicephala macrorhynchus		
Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas		
Long-finned Pilot Whale [59282]		Species or species habitat may occur within area
Grampus griseus		
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps		
Pygmy Sperm Whale [57]		Species or species habitat may occur within area

Name	Status	Type of Presence
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lissodelphis peronii Southern Right Whale Dolphin [44]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Mesoplodon bowdoini Andrew's Beaked Whale [73]		Species or species habitat may occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon hectori Hector's Beaked Whale [76]		Species or species habitat may occur within area
Mesoplodon layardii Strap-toothed Beaked Whale, Strap-toothed Whale, Layard's Beaked Whale [25556]		Species or species habitat may occur within area
Mesoplodon mirus True's Beaked Whale [54]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Belowla Island	NSW
Brush Island	NSW
Clyde River	NSW
Cullendulla Creek	NSW
Forestry Management Areas in Batemans Bay (FMZ2)	NSW
Meroo	NSW
Murramarang	NSW
South Coast Subregion of Southern Region	NSW
Tollgate Islands	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
Southern RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat may occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Clyde River Estuary	NSW
Cormorant Beach	NSW
Cullendulla Creek and Embayment	NSW
Durras Lake	NSW
Meroo Lake Wetland Complex	NSW
Swan Lagoon	NSW
Termeil Lake Wetland Complex	NSW

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Upwelling East of Eden	South-east

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-35.715246 150.248826,-35.715246 150.248826,-35.519879 150.392335,-35.526586 150.425981,-35.72751 150.274232,-35.715246 150.248826

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix F: NSW BioNet Atlas search results – threatened ecological communities in Murramarang National Park

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria: Public Report of all Valid Records of Communities in Murramarang NP NPWS Reserve.

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Kingdom	Scientific Name	Common Name	NSW status	Comm. status	Records
Community	*Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions*	Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	E3		K
Community	*Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	V	K
Community	*Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K
Community	*Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion*	Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion	E3	CE	K
Community	*Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	CE	K
Community	*Lowland Grassy Woodland in the South East Corner Bioregion*	Lowland Grassy Woodland in the South East Corner Bioregion	E3	CE	K
Community	*Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion*	Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion	E3	CE	K
Community	*River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	CE	K
Community	*Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	E	K

Community	*Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K
Community	*Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions*	Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3		K

Appendix G: NSW BioNet Atlas search results – threatened ecological communities in Murramarang Aboriginal Area

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria: Public Report of all Valid Records of Communities in Murramarang AA NPWS Reserve.

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Kingdom	Scientific Name	Common Name	NSW status	Comm. status	Records
Community	*Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions*	Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	E3		K
Community	*Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	V	K
Community	*Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K
Community	*Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion*	Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion	E3	CE	K
Community	*Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	CE	K
Community	*Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion*	Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion	E3	CE	K
Community	*River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	CE	K
Community	*Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	E	K
Community	*Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K

Community	*Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions*	Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3		K

Appendix H: Likelihood of occurrence evaluation for species of conservation significance

An evaluation of the likelihood of occurrence was made for listed threatened and migratory species and populations identified as occurring, having occurred or likely to occur in the locality. Species or populations that are solely dependent on marine environments, such as cetaceans, fish and marine turtles, and seabirds that are dependent on marine environments and offshore islands such as shearwaters, albatross and petrels etc, have been omitted from the table due to lack of suitable habitat in the study area. This likelihood of occurrence evaluation was based on: database searches of NSW BioNet Wildlife Atlas and the EPBC Act's Protected Matters Search Tool for listed matters for the locality; relevant studies; presence or absence of suitable habitat; the ecology of the species as detailed in references, particularly NSW OEH (2017b), Birdlife Australia (n.d.) and the Australian Government (2019b); features of the study area; results of the field surveys; professional judgement; and advice from local NPWS staff. Five terms for the likelihood of occurrence of listed species and populations are used in this report. The terms for likelihood of occurrence are:

- 'yes' = the matter of conservation significance was or has been observed in the study area or immediate surrounds
- 'likely' = there is a medium to high probability that the matter of conservation significance uses or occurs in the study area or immediate surrounds
- 'potential' = suitable habitat/plant community type for the matter of conservation significance occurs in the study area, but there is insufficient information to categorise the matter of conservation significance as likely or unlikely to occur
- 'unlikely' = there is a low to very low probability that the matter of conservation significance uses or occurs in the study area or immediate surrounds
- 'no' = the habitat/environment within the study area or immediate surrounds is unsuitable for the matter of conservation significance

Species	NSW BC Act	C'wlth EPBC Act	Distribution and habitat associations	Likelihood of Occurrence
Caladenia tessellata Thick-lip Spider-orchid	E	V	The Thick-lip Spider Orchid has been recorded in the Sydney region, the Central Coast, Ulladulla, Kiama, inland near Queanbeyan and Braidwood, and along the east coast of Victoria. However, many of these populations are predicted to be extinct or have not had any recent recordings. It prefers grassy woodland on clay loam or sandy soils, although population inland at Braidwood is on stony soils. It has a single leaf which regrows each year with flowering between September and November (NSW Scientific Committee 2008).	**No:** No recent records in LGAs – last record for Ulladulla in 1998. Not recorded during field surveys. The study area is isolated from the previous record at Ulladulla.
Correa baeuerlenii Chef's Cap	V	V	Chef's Cap Correa is a shrub to 2.5 metres tall. It has been recorded between has been recorded between Nelligen (on Nelligen Creek and the Buckenbowra River) and Mimosa Rocks National Park. Occurs in riparian sites within forests of various eucalypts, including Silvertop Ash (*Eucalyptus sieberi*), Yellow Stringybark (*E. muelleriana*), Blue-leafed Stringybark (*E. agglomerata*) and Spotted Gum (*Corymbia maculata*), or she-oak woodland. It may also be found in near-coastal rocky sites. (OEH 2017b).	**Unlikely**: There are no records under NSW BioNet for the species. The field survey did not record the species. There is one record from 1884 for the species on Atlas of Living Australia near the study area/national park. Not preferred habitat.

Species	NSW BC Act	C'wlth EPBC Act	Distribution and habitat associations	Likelihood of Occurrence
Cryptostylis hunteriana Leafless Tongue Orchid	V	V	The Leafless Tongue Orchid is known, and predicted, to occur in a number of sites in south-eastern Australia, mainly near the coast or coastal ranges. Known populations in the Shoalhaven and Eurobodalla LGAs. This terrestrial orchid is known from swamp-heath and open forest on sandy soils in coastal districts. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black She-oak (*Allocasuarina littoralis*); where it appears to prefer open areas in the understory of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*). The species flowers between November and February (OEH 2017b).	**Unlikely**: Known to occur in locality. However, limited marginal habitat in study area. Not recorded during targeted field surveys during known flowering period in suitable habitat.
Galium australe Tangled Bedstraw	V	V	Tangled Bedstraw is widespread in Victoria and Tasmania and is also found in South Australia, and Jervis Bay. Following a taxonomic revision, many recent records in NSW have been re-determined as other species. Tangled Bedstraw has been recorded historically in the Nowra (Colymea) and Narooma areas and is extant in Nadgee Nature Reserve, south of Eden. Records in the Sydney area are yet to be confirmed. Most flowering collections have been made in late spring to early autumn. In NSW and Jervis Bay, Tangled Bedstraw has been recorded in Turpentine forest and coastal Acacia shrubland. In other States the species is found in a range of near-coastal habitats, including sand dunes, sand spits, shrubland and woodland (OEH 2017b).	**Unlikely:** Only record from locality is a preserved specimen from 1911. Recent NSW records pre-determined as other species.
Genoplesium baueri Bauer's Midge Orchid	E	E	Bauer's Midge Orchid is known from coastal areas from the Shoalhaven LGA to NSW Central Coast. Many populations have no recent records. It grows in shrubby woodland and open forest on shallow sandy soils. In the Shoalhaven, relatively large populations are known from Scribbly Gum, Red Bloodwood, Silvertop Ash and Black She-oak dominated communities (OEH 2017b). Flowering between February and March (Stephenson 2011).	**Unlikely**: No records from the locality. Limited marginal habitat in study area.

Species	NSW BC Act	C'wlth EPBC Act	Distribution and habitat associations	Likelihood of Occurrence
Genoplesium vernale East Lynne Midge Orchid	V	V	The East Lynne Midge Orchid grows in dry sclerophyll woodland and forest extending from near the coast to the coastal ranges. It prefers well-drained shallow soils, often occurring near the crests of ridges and on low rises where the ground cover is more open and sedge dominated rather than being shrubby. The species is currently known from only a narrow 12 km wide belt of predominantly dry sclerophyll forest from 17 km south of Batemans Bay to 24 km north of Ulladulla. The species generally flowers between early November and mid-December (OEH 2017b, NSW NPWS 2002).	**Unlikely**: Known to occur in the locality. Closest records to study area inland near the Princes Highway. Not recorded during field surveys, which coincided with general flowering season.
Haloragis exalata subsp. *exalata* Square Raspwort	V	V	Square Raspwort is a shrub that occurs in four widely scattered localities in eastern NSW including the Central Coast, the South Coast and the North Western Slopes. The species appears to require protected and shaded damp situations in riparian habitats. The recorded flowering season is from November to January (OEH 2017b).	**No**: Known to occur in locality with one record inland from Durras. Study area not preferred habitat. Not recorded during field surveys, which coincided with general flowering season.
Melaleuca biconvexa Biconvex Paperbark	V	V	Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October (OEH 2017b).	**Unlikely:** No records for locality. Study area does not traverse paperbark stands and areas of fringing swamp, such as Durras Lake. Not known for Batemans IBRA sub-region.
Persicaria elatior Tall Knotweed	V	V	Tall Knotweed is an erect herb to 90 cm tall. It has been recorded in south-eastern NSW, including around Batemans Bay, northern NSW and in Queensland. The species preferred habitat is damp places beside streams and lakes. It occasionally occurs in swamp forest or associated with disturbance (OEH 2017b).	**No**: One record from locality from preserved specimen in 1972. Lack of preferred habitat in study area. Not recorded during field surveys.
Prasophyllum affine Jervis Bay Leek Orchid	E	E	The Jervis Bay Leek Orchid is a ground orchid which produces a single onion-like leaf that can grow to 40 cm long. Flowers are produced on a cylindrical stalk that emerges from about two thirds of the way up the hollow leaf. Up to 35 flowers are clustered in a spike arranged along the top third of each flower stalk. It is currently known from three areas south-east of Nowra on South Coast. These are Kinghorne Point, Wowly Gully near the town of Callala Bay, and near the township of Vincentia. Flowering November – December.	**Unlikely:** No records for locality. Not recorded during field surveys, despite being known flowering season.

Species	NSW BC Act	C'wlth EPBC Act	Distribution and habitat associations	Likelihood of Occurrence
Pterostylis gibbosa Illawarra Greenhood	E	E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). It is apparently extinct in western Sydney which is the area where it was first collected (1803). All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Red Gum *Eucalyptus tereticornis*, Woollybutt *E. longifolia* and White Feather Honey-myrtle *Melaleuca decora*. Near Nowra, the species grows in an open forest of Spotted Gum *Corymbia maculata*, Forest Red Gum and Grey Ironbark *E. paniculata*. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark *E. crebra*, Forest Red Gum and Black Cypress Pine *Callitris endlicheri*. The Illawarra Greenhood is a deciduous orchid that is only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth (OEH 2017b).	**Unlikely:** No records for locality. Study area not poorly drained soils.
Rhodamnia rubescens Scrub Turpentine	CE	-	Shrub or small tree to 25 m high. Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m ASL. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. (OEH 2017b).	**Potential:** Numerous records of the species in the national park (OEH BioNet search), and on the Atlas of Living Australia. Although very little of preferred habitat in subject site (rainforest and wet gullies), there is suitable habitat in the study area. Not recorded during field surveys.
Rhizanthella slateri Eastern Underground Orchid	V	E	An orchid with a whitish, fleshy underground stem to 15 cm long and 15 mm diameter. The flowering heads mature below the soil surface or may extend to 2 cm above the ground. Each flower head has up to 30, tubular, purplish flowers. Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Habitat requirements are poorly understood, and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore, usually located only when the soil is disturbed. Flowers September to November.	**Unlikely**: No records for the locality. Not recorded during field surveys despite flowering season.

Species	NSW BC Act	C'wlth EPBC Act	Distribution and habitat associations	Likelihood of Occurrence
Syzygium paniculatum Magenta Lilly Pilly	E	V	The Magenta Lilly Pilly is a small to medium sized rainforest tree that grows to 8 m tall. Its distribution is restricted to a narrow coastal belt from Upper Lansdowne in the mid North Coast to Conjola State Forest on the south coast. South coast records are from grey soils over sandstone, generally restricted to remnant coastal littoral rainforest stands (OEH 2017b).	**Unlikely**: No records from the locality. Not recorded during field surveys.
Thesium australe Austral Toadflax	V	V	The Austral Toad-flax is a small herb up to 40 cm tall. It is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It occurs in grassland or grassy woodland and is often found in damp sites in association with Kangaroo Grass (*Themeda australis*) (OEH 2017b).	**Unlikely:** One record from the locality. Not recorded during field surveys. Limited preferred habitat in study area.
Xerochrysum palustre Swamp Everlasting	-	V	Found in Kosciuszko National Park and the eastern escarpment south of Badja. Also found in eastern Victoria. Grows in swamps and bogs which are often dominated by heaths. Also grows at the edges of bog margins on peaty soils with a cover of shrubs or grasses (OEH 2017b).	**No:** Not known from Sydney Basin IBRA Jervis subregion or South East Corner IBRA Batemans subregion.
Disclaimer: Data extracted from the Atlas of NSW Wildlife and the Australian Government's Protected Matters Search Tool is indicative and cannot be considered comprehensive.				
CE = Critically Endangered; E = Endangered; E2 = Endangered Population; V = Vulnerable; M = Migratory				

Likelihood of occurrence evaluation – fauna of conservation significance

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Actitis hypoleucos Common Sandpiper	-	M	The Common Sandpiper breeds in Europe and Asia. In Australasia it visits New Guinea and Australia, mainly in the north and west. It is less often seen in New Zealand. In Australia, the Common Sandpiper is found in coastal or inland wetlands, both saline or fresh. It is found mainly on muddy edges or rocky shores. During the breeding season in the northern hemisphere, it prefers freshwater lakes and shallow rivers (Birdlife Australia n.d.).	**Unlikely:** Two records for edge of locality (one recent one more than 30 years old). No records for study area. The study area has a lack of preferred habitat of wetlands.
Anthochaera phygia Regent Honeyeater	CE	CE	The Regent Honeyeater is mainly associated with temperate woodlands and open forests of the inland slopes of south-east Australia. The woodlands and forests typically have significant numbers of mature trees, with high canopy cover and abundance of mistletoes. The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes. As such it is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar, and may undertake landscape scale migrations to the coast during non-breeding. Two of three known breeding sites are located in NSW at Capertee Valley and Bundarra-Barraba region. The species has occasionally been observed foraging on spotted gums in South Coast (OEH 2017b).	**Potential**: Three records from locality. Suitable habitat in study area.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Apus pacificus Fork-tailed Swift	-	M	The Fork-tailed Swift prefers a range of foraging habitats including riparian woodland, swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes. They are non-breeding visitors to all states and territories of Australia, arriving from its breeding grounds in Siberia around October, and departing in April. The species is thought to be highly mobile within Australia, moving across the country in search of food. They probably roost aerially.	**Unlikely:** A few records from locality. Lack of optimal foraging habitat in the study area.
Artamus cyanopterus cyanopterus Dusky Woodswallow	V	-	Dusky woodswallows are widespread in eastern, southern and south western Australia. Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understory of eucalypt saplings, acacias and other shrubs, and ground cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland (OEH 2017b).	**Potential:** Records from the locality. Some low value generic potential habitat in the study area.
Botaurus poiciloptilus Australasian Bittern	E	E	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Occurs in both terrestrial and estuarine wetlands generally in areas of permanent water and dense vegetation. In areas with permanent water it may occur in flooded grassland, forest, woodland, rainforest and mangroves (OEH 2017b).	**Unlikely:** Known to occur within the locality although only one record. The study area has a lack of preferred habitat of freshwater wetlands and coastal swamps.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Calamanthus fuliginosus Striated Fieldwren	E	-	The Striated Fieldwren is found in south-eastern NSW, into southern Victoria and the south-east of South Australia, and Tasmania. Most NSW records are from the far south coast (Nadgee NR and Ben Boyd NP) and in Morton NP (Little Forest, Tianjara Falls) with scattered records in between particularly in coastal habitats. The species prefers ground and understory vegetation, and can be found in swampy, coastal heathlands, tussocky grasslands, low shrubby vegetation and margins of swamps (OEH 2017b). Known to occur in the Batemans subregion in Coastal Headland Heaths of Bracelet Honey-myrtle - Coast Tea-tree tall shrubland on headlands, South East Corner Bioregion.	**Potential:** Known to occur within the locality although only one record from 2001 and shown as near Depot Beach Camping Area which is not heathland. The study area has no swamps, a small area of heath at Snapper Point and patches of the plant community Bracelet Honey-myrtle - Coast Tea-tree tall shrubland on headlands.
Calidris acuminata Sharp-tailed Sandpiper	-	M	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. They are widespread in most coastal areas of NSW (Department of Environment 2019). The Sharp-tailed Sandpiper prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches (Birdlife Australia n.d.).	**Potential:** Known to occur within locality, although few records. Suitable habitat (beaches) within study area.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Calidris canutus Red Knot	-	E, M	Red Knots are widespread around the Australian coast, less in the south and with few inland records. Small numbers visit Tasmania and off-shore islands. It is widespread but scattered in New Zealand. They breed in North America, Russia, Greenland and Spitsbergen. Red Knots are a non-breeding visitor to most continents. They gather in large flocks on the coast in sandy estuaries with tidal mudflats (Birdlife Australia n.d.).	**Unlikely:** Known to occur within the locality although only one record near Durras shown on BioNet and Atlas Of Living Australia.
Calidris ferruginea Curlew Sandpiper	E	CE	The Curlew Sandpiper is found around most of the Australian coastline, including all the NSW coast, and sometimes in freshwater wetlands in the Murray-Darling Basin. The species breeds in Siberia and migrates to Australia for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April. The species occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts.	**Unlikely:** Lack of preferred habitat. One record on Atlas of Living Australia south of study area near Batemans Bay from 1978.
Calidris melanotos Pectoral Sandpiper	-	M	A migratory wetland species, the Pectoral Sandpiper breeds both in Siberia and Alaska as well as the Canadian Arctic. It is a long distance migrant, with the bulk wintering in South America's Southern Cone. Some also winter in Australasia – including around coastline of most of most jurisdictions (Birdlife Australia n.d.).	**Unlikely:** No records for locality. The study area has a lack of preferred habitat of wetlands.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Callocephalon fimbriatum Gang-gang Cockatoo	V	-	The Gang-gang Cockatoo prefers dense, tall, wet forests of mountains and gullies and alpine woodlands. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. The species range extends from southern Victoria to southern and central-eastern New South Wales. For nesting and roosting, old growth forest and woodlands are preferred, with nests located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts (OEH 2017b).	**Potential**: Numerous records for the locality. May use study area as minor part of foraging range.
Calyptorhynchus lathami Glossy Black-Cockatoo	V	-	The glossy black-cockatoo lives in dry sclerophyll forest and woodland containing Allocasuarina and Casuarina In NSW, the species distribution is from the coast to the tablelands, extending further west to the Riverina and Pilliga Scrub. It prefers seeds from mature casuarinas trees, with the evidence of feeding obvious through chewed and cracked cones at the trees base. Its preferred regional forage species are *A. littoralis* and *A. Torulosa*. They occasionally eat seeds from eucalypts, angophoras, acacias and hakeas, as well as eating insect larvae. The species nests in the hollows of large, old eucalypt trees, with the typical nest site up to 30 metres above the ground. In NSW, breeding takes place from March to August. It rrequires sufficient extent of forage within home range to support breeding (OEH 2017b).	**Yes:** Active feed tree observed during field surveys and many more preferred feed tree, *A. littoralis*, present in study area.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Charadrius bicinctus Double-banded Plover	-	M	The Double-banded Plover utilizes a range of habitats including littoral, estuarine, fresh or saline terrestrial wetlands, saltmarsh, grasslands and muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial. The species has been observed on exposed reefs and rock platforms with shallow rock pools and also on coastal sand dunes. It usually builds nests in flat, open, slightly elevated areas on sand, shells, gravel or shingle (Department of the Environment 2019).	**Potential:** Although mainly a wetlands species, feeding, foraging or related behaviour has been observed within the locality. There is suitable habitat (beaches) in the study area.
Climacteris picumnus victoriae Brown Tree-creeper (eastern subspecies)	V	-	The Brown Tree-creeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges.	**Unlikely:** Lack of preferred habitat. One record from locality in 2000 – inland from coast.
Cuculus optatus Oriental Cuckoo	-	M	Non-breeding over-wintering nomadic bird foraging in forest on insects.	**Potential:** Generic habitat potential towards southern end of known range. One record immediately outside of locality however from 1992.
Daphoenositta chrysoptera Varied Sittella	V	-	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. The species feeds on arthropods removed from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy (OEH 2017b).	**Potential:** Numerous records for locality. Preferred habitat present.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Dasyornis brachypterus Eastern Bristlebird	E	E	This species habitat is characterised by dense, low vegetation including heath and open woodland with a heathy understory. Age of habitat since fires (fire-age) is of paramount importance to this species; Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years. There are three main populations: southern Queensland/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 (OEH 2017b).	**Unlikely:** Recorded for locality but on western side of highway and at southern extent of locality south of Batemans Bay. Very marginal and limited habitat.
Esacus magnirostris Beach Stone-curlew	CE	M	The Beach Stone-Curlew has been observed around the north coast of Australia and associated islands from near Onslow in Western Australia to the Manning River in New South Wales. The species has largely disappeared from the south-eastern part of its former range, and is now rarely recorded on ocean beaches in New South Wales. The Beach Stone-curlew is found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage for crabs and other marine invertebrates in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. They breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves (Birdlife Australia n.d.).	**Potential:** Suitable habitat and one record from locality. However, range of species has contracted recently and rarely observed in southern NSW.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Gallinago hardwickii Latham's Snipe	-	M	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture (Birdlife Australia n.d.).	**No:** A few records for locality. No records for study area. Species preferred habitat of freshwater wetlands absent in study area.
Gallinago megala Swinhoe's Snipe	-	M	Few definite records exist for Swinhoe's Snipe in Australia with most records for northern Australia. During the non-breeding season Swinhoe's Snipe occurs at the edges of freshwater or brackish wetlands, including swamps and freshwater streams (Department of the Environment 2019).	**No:** No records for locality. Species preferred habitat of wetlands absent in study area.
Gallinago stenura Pin-tailed Snipe	-	M	Most records for Pin-tailed Snipe records are for northern Australia and south-west. During non-breeding period the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range (Department of the Environment 2019).	**No:** No records for locality. Species preferred habitat of wetlands absent in study area.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Glossopsitta pusilla Little Lorikeet	V	-	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat. The species forages primarily in the canopy of open *Eucalyptus* forest and woodland, as well as in other tree species. Riparian habitats are particularly used. Isolated flowering trees in open country also help sustain viable populations of the species. The species feeds mostly on nectar and pollen, occasionally on native fruits, and only rarely in orchards. It roosts in treetops, often distant from feeding areas. However, nests are closer to feeding areas, most typically in tree small hollows (3 cm) in the limb or trunk of smooth-barked Eucalypts, and usually high above the ground (2–15 m). Riparian trees often chosen as nest trees, including *Allocasuarina*. Nesting extends from May to September.	**Potential:** Suitable habitat and numerous records from locality.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Grantiella picta Painted Honeyeater	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. It inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches (OEH 2017b).	**Unlikely:** No records for the locality. Outside of range.
Haematopus fuliginosus Sooty Oystercatcher	V	-	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. The species forages on exposed rock or coral at low tide for foods such as limpets and mussels. It breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. The nest is a shallow scrape on the ground, or small mounds of pebbles, shells or seaweed when nesting among rocks (OEH 2017b).	**Yes:** Study area has preferred habitat. Observed during field surveys and multiple records for locality.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Haematopus longirostris Pied Oystercatcher	E	-	The Pied Oystercatcher is found in coastal areas throughout the Australian continent except for areas of unbroken sea cliffs such as the Great Australian Bight. The Pied Oystercatcher prefers mudflats, sandbanks and sandy ocean beaches and is less common along rocky or shingle coastlines. Although rarely recorded far from the coast, the Pied Oystercatcher may occasionally be found in estuarine mudflats and short pasture (Birdlife Australia n.d.).	**Yes:** Study area has preferred habitat. Multiple records for locality.
Haliaeetus leucogaster White-bellied Sea-eagle	V	-	The White-bellied Sea-eagle is found across Australia, in and near coastal areas, but can also be found inland along rivers and near wetlands. It depends on forest or woodlands with large trees to build their large stick nests up in the canopy, often with some exposed dead branches nearby to use as lookout posts. It feeds mainly on fish but also birds, mammals, turtles and carrion (OEH 2017b).	**Yes:** Study area has preferred habitat. Observed during field surveys and multiple records for locality.
Hieraaetus morphnoides Little Eagle	V	-	The Little Eagle is found in open forest, woodland, grassland and arid regions. It does not like dense forests. It nests in tall trees and builds stick nests (OEH 2017b).	**Yes.** Numerous records of species from locality. Suitable habitat although marginal and limited.
Hirundapus caudacutus White-throated Needletail	-	V/M	The White-throated Needle-tail is an aerial forager that has a range of habitats including the coast and ranges. It prefers woodland areas and roosts in dense foliage of canopy trees seeking out tree hollows in inclement weather (Marchant & Higgins 1993).	**Potential**: Known to occur in the locality. Suitable habitat is present in study area but is very limited and marginal.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Ixobrychus flavicollis Black Bittern	V	-	The Black Bittern has a wide distribution, from southern NSW north to Cape York and along the north coast to the Kimberley region. The species also occurs in the south-west of Western Australia. In NSW, records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. It inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. The species feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds (OEH 2017b).	**Unlikely:** Known to occur within locality. However, study area not optimal habitat. Prefers rainforest creeklines.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Lathamus discolor Swift Parrot	E	CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. The species migrates to the Australian south-east mainland between February and October and inhabits areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Their preferred feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Forest Red Gum *E. tereticornis*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. They also use lerp infested trees including Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana*, Blackbutt *E. pilularis*, and Yellow Box *E. melliodora* (OEH 2017b).	**Potential:** Suitable habitat in study area and recorded within locality.
Limosa lapponica Bar-tailed Godwit	-	M	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas (Marchant & Higgins 1993; Department of the Environment 2019).	**Unlikely:** Known to occur in locality but unlikely to occur in study areas as preferred habitat is wetlands.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Lophoictinia isura Square-tailed Kite	V	-	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses (OEH 2017b).	**Potential:** Suitable habitat in study area. No BioNet records but numerous Atlas of Living Australia records for locality.
Monarcha melanopsis Black-faced Monarch	-	M	The Black-faced Monarch is found along the coast of eastern Australia, becoming less common further south. The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating The Black-faced Monarch forages for insects among foliage, or catches flying insects on the wing. The species builds a cup nest of casuarina needles, bark, roots, moss and spider web in the fork of a tree, about 3 m to 6 m above the ground (Birdlife Australia n.d.).	**Potential:** Known to occur in locality. Potential for seasonal foraging over study area**.**

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Monarcha trivirgatus Spectacled Monarch	-	M	The Spectacled Monarch is found in coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. It is much less common in the south. It is also found in Papua New Guinea, the Moluccas and Timor. The Spectacled Monarch prefers thick understory in rainforests, wet gullies and waterside vegetation, as well as mangroves. It is insectivorous, foraging mostly below the canopy in foliage and on tree trunks or vines. The species builds a small cup nest of fine bark, plant fibres, moss and spider web in a tree fork or in hanging vines, 1 m - 6 m above the ground, often near water (Birdlife Australia n.d.).	**Unlikely:** Although known to occur in locality, lack of preferred habitat.
Myiagra cyanoleuca Satin Flycatcher	-	M	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. It is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. The species is an insectivorous aerial forager, often active from perches in mid- to upper canopy (Birdlife Australia n.d.).	**Potential:** Known to occur in locality. Potential for seasonal foraging over study area**.**

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Neophema chrysogaster Orange-bellied Parrot	CE	CE	The Orange-bellied Parrot breeds in the south-west of Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern South Australia and southern Victoria. There are occasional reports from NSW, with the most recent records from Shellharbour and Maroubra in May 2003. Typical winter habitat is saltmarsh and strandline/foredune vegetation communities either on coastlines or coastal lagoons. Spits and islands are favoured. The species can be found foraging in weedy areas associated with these coastal habitats or even in totally modified landscapes. On the mainland, the Orange-bellied Parrot spends winter mostly within 3 km of the coast in sheltered coastal habitats including bays, lagoons, estuaries, coastal dunes and saltmarshes. The species also inhabits small islands and peninsulas. Birds forage in low samphire herbland or taller coastal shrubland.	**Unlikely:** No records for locality. Lack of preferred habitat.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Ninox connivens Barking Owl	V	-	The Barking Owl is found throughout continental Australia except for the central arid regions. Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. It inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile riparian soils. They roost in shaded portions of tree canopies, including tall mid-story trees with dense foliage such as *Acacia* and *Casuarina* species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance (OEH 2017b).	**Potential:** Suitable habitat in study area. Recorded for locality.
Ninox strenua Powerful Owl	V	-	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds and flying foxes. Large trees with hollows at least 0.5m deep are required for shelter and breeding. Very large territory (500-5000ha).	**Potential:** Generic foraging habitat and potential roosting habitat in limited areas e.g. behind Snake Bay. Study area could overlap with multiple pairs/territories. Multiple records for locality.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Numenius madagascariensis Eastern Curlew	-	CE, M	The Eastern Curlew is widespread in coastal regions in the north-east and south of Australia, including Tasmania, and scattered in other coastal areas. It is rarely seen inland. The species is found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons. The Eastern Curlew eats mainly small crabs and molluscs. The species breeds in the northern hemisphere (Birdlife Australia n.d.).	**Unlikely:** Known to occur in locality but unlikely to occur in study area as preferred habitat is wetlands.
Numenius minutus Little Curlew, Little Whimbrel	-	M	The Little Curlew is widespread in the north of Australia and scattered elsewhere. It is an irregular visitor to New Zealand and Tasmania. It breeds in Siberia and is seen on passage through Mongolia, China, Japan, Indonesia and New Guinea. Little Curlews may gather in large flocks on coastal and inland grasslands and black soil plains in northern Australia, near swamps and flooded areas. They also feed on playing fields, paddocks and urban lawns (Birdlife Australia n.d.).	**Unlikely:** Known to occur in locality but unlikely to occur in study area as preferred habitat is wetlands.
Numenius phaeopus Whimbrel	-	M	Whimbrels are common across northern Australia and uncommon to rare further south. They breed in central Siberia to Iceland. They are found mainly on the coast, on tidal and estaurine mudflats, especially near mangroves. They are sometimes found on beaches and rocky shores. The species feed on intertidal mudflats by day and night, on worms, crustaceans and occasionally fish and nestling birds. They breed in the Arctic Circle (Birdlife Australia n.d.).	**Unlikely:** Known to occur in locality but unlikely to occur in study area as preferred habitat is wetlands.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Onychoprion fuscata Sooty Tern	V	-	The Sooty Tern is found over tropical and sub-tropical seas and on associated islands and cays around Northern Australia. In NSW only known to breed at Lord Howe Island. Occasionally seen along coastal NSW, especially after cyclones. Large flocks can be seen soaring, skimming and dipping but seldom plunging in off shore waters. Breeds in large colonies in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands (OEH 2017b).	**Potential:** No BioNet records but known to occur in locality, and numerous records on Atlas of Living Australia. May be seen along coast in study area on rare occasions.
Pachycephala olivacea Olive Whistler	V	-	The Olive Whistler inhabits the wet forests on the ranges of the east coast. It has a disjunct distribution in NSW chiefly occupying the beech forests around Barrington Tops and the MacPherson Ranges in the north and wet forests from Illawarra south to Victoria. In the south it is found inland to the Snowy Mountains and the Brindabella Range. It mostly inhabits wet forests above about 500m. During the winter months they may move to lower altitudes. It forages in trees and shrubs and on the ground, feeding on berries and insects, and makes nests of twigs and grass in low forks of shrubs (OEH 2017b).	**Unlikely:** Numerous records for locality. Lack of suitable habitat in study area – as more inland.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Pachyptila turtur subantarctica Fairy Prion (southern)	-	V	The Fairy Prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. There are 80 to 250 breeding pairs in Australia and a global population of 80 000. In Australia, breeding is recorded on two rock stacks off Macquarie Island and on the nearby Bishop and Clerk Island. The population may have been larger prior to the arrival of black rats on Macquarie Island. The subspecies digs burrows among rocks or low vegetation in which to nest. Burrows may be dug below mat forming herbs. Feeds by plucking food from the ocean surface. Some individuals may migrate towards New Zealand and southern Australia in winter (Department of the Environment 2019).	**Unlikely:** Although known to occur in locality they only breed in Macquarie Island and subantarctic islands. They may use ocean adjacent to study area for foraging.
Pandion cristatus Eastern Osprey	V	-	The Eastern Osprey is found in many coastal and lake areas of the world. In Australia, it is found on the north and east coast from Broome to the south coast of New South Wales. They are found on the coast and in terrestrial wetlands of tropical and temperate Australia and off-shore islands, occasionally ranging inland along rivers, though mainly in the north of the country. They mainly feed on medium sized fish. They nest on cliff, or large dead trees or other tall structures such as radio mast. The nests are constructed of sticks and driftwood (Birdlife Australia n.d.).	**Unlikely:** Recorded for locality. However, the species feed on the wing from the ocean. No nests recorded during survey.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Petroica boodang Scarlet Robin	V	-	The Scarlet Robin is found in south-eastern and south-western Australia, as well as on Norfolk Island. The species prefers open forests and woodlands in Australia, while it prefers rainforest habitats on Norfolk Island. During winter, it will visit more open habitats such as grasslands. It feeds mainly on insects and forages on or near the ground. It will sit on a perch and fly down to catch prey (Birdlife Australia n.d.).	**Potential**: Recorded for locality although more likely to occur in the hinterland, the species may use the study area for foraging.
Petroica phoenicea Flame Robin	V	-	The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands (OEH 2017b).	**Potential**: Numerous records on Atlas of Living Australia. No BioNet records. More likely to occur in the hinterland, the species may use the study area for foraging.
Pezoporus wallicus wallicus Eastern Ground Parrot	V	-	The Ground Parrot is found in scattered populations along the east coast of Australia, from south-east coastal Queensland and in pockets in north-east and southern New South Wales, through to coastal areas of Gippsland in Victoria and the islands of the Bass Strait to its stronghold in Tasmania. The species lives mainly in heathland, sedgeland or on button-grass plains (Birdlife Australia n.d.).	**Unlikely:** Two records in northern part of locality, including one 20 year old record near/at Murramarang Aboriginal Area. Very minimal suitable habitat for species in study area.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Rhipidura rufifrons Rufous Fantail	-	M	The Rufous Fantail is a summer breeding migrant to southeastern Australia (Morcombe 2004). The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation (Morcombe 2004). Open country and drier open forest may be used by the Rufous Fantail during migration (Morcombe 2004). It is insectivorous, seeking its prey from the middle and lower levels of the canopy.	**Potential:** Multiple records for locality. May seasonally forage over study area**.**
Rostratula australis Australian Painted-snipe	E	E	The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter (OEH 2017b).	**No:** No records for locality. Lack of suitable habitat. Not known from Sydney Basin IBRA Jervis subregion or South East Corner IBRA Batemans subregion.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Sternula albifrons Little Tern	E	-	Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. It is almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). They nest in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. The nest is a scrape in the sand, which may be lined with shell grit, seaweed or small pebbles. Often seen feeding in flocks, foraging for small fish, crustaceans, insects, worms and molluscs by plunging in the shallow water of channels and estuaries, and in the surf on beaches, or skipping over the water surface with a swallow-like flight (OEH 2017b).	**Potential:** Limited suitable and preferred habitat in study area with only minimal dunes/sandy beaches, although records in proximity for locality.
Sternula nereis Fairy Tern	-	V	The Fairy Tern is found on isolated sandy inlets and along the coast from Dampier Archipelago, Western Australia, southward to Tasmania and Victoria, and is only vagrant to the east coast. It is most common in Western Australia and rare in New South Wales, Northern Territory and Queensland. It is also found in New Zealand and New Caledonia. The Fairy Tern is found on coastal beaches, inshore and offshore islands, sheltered inlets, sewage farms, harbours, estuaries and lagoons. It favours both fresh and saline wetlands and near-coastal terrestrial wetlands, including lakes and salt-ponds (Birdlife Australia n.d.).	**Unlikely:** No records for locality. Feed on water and nest on sandy beaches. No suitable habitat in study area.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Thinornis rubricollis Hooded Plover	CE	V	The Hooded Plover is endemic to southern Australia. Presently the Hooded Plover occurs in NSW north to Sussex Inlet. Occasionally, individual birds are sighted slightly further north to the Shoalhaven River and Comerong Beach and one bird was sighted at Lake Illawarra in March 2001. n south-eastern Australia Hooded Plovers prefer sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone for feeding, much beachcast seaweed, and backed by sparsely vegetated sand-dunes for shelter and nesting. Hooded Plovers forage in sand at all levels of the zone of wave-wash during low and mid-tide or among seaweed at high-tide, and occasionally in dune blowouts after rain (OEH 2017b).	**Yes:** Known to occur in study area and multiple records for locality. Suitable habitat in study area. Known monitoring site south of Pretty Beach.
Tringa nebularia Common Greenshank		M	The Common Greenshank breeds in the Palaearctic regions and is widespread in Africa, Coastal Asia, the Indian subcontinent, the Philippines and southern New Guinea. They are common throughout Australia in the summer. Common Greenshanks are found both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops (Birdlife Australia n.d.).	**Unlikely:** Known to occur in locality but unlikely to occur in study area as preferred habitat is wetlands.
Tyto novaehollandiae Masked Owl	V	-	The Masked Owl is associated with forest with sparse, open, understory, typically dry sclerophyll forest and woodland and especially the ecotone between wet and dry forest, and non-forest habitat. It is known to utilise forest margins and isolated stands of trees within agricultural land and heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained.	**Potential:** Generic potential foraging habitat in study area. Numerous records for locality.

Birds				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Tyto tenebricosa Sooty Owl	V	-	Sooty Owls are associated with tall wet old growth forest on fertile soil with a dense understory and emergent tall Eucalyptus species. Pairs roost in the daytime amongst dense vegetation, in tree hollows and sometimes in caves. The Sooty Owl is typically associated with an abundant and diverse supply of prey items and a selection of large tree hollows.	**Potential:** Generic potential foraging habitat in study area. Multiple records for locality.
Disclaimer: Data extracted from the Atlas of NSW Wildlife and the Australian Government's Protected Matters Search Tool are indicative and cannot be considered comprehensive.				
CE = Critically Endangered; E = Endangered; E2 = Endangered Population; V = Vulnerable; M = Migratory				

Reptiles and amphibians				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Heleioporus australiacus Giant Burrowing Frog	V	V	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water (OEH 2017b).	**Unlikely:** No records for locality. Study area outside of the two known populations. Lack of suitable breeding habitat in study area.
Hoplocephalus bungaroides Broad-headed Snake	E	V	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevices or hollows in large trees within 500m of escarpments in summer (OEH 201c7).	**Unlikely:** BioNet and Atlas of Living Australia have no records from coastline for locality. No suitable habitat e.g. cliff edges, in study area.

Reptiles and amphibians				
Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Litoria aurea Green and Golden Bell Frog	E	V	This species has been observed utilising a variety of natural and man-made waterbodies (Pyke & White 1996) such as coastal swamps, marshes, dune swales, lagoons, lakes, other estuary wetlands, riverine floodplain wetlands and billabongs, stormwater detention basins, farm dams, bunded areas, drains, ditches and any other structure capable of storing water (OEH 2017b). Fast flowing streams are not utilised for breeding purposes by this species. Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading (OEH 2017). Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially *Typha* sp. and *Eleocharis* sp.) adjacent to open grassland areas for foraging are preferable (Ehmann 1997; Robinson 1994). Ponds that are typically inhabited tend to be free from predatory fish such as Mosquito Fish (*Gambusia holbrooki*) (OEH 2017b).	**Unlikely**: Study area not preferred habitat and not connected to known or significant potential habitat. One record for Murramarang National Park, but not within study area.
Mixophyes balbus Stuttering Frog	E	V	Stuttering Frogs occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east NSW. It is the only *Mixophyes* species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. The Dorrigo region, in north-east NSW, appears to be a stronghold for this species. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Breed in streams during summer after heavy rain (OEH 2017b).	**Unlikely:** No records for locality. Lack of suitable habitat in study area.
Disclaimer: Data extracted from the Atlas of NSW Wildlife and the Australian Government's Protected Matters Search Tool is indicative and cannot be considered comprehensive.				
CE = Critically Endangered; E = Endangered; E2 = Endangered Population; V = Vulnerable; M = Migratory				

Mammals				
Fauna Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Arctocephalus pusillus doriferus Australian Fur-Seal	V	-	Found along rocky platforms and islands of south-eastern Australia. Reported to have bred at Seal Rocks, near Port Stephens and Montague Island in southern NSW. Haul outs are observed at isolated places along the NSW coast. Prefers rocky parts of islands with flat, open terrain (OEH 2017b). The species forages in oceanic waters of the continental shelf and generally does not dive deeper than 150 m (Department of the Environment 2019).	**Potential:** Known breeding site south at Montague Island. Numerous records for locality. Suitable habitat of rocky platforms in study area which may be used as haul out sites.
Cercartetus nanus Eastern Pygmy Possum	V	-	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. It is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. The species feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. It also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. The Eastern Pygmy Possum shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks (OEH 2017b).	**Yes:** A few records on edge of locality area, however study area has suitable habitat and NPWS advice of one released near north end of North Durras Beach/south-western end of Depot Headland.
Chalinolobus dwyeri Large-eared Pied Bat	V	V	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes.	**Unlikely:** No known records from locality. Few records in region.

Mammals				
Fauna Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Dasyurus maculatus Spotted-tailed Quoll	V	E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests, more frequently recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in. Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; and burrows. Home ranges measured in hundreds to thousands of hectares.	**Potential**: Suitable habitat within study area. Numerous records for locality.
Isoodon obesulus Southern Brown Bandicoot	E	E	This species is associated with heath, coastal scrub, heathy forests, shrubland and woodland on well drained (often sandy) soils. This species is thought to display a preference for newly regenerating heathland and other areas prone to fire. Nocturnal and sleeping by day in well-concealed nests of shredded vegetation often mixed with dirt under grass-trees, dense Blackberry and rabbit burrows. Omnivorous, feeding on fungi, fern shoots, plant roots, insects, worms and spiders. Solitary with non-overlapping home ranges 5-20ha for males, with females in smaller ranges about 2-3ha. Breed year round often following heavy rain (OEH 2017b).	**Unlikely**: Lack of preferred habitat in study area. One record for locality.
Miniopterus schreibersii oceanensis Eastern Bent-wing Bat	V	-	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland. It forages above and below the tree canopy on small insects. Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter.	**Likely**: Preferred habitat in study area. Numerous records for locality.
Mormopterus norfolkensis Eastern Freetail Bat	V	-	Specific habitat requirements of this species are poorly known. Has been recorded in habitats ranging from rainforest to dry sclerophyll and woodland, with most recorded in the latter. Roosts in small colonies in tree hollows and under loose bark; has been found under house eaves, in roofs and metal caps on telegraph poles. Probably forages above forest or woodland canopy, and in clearings adjacent to forest. Most records are of single individuals, and are likely to occur at low densities over its range.	**Likely:** No BioNet records however, small number of ATLAS of Living Australia records for locality. Preferred habitat in study area.

Mammals				
Fauna Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Myotis macropus Southern Myotis	V	-	This species will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as they are close to water. The bat forages over streams and pools catching insects and small fish by raking their feet across the water surface. When roosting it is most commonly associated with caves, however, this species has been observed to roost in tree hollows, amongst vegetation, under bridges, in mines, tunnels and stormwater drains. The species apparently has specific roost requirements, and only a small percentage of available caves, mines, tunnels and culverts are used.	**Unlikely**: Lack of suitable habitat in study area e.g. no large freshwater water bodies. A few records for locality.
Petauroides volans Greater Glider	EP	V	The greater glider is restricted to eucalypt forests and woodlands of eastern Australia. Its diet is mostly eucalypt leaves and occasional flowers and is found in highest abundance in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows. The distribution may be patchy even in suitable habitat. Forests with a diversity of eucalypt species, due to seasonal variation, are its preferred community. There is an Endangered Population of Greater Glider in the Eurobodalla LGA extending south from Moyura (OEH 2019).	**Potential:** There is suitable habitat for the species in the study area. A BioNet search resulted in numerous records of the species for the locality. A number of these are mapped as Eurobodalla Greater Glider Endangered Population. However, official OEH advice is that the Endangered Population is south of the Moruya River, with the river acting as a barrier to dispersal, isolating the population from other occurrences of the species. A search of the Atlas of Living Australia records found numerous records in the locality. Adopting a precautionary approach, the assessment concludes that the species may potentially occur and will assess the species as Vulnerable under the EPBC Act, and as part of the Endangered Population in the Eurobodalla LGA under NSW BC Act.

Mammals				
Fauna Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Petaurus australis Yellow-bellied Glider	V	-	The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. It occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. The species feeds mainly on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein, and extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. They live in small family groups of two - six individuals and are nocturnal, with their dens in hollows of large trees. They are very mobile and occupy large home ranges between 20 and 85 ha to encompass dispersed and seasonally variable food resources (OEH 2017b).	**Potential:** Many records for locality. Suitable habitat in study area. No incisions observed during field surveys.
Petaurus norfolcensis Squirrel Glider	V	-	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. The species inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understory in coastal areas. It prefers mixed species stands with a shrub or Acacia mid-story. They live in family groups of a single adult male one or more adult females and offspring and require abundant tree hollows for refuge and nest sites. The diet varies seasonally and consists of *Acacia* gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein (OEH 2017b).	**Potential:** Numerous records from locality. These records are from 1980 – 2002 from Davey's research. Marginal habitat in study area with minimal forest/woodland with heath understory.
Petrogale penicillata Brush-tailed Rock-wallaby	E	V	The range of the Brush-tailed Rock-wallaby extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. However the distribution of the species across its original range has declined significantly in the west and south and has become more fragmented. In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north (OEH 2017b)	**No:** No records from locality and no suitable habitat in study area.

Mammals				
Fauna Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Phascogale tapoatafa Brush-tailed Phascogale	V	-	The Brush-tailed Phascogale has a patchy distribution around the coast of Australia. In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide. It prefers dry sclerophyll open forest with sparse ground cover of herbs, grasses, shrubs or leaf litter. They also inhabit heath, swamps, rainforest and wet sclerophyll forest. The species forages in rough barked trees of 25 cm DBH or greater, feeding mainly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. The females have exclusive territories of approximately 20 - 40 ha, while males have overlapping territories often greater than 100 ha. They nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span (OEH 2017b).	**Potential:** A few records for locality. Suitable habitat in study area.
Phascolarctos cinereus Koala	V	V	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. It was briefly historically abundant in the 1890s in the Bega District on the south coast of NSW, although not elsewhere, but it now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands. They inhabit eucalypt woodlands and forests, feeding on foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Their home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. (OEH 2017). In the South East Corner Bioregion the Koala is known to be associated with a range of vegetation formations and classes, including *Spotted Gum - White Stringybark - Burrawang shrubby open forest on hinterland foothills, northern South East Corner* and *Lilly Pilly - Coachwood warm temperate rainforest on moist sheltered slopes and gullies, Sydney Basin Bioregion and South East Corner Bioregion*. South coast populations preferred feed trees include *Eucalyptus punctata, E. robusta, E. microcorys, E. sclerophylla* and *E. tereticornis*.	**Potential**: A few records for locality. One feed tree species, *E. tereticornis,* is present in some parts of study area but not extensively. *Spotted Gum - White Stringybark - Burrawang shrubby open forest on hinterland foothills*, and *Lilly Pilly - Coachwood warm temperate rainforest on moist sheltered slopes and gullies* which occur in the study area are known Koala vegetation communities.

Mammals				
Fauna Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Phoniscus papuensis Golden –tipped Bat	V	-	The Golden-tipped Bat is distributed along the east coast of Australia in scattered locations from Cape York Peninsula in Queensland to south of Eden in southern NSW. It also occurs in New Guinea. It is found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, *Casuarina*-dominated riparian forest and coastal *Melaleuca* forests. They will fly up to two kilometres from roosts to forage in rainforest and sclerophyll forest on mid- and upper-slopes. Their roosts are mainly in rainforest gullies on small first- and second-order streams in usually abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests modified with an access hole on the underside. Bats may also roost under thick moss on tree trunks, in tree hollows, dense foliage and epiphytes (OEH 2017b).	**Unlikely:** Study areas not optimal habitat. A few records for locality. Prefers rainforest creeklines.
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland)	V	V	The long-nosed potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. There are geographically isolated populations in western Victoria. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. They inhabit coastal heaths and dry and wet sclerophyll forests. Dense understory with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. Underground-fruiting fungi are a large component of the diet, but they also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. They dig small holes in the ground in a similar way to bandicoots. They are mainly nocturnal (OEH 2017b).	**Potential:** Suitable habitat in study area. Not recorded from locality.
Pseudomys novaehollandiae New Holland Mouse	-	V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Known to inhabit open heathlands, woodlands and forests with a heathland understory and vegetated sand dunes. Distribution is patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire (OEH 2017b).	**Unlikely:** No records from locality. Lack of preferred habitat in study area.

Mammals				
Fauna Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Pteropus poliocephalus Grey-headed Flying-fox	V	V	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. The Grey-headed Flying-fox inhabits a wide range of habitats including rainforest, mangroves, and paperbark forests. Camps are often located in gullies, typically close to water, in vegetation with a dense canopy. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Their roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. They feed on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops (OEH 2017b).	**Potential:** Numerous records for locality, however seasonal foraging habitat only. Not recorded during field surveys.
Scoteanax rueppellii Greater Broad-nosed Bat	V	-	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m. It utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Usually roosts in tree hollows, foraging for beetles and other large, slow-flying insects, and sometimes other bat species, after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m (OEH 2017b).	**Potential:** A few records for locality. Suitable habitat in study area.

Mammals				
Fauna Species	**NSW BC Act**	**C'wlth EPBC Act**	**Distribution and habitat associations**	**Likelihood of Occurrence**
Sminthopsis leucopus White-footed Dunnart	V	-	The White-footed Dunnart occurs in Tasmania and along the Victorian and southern NSW coast. The Shoalhaven area is the species' northern-most limit. It has not been recorded west of the coastal escarpment with the western-most record being from Coolangubra State Forest, approximately 10 km south-east of Bombala. It is found in a range of different habitats across its distribution, including coastal dune vegetation, coastal forest, tussock grassland and sedgeland, heathland, woodland and forest. In NSW, the species seems to favour vegetation communities with an open understory structure (contrasting with populations in Victoria which apparently prefer dense shrub and ground layers). It is patchily distributed across these habitats and, where present, typically occurs at low densities. It is an opportunistic carnivore that feeds on a variety of ground-dwelling invertebrates and, occasionally, small lizards. They shelter in bark nests in hollows under standing or fallen timber, burrows in the ground, piles of logging debris, in the 'skirts' of grass-trees *Xanthorrhoea* spp. and cycads *Macrozamia* spp. and in rock crevices (OEH 2017b).	**Potential:** A few records for locality. Occurs in broad range of habitat including those in the study area.
Disclaimer: Data extracted from the Atlas of NSW Wildlife/Bio Net and the Australian Government's Protected Matters Search Tool is indicative and cannot be considered comprehensive.				
CE = Critically Endangered; E = Endangered; E2 = Endangered Population; EP = Endangered Population; V = Vulnerable; M = Migratory				

Appendix I: Likelihood of occurrence evaluation for ecological communities of conservation significance

An evaluation of the likelihood of occurrence was made for listed threatened ecological communities (TECs) identified as occurring, having occurred or likely to occur in the locality. This evaluation was based on: database searches of NSW BioNet Wildlife Atlas and the Protected Matters Search Tool for EPBC Act listed matters for the locality; Forest Ecosystem Validation Mapping (NGH 2002); presence or absence of suitable habitat; features of the study area; results of the field surveys; professional judgement; literature (Australian Government 2019); and advice from local NPWS staff. Five terms for the likelihood of occurrence of listed communities are used in this report. The terms for likelihood of occurrence are:

- 'yes' = the matter of conservation significance was or has been observed in the study area or immediate surrounds
- 'likely' = there is a medium to high probability that the matter of conservation significance uses or occurs in the study area or immediate surrounds
- 'potential' = suitable habitat/plant community type for the matter of conservation significance occurs in the study area, but there is insufficient information to categorise the matter of conservation significance as likely or unlikely to occur
- 'unlikely' = there is a low to very low probability that the matter of conservation significance uses or occurs in the study area or immediate surrounds
- 'no' = the habitat/environment within the study area or immediate surrounds is unsuitable for the matter of conservation significance

Ecological community of conservation significance	Considerations related to study area	Likelihood of occurrence
Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions (NSW TEC)	• study area is within a few kms from the sea as in NSW TEC • study area altitude < 100 m meets NSW TEC • presence of indicator species in the study area	Yes
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC) Subtropical and Temperate Coastal Saltmarsh (C'wlth TEC)	• study area is not on and immediately above marine and estuarine tidal flats • study area includes areas of intertidal zone on shores of estuaries and lagoons e.g. shoreline alignment (Alignment A) near Maloneys Beach • lack of indicator species in study area	Unlikely
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC)	• study area not periodically or semi-permanently inundated by freshwater, or has no wetlands that have saline influence	No
Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion (NSW TEC) Illawarra and South Coast Lowland Forest and Woodland Ecological Community (C'wlth TEC)	• the NSW version of this community does not occur in Eurobodalla or southern Shoalhaven • C'wlth version does occur in LGAs, in the Jervis, Ettrema and Illawarra subregions of the Sydney Basin Bioregion and the Bateman subregion of the South East Corner Bioregion. • not recorded during field surveys	No

Ecological community of conservation significance	Considerations related to study area	Likelihood of occurrence
Illawarra Subtropical Rainforest in the Sydney Basin Bioregion (NSW TEC) Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion (C'wlth)	• study area outside of geographical occurrence	No
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC) Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (C'wlth TEC)	• canopy and shrub layer made up of rainforest species/closed canopy • north of Bega and close to ocean; study area subject to marine environment/climatic influences • evidence of low fire occurrence • scattered remnants in study area	Likely
Lowland Grassy Woodland in the South East Corner Bioregion (NSW and C'wlth TEC)	• occurs in LGA – Eurobodalla • predominantly south of Clyde River catchment – main occurrences west of Batemans Bay, around Moruya, in the Araluen valley, in the Cobargo - Bega – Candelo area, the Towamba Valley and near Tanja • occurs in rainshadow areas • some common canopy species present in study area *Eucalyptus globoidea* and *E. tereticornis*-species components of ecotone transitional areas between higher Spotted Gum complex and lower areas • not observed during field surveys -	No
Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion (NSW TEC) Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion (C'wlth)	• study area outside of boundaries of community • geology of study area not Milton Monzonite • for C'wlth characteristics, see above under Illawarra-Shoalhaven description	No
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC) River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (C'wlth)	• study area not on river flats or river terraces in the central to upper parts of coastal floodplain	No
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC) Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community (C'wlth TEC)	• in relevant geographic area • sandy loam soils present • areas near beach east of Maloneys Beach potential and behind next beach east, may be subject to waterlogging/inundation	Potential
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC)	• no areas in study area have characteristic species • BioMetric mapping has TEC occurring in study area	Potential

Ecological community of conservation significance	Considerations related to study area	Likelihood of occurrence
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions (NSW TEC)	• study area does not have native grasslands on headlands	No

NSW TEC = NSW Threatened Ecological Community listed under the *Biodiversity Conservation Act 2016*; C'wlth TEC = Commonwealth Threatened Ecological Community as listed under the *Environment Protection and Biodiversity Conservation Act 1999.*