City of Cockburn - Woodman Point EIA

Environmental Impact Assessment of Proposed Off-Leash Dog Beach at Woodman Point

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This document has been prepared based on assumptions as reported throughout and upon information and data supplied by others or generated by Integrate Sustainability Pty Ltd (Integrate Sustainability). This document has been subject to review and changes from the Client and the Client's representative.

Executive Summary

A Draft Animal Management and Exercise Plan (AMP) has recently been submitted to the City of Cockburn Council (the Council) for their approval; to guide the City's approach to promoting responsible pet ownership and to ensure the facilities are appropriately equipped and accessible for the City's growing population of pets. Within the AMP, a trial period has been suggested to change the zoning to a 2.7km stretch of beach south of Ammunition Jetty at Woodman Point for 24-months as a 'dog off-leash' area and becoming a 'dog prohibited' area during the Australian Fairy Tern (*Sternula nereis nereis*) nesting season (October to March, with the months to be identified each year).

Integrate Sustainability Pty Ltd (ISPL) was engaged by the City of Cockburn to undertake an impact assessment and prepare a report on the feasibility of a 2.7km section of beach at Woodman Point being closed to dogs during the Fairy Tern nesting season. An environmental impact assessment approach was utilised to assess the feasibility. The EIA prepared by ISPL for the City of Cockburn has been completed by:

- Undertaking a site visit;
- Completing a desktop assessment on the environmental values at Woodman Point with a particular focus on coastal habitat and use by Fairy Terns and other shorebirds;
- Identification of potential environmental impacts associated with the rezoning of the beach and completing a risk assessment to outline the likelihood and severity of these impacts occurring;
- Consultation with key stakeholders (Fairy Tern Network, Birdlife Australia, CCWA); and
- Provision of recommendations based on the risk assessment.

Woodman Point provides known habitat for a range of shorebirds and migratory shorebirds which are listed under the *Biodiversity Conservation Act 2016* (WA) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). In particular, the following listed species have been recorded in recent years:

- Great Knot (*Calidris tenuirostris,* critically endangered);
- Curlew Sandpiper (*Calidris ferruginea*, critically endangered);
- Red Knot (*Calidris canutus*, endangered);
- Lesser Sand Plover (*Charadrius mongolus*, endangered);
- Greater Sand Plover (*Charadrius leschenaultia*, vulnerable);
- Australian Fairy Tern (*Sternula nereis nereis*; vulnerable); and
- 25 listed migratory shorebirds.

Fairy Terns are known to have previously used the area between Cockburn Cement and the Carpark at Woodman Point Headland for breeding; however, the increase in human traffic, recreation and dog access are likely to have contributed to reduced breeding attempts and breeding success (CCWA Pers Comm, 2020; Birdlife Australia Pers Comm, 2020; Pers Comm C. Greenwell, 2020).

The risk assessment ranked potential impacts to Fairy Terns and other beach-nesting shorebirds as high due to habitat degradation, disturbance and predation which is likely to increase with use of the beach by people and dogs even if the beach is closed to dogs over the summer months. Public safety impacts were also ranked as high due to the isolation and incompatible recreational activities which occur along this stretch of beach.

Allowing dog access to a 2.7km section of beach from Ammunition Jetty to the Carpark at the Woodman Point Headland with the exception of during the Fairy Tern nesting season between October to March, is unfeasible for the following reasons:

- Shorebird populations, including Fairy Terns, may be adversely impacted by:
    - Loss of breeding, roosting and foraging habitat;
    - Increased predation;
    - Increased disturbance rendering the site unsuitable;
- Fairy Tern nesting season and beach closure coincides with peak beach access periods over the summer months;
- Other shorebirds, including migratory species listed under the EPBC Act, also utilise this stretch of beach;
- There is significant potential that impacts will modify, destroy, remove or decrease the availability or quality of habitat for Fairy Terns, other shorebirds and migratory shorebirds and triggers the need to refer the action under Part 9 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth);
- Re-zoning is not in alignment with the Woodman Point Regional Park Management Plan;
- The area is isolated making it difficult to patrol and manage beach closures;
- Litter may become an issue along the beach and bins could only be installed and emptied at the entry point near the Ammunition Jetty;
- Closing the beach for the summer months could lead to confusion and be unpopular amongst dog owners; and
- The possibility of a dog attack would be increased if dogs were permitted off-leash increasing public safety issues and incompatible recreational activities with the Woodman Point Recreational Camp. Isolation is also a primary concern as access by emergency vehicles in the event of a severe dog attack or other emergency is limited.

Based on this assessment, it is recommended that the beach south of Ammunition Jetty to the Carpark at Woodman Point Headland be zoned as a 'no dog' area. This recommendation is in line with the Woodman Point Regional Park Management Plan and would provide a safe refuge with conservation benefits for Fairy Terns, shorebirds and seabirds.

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1 Introduction

Integrate Sustainability Pty Ltd (ISPL) was engaged by the City of Cockburn to undertake an impact assessment and prepare a report on the feasibility of a 2.7km section of beach at Woodman Point being closed to dogs during the Australian Fairy Tern (*Sternula nereis nereis*) nesting season. Three subspecies of Fairy Terns are recognised, these being the New Zealand Fairy Tern, the New Caledonian Fairy Tern and the Australian Fairy Tern. The term Fairy Tern is used throughout this document and refers to the Australian Fairy Tern (*Sternula nereis nereis*) which is listed as Vulnerable under both the *Biodiversity Conservation Act 2016* (WA) (BC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (Cth), (the EPBC Act).

1.1 Project overview

A Draft Animal Management and Exercise Plan (AMP) has recently been submitted to the City of Cockburn Council (the Council) for their approval; to guide the City's approach to promoting responsible pet ownership and to ensure the facilities are appropriately equipped and accessible for the City's growing population of pets (City of Cockburn, 2020). One of the recommendations put forward in the AMP was to prohibit dogs on a portion of beach south of Ammunition Jetty and over the Woodman Point Headland within the Woodman Point Regional Park for the purpose of protecting potential Fairy Tern nesting habitat (Figure 1.1). This section of beach is currently designated as a 'dog on-leash' area (Figure 1.2). At its July 2020 meeting, the Council requested Woodman Point be changed from a 'dog on-leash' area to a 'dog off-leash' area, as outlined in the Draft AMP currently open for public comment (City of Cockburn, 2020). A trial period has been suggested for changing the access to this stretch of beach for 24-months to be a 'dog off-leash' area, but becoming a 'dog prohibited' area during the Fairy Tern nesting season (October to March, with the months to be identified each year). The purpose of this report is to assesses the feasibility of the recommendation to change the zoning of the beach as per the trial, with a particular focus on Fairy Terns and other shorebirds for which this stretch of beach provides habitat.

Figure 1.1 Woodman Point location of beach re-zoning

Figure 1.2 Woodman Point current and proposed beach dog access. Red – No access, Yellow – On-leash, Green – Off-leash (City of Cockburn, 2020)

1.2 Approach and methodology

An environmental impact assessment approach was utilised to assess the feasibility of closing a 2.7km section of beach at Woodman Point to dogs during the Fairy Tern nesting season. Environmental Impact Assessment (EIA) is a process which involves examining and identifying potential consequences or impacts to the environment should proposed activities be implemented (Wathern, 2013). EIA is used as a decision making and planning tool for urban development as it can provide decision makers with an indication of the consequences related to an activity. The EIA process includes initial identification of the environmental values of the area proposed for development or activity; either through a desktop assessment summarising the information already known about the area, or using targeted surveys where the environmental values are unknown or there are potential significant environmental impacts.

This is followed by identification and discussion of the environmental risks associated with environmental values or characteristics of the proposed development. Where risks are identified, management measures are also recommended with the aim of minimising the environmental impacts should the development or activity proceed. This information is then used by decision-makers to determine whether the project or activity can be appropriately managed and should proceed; or if it will result in a significant impact to the environment and should not be implemented.

The EIA prepared by ISPL for the City of Cockburn has been completed by:

- Undertaking a site visit;
- Completing a desktop assessment on the environmental values at Woodman Point with a particular focus on coastal habitat and use by Fairy Terns and other shorebirds;
- Identification of potential environmental impacts associated with the rezoning of the beach and completing a risk assessment to outline the likelihood and severity of these impacts occurring;
- Consultation with key stakeholders (Fairy Tern Network, Birdlife Australia, CCWA); and
- Provision of recommendations based on the risk assessment.

2 Environmental desktop review

As part of the EIA process, a desktop review was completed for the Woodman Point area to identify known and potential environmental values. These are described in the subsections below.

2.1 Woodman Point Regional Park

Woodman Point Regional Park is located approximately 9km south of Fremantle and 22km south of Perth in the City of Cockburn (Conservation Commission, 2010). The Park covers an area of 255ha and is situated on a narrow beach ridge plain extending to a peninsula (Conservation Commission, 2010). Woodman Point itself separates Owen Anchorage from Jervois Bay and marks the northern extent of the Cockburn Sound

(Conservation Commission, 2010). The Park can be accessed by vehicles via Cockburn Road. The long-term vision and strategy for the Park are:

> Vision: *"Woodman Point Regional Park will be a well-managed coastal park supporting and preserving species and habitat diversity in a sustainable manner. The Park will provide for the conservation and preservation of cultural heritage values, as well as providing for the recreational needs of the community, in a visually harmonious way"* (Conservation Commission, 2010).
>
> Strategy: *"Manage the Park for conservation and allow recreation and other uses to occur to the extent that they do not adversely impact on other Park values."* (Conservation Commission, 2010).

2.1.1 Landform

The landform of Woodman Point Regional Park is characterised by gently undulating coastal dunes and swales (Conservation Commission, 2010). The beach ridge characterising Woodman Point was formed from sand deposition over thousands of years (Conservation Commission, 2010). East of the coastline is the Tamala Limestone comprised of a superficial layer of limestone deposition over sand which form a series of ridge and valley systems representing former dunes (Conservation Commission, 2010).

2.1.2 Flora and vegetation

The floristic communities of the Swan Coastal Plain were classified by Gibson *et al* (1994); and the flora and vegetation of Woodman Point Regional Park represents coastal floristic communities of the Quindalup dune system which have remained relatively intact since European settlement (Conservation Commission, 2010). Five floristic communities occur within the Woodman Point Regional Park and are widely distributed across the Swan Coastal Plain:

- Coastal shrublands on shallow sands;
- *Acacia* shrublands on taller dunes;
- *Callitris preissii* (Rottnest Cyprus) and/or *Melaleuca lanceolata* forests and woodlands;
- *Eucalyptus gomphocephala* (Tuart) and/or *Agonis flexuosa* (Peppermint) woodlands; and
- Woodlands and shrublands on Holocence Dunes. (Conservation Commission, 2010; Gibson, et al., 1994).

2.1.3 Terrestrial fauna

The variety of vegetation communities provide a range of habitats for terrestrial fauna. There is a diverse species composition of avifauna ranging from woodland/bush birds, trans-equatorial migratory birds, waterbirds and shorebirds (Conservation Commission, 2010). Quenda are also known to occur within the Park along with a range of reptiles (Conservation Commission, 2010).

2.1.4 Marine and coastal areas

The coastline frames Woodman Point Regional Park and is a key feature of the Park's environmental and recreational values (Figure 2.1). The coastal vegetation, dune systems and sandy beaches are a good representation of the natural coastal environment pre-development in the Perth region. The coastal foreshore provides habitat for a diverse bird population including trans-migratory birds and breeding habitat for local shorebirds (Conservation Commission, 2010). Wind and waves are driving forces behind currents and sediment movement. Seasonal trends in wind and waves influence sand deposition on the beaches as well as erosion. Artificial groyne structures have started to lead to an accumulation of sediment on the northern side of the point while there is some evidence of erosion along the Jervoise Bay shoreline (Conservation Commission, 2010).

Figure 2.1 Woodman Point characteristic coastal features

2.1.5 Aboriginal and European Heritage

A search of the Aboriginal Heritage Inquiry System identifies Woodman Point (ID15841) as a registered Aboriginal site of mythical significance. This area was traditionally used for Cobbler fishing and mussel gathering. Local plants in the area such as the quandong (*Santalum acuminatum*) were used in jam making and also hold cultural significance (Conservation Commission, 2010).

Woodman Point is also considered historically import, as European settlers used this as a quarantine station for people disembarking ships in the late 1800's. The quarantine station was later used for troops during the First World War and later for migrants to fumigate their clothes and luggage in the 1950's (Conservation Commission, 2010). Ammunition stores were built to house explosives during the Second World War (Conservation Commission, 2010). The buildings which make up the quarantine station and magazine storage, a number of tuart trees near Cockburn Road, the Coogee Beach and Jetty and Ammunition Jetty are included in the City of Cockburn Municipal Inventory as Heritage Places (Conservation Commission, 2010).

2.1.6 Recreation and community use

Woodman Point provides a range of areas for community use and recreation. The beach between Ammunition Jetty and Woodman Point Headland includes beach access for swimming, snorkelling and sailing. The Woodman Point Recreation Camp conducts over 65,000 hours of structured physical activity programs primarily for children on school and community camps on behalf of its owner agency, the WA Department of Local Government, Sport and Cultural Industries. The beach in this area is heavily utilised by children attending camps at Woodman Point, both during structured and unstructured recreational activities. From Woodman Point Headland to the boating precinct, the beach and groyne can be accessed for fishing, swimming and off-leash dog exercise.

2.2 Shorebirds at Woodman Point

2.2.1 What are shorebirds?

Shorebirds or waders are a diverse group of birds associated with wetland and coastal habitats where they wade in shallow water and feed along the shore (DBCA, 2017). Shorebirds can be further divided into two groups – those which are resident and spend their entire life in Australia and those which are migratory coming to feeding grounds in Australia each year from September to March (Department of Environment and Climate Change, 2008). Most migratory shorebirds make an annual return journey of thousands of kilometres between breeding grounds in the northern hemisphere and non-breeding grounds in the southern hemisphere (Weller & Lee, 2017). Coastal, wetland and estuarine habitats in Australia provide important habitat for resident shorebird populations and also as a resting and feeding ground for migratory shorebirds (Weller & Lee, 2017). Figure 2.2 shows typical shorebird habitat at Woodman Point.

Seabirds differ from shorebirds in that they forage at sea, only coming ashore to roost and nest (DBCA, 2017). Shorebirds and seabirds can often be seen in flocks alongside each other (DBCA, 2017). Woodman Point also provides resting and roosting habitat for seabirds.

Figure 2.2 Shorebird habitat at Woodman Point

Common shorebirds of the Perth region and which have been known to utilise habitat at Woodman Point from regional database (NatureMap, 2020; Birdata, 2020; Urban Bushland Council, 2020) are:

- Pied Oystercatcher (*Haematopus longirostris*);
- Banded Stilt (*Cladorhynchus leucocephalus*);
- Banded Lapwing (*Vanellus tricolor*);
- Black Fronted Dotterel (*Elseyornis melanops*);
- Grey Plover (*Pluvialis squatarola*);
- Red-capped Plover (*Charadrius ruficapillus*); and
- Sooty Oystercatcher (*Haematopus fuliginosus*).

a)  b) 

c) 

Figure 2.3 Common Shorebirds of Woodman Point – a) Pied Oystercatcher, b), Black Fronted Dotterel c) Red-Capped Plover (Perth Birds and Bush, 2020)

2.2.2 Beach nesting shorebirds

Many resident shorebirds spend their entire life cycle (foraging, roosting and breeding) along the coastlines and beaches of Australia. Beach nesting birds build their nests directly on beaches, estuaries, dunes or rocky shores above the high tide mark (Maguire, 2018; Maguire, 2008). Sand, shells and stones provide an ideal camouflage for eggs and mottled chicks (Maguire, 2008).

The key breeding habitat for beach nesting birds is also highly favoured by people for recreation, particular during the summer months which coincide with the breeding season of many beach nesting birds. These added pressures contribute to an already low breeding success rate (Maguire, 2008). Figure 2.4 shows how well eggs and chicks camouflage on the beach.

Figure 2.4 Typical example of the nest of a beach-nesting shorebird (Fairy Tern nest at Point Walter, Image: Corlette, 2020)

2.2.3 Conservation significant shorebirds of Woodman Point

A NatureMap report for Woodman point identified 131 birds with the potential to occur at Woodman Point, of these, 37 species are shorebirds or waterbirds (NatureMap, 2020). Many shorebirds are of conservation significance due to either their low populations and threats facing their persistence or their migratory status in Australia which is recognised under several international agreements (e.g. JAMBA, CAMBA, ROKAMBA[1]).

Table 2.1 provides a list of conservation significant shorebirds and seabirds recorded at Woodman Point, or for which Woodman Point provides suitable habitat. The complete list from NatureMap and the Protected Matters Search Tool are provided as Appendix A. Species which have been recorded and lodged through Birdlife Australia's Birdata portal have also been recorded. It is important to note that Birdata also collates citizen science data and identifications may not have been verified by a fauna specialist.

Table 2.1. Conservation significant shorebirds and migratory birds (NatureMap, 2020; Birdata, 2020; DAWE, 2020)

Species	Conservation Status		Recorded (Birdata)
	WA	Commonwealth	
Eastern Curlew (*Numenius madagascariensis*)	Cr	Cr	X
Curlew Sandpiper (*Calidris ferruginea*)	Cr	Cr	X
Great Knot (*Calidris tenuirostris*)	Cr	Cr	X
Lesser Sand Plover (*Charadrius mongolus*)	En	En	X
Red Knot (*Calidris canutus*)	En	En / IA	X
Greater Sand Plover (*Charadrius leschenaultii*)	Vu	Vu / IA	X
Fairy Tern (*Sternula nereis nereis*)	Vu	Vu	X
Flesh-footed Shearwater (*Ardenna carneipes*)	Vu	IA	X
Hooded Plover (*Thinornis rubricollis*)	P4		X
Grey-tailed Tattler (*Tringa brevipes*)	P4 / MI	IA	X
Brown Skua (*Stercorarius antarcticus*)	P4		X
Common Sandpiper (*Actitis hypoleucos*)	MI	IA	X
Wedge-tailed Shearwater (*Ardenna pacifica*)	MI	IA	X
Ruddy Turnstone (*Arenaria interpres*)	MI	IA	X
Sanderling (*Calidris alba*)	MI	IA	X
Red-necked Stint (*Calidris ruficollis*)	MI	IA	X
Caspian Tern (*Hydroprogne caspia*)	MI	IA	X
Bar-tailed Godwit (*Limosa lapponica*)	MI	IA	X
Southern Giant Petrel (*Macronectes giganteus*)	MI	En / IA	X
Northern Giant Petrel (*Macronectes halli*)	MI	Vu / IA	X
Whimbrel (*Numenius phaeopus*)	MI	IA	X
Wilson's Storm-Petrel (*Oceanites oceanicus*)	MI	IA	X
Bridled Tern (*Onychoprion anaethetus*)	MI	IA	X
Pacific Golden Plover (*Pluvialis fulva*)	MI	IA	X
Grey Plover (*Pluvialis squatarola*)	MI	IA	X
Arctic jaeger (*Stercorarius parasiticus*)	MI	IA	X
Pomarine Jaeger (*Stercorarius pomarinus*)	MI	IA	X
Roseate Tern (*Sterna dougallii*)	MI	IA	X
Common Tern (*Sterna hirundo*)	MI	IA	X
Little Tern (*Sternula albifrons*)	MI	IA	
Crested Tern (*Thalasseus bergii*)	MI	IA	X
Common Greenshank (*Tringa nebularia*)	MI	IA	X
Marsh Sandpiper (*Tringa stagnatilis*)	MI	IA	X
Sharp-tailed Sandpiper (*Calidris acuminata*)	MI	IA	X
Terek Sandpiper (*Xenus cinereus*)	MI	IA	X

[1] JAMBA – Japan-Australia Migratory Bird Agreement. CAMBA – China-Australia Migratory Bird Agreement. ROKAMBA – Republic of Korea-Australia Migratory Bird Agreement.
For more information see: https://www.environment.gov.au/biodiversity/migratory-species/migratory-birds

Cr – Critically endangered, En – Endangered, Vu – Vulnerable, P4 – Priority 4, MI – Migratory, IA – International Agreement

2.2.4 Australian Fairy Terns

The Australian Fairy Tern (*Sternula nereis nereis,* Figure 2.5) is endemic to Australia and nests in colonies located along shorelines, coastal lagoons and salt lakes with sparse vegetation and where their main prey, small schooling fish (such as whitebait and sardines), are naturally abundant (Greenwell, et al., 2019; Dunlop, 2018). The Fairy Tern is listed as Vulnerable under both the *Biodiversity Conservation Act 2016* (WA) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

In south-west Australia, Fairy Terns are partially migratory, spending winter months (June to August) along the north-west coast and establishing breeding colonies along the south-west coast from October to March (Dunlop, 2018). Peak breeding activity occurs from mid-November to early January (Dunlop, 2018).

Fairy Terns forage by plunge diving for small schooling fish within close proximity of nests (Dunlop, 2018). Habitat critical to the survival of the Fairy Tern is considered to include any habitat, within its range, where the species is known or likely to breed or forage (Commonwealth of Australia, 2019). The principal threats to Fairy Terns in south-western Australia are disturbances to breeding colonies and habitat loss (Dunlop, 2018).

Figure 2.5 Fairy Tern (*Sternula nereis nereis*) (*image: C. Greenwell*)

At Woodman Point, the stretch of beach between Woodman Point carpark and Cockburn Cement is of breeding significance for Fairy Terns (Figure 2.6). Fairy Terns are known to have used this area for breeding, however, the increase in human traffic, recreation and dog access have reduced breeding attempts and breeding success (CCWA Pers Comm, 2020; Birdlife Australia Pers Comm, 2020; Pers Comm C. Greenwell, 2020).

Fairy Terns are known to have attempted to nest in this location in November 1997, February 1998, December 1999, December 2007 and December 2009 (CCWA Pers Comm, 2020). In all cases eggs were destroyed by people or four-wheel drives and the breeding attempt was unsuccessful (CCWA Pers Comm, 2020). There has been no record of breeding activity by Fairy Terns in the last decade however, Fairy Terns are still regularly sighted at Woodman Point during the summer months (October to April) (CCWA Pers Comm, 2020). Figure 2.6 and Figure 2.7 present data from Birdlife Australia's Birdata Portal of Fairy Tern sightings at Woodman Point indicating that Fairy Terns are a regular visitor to the area (Birdata, 2020).

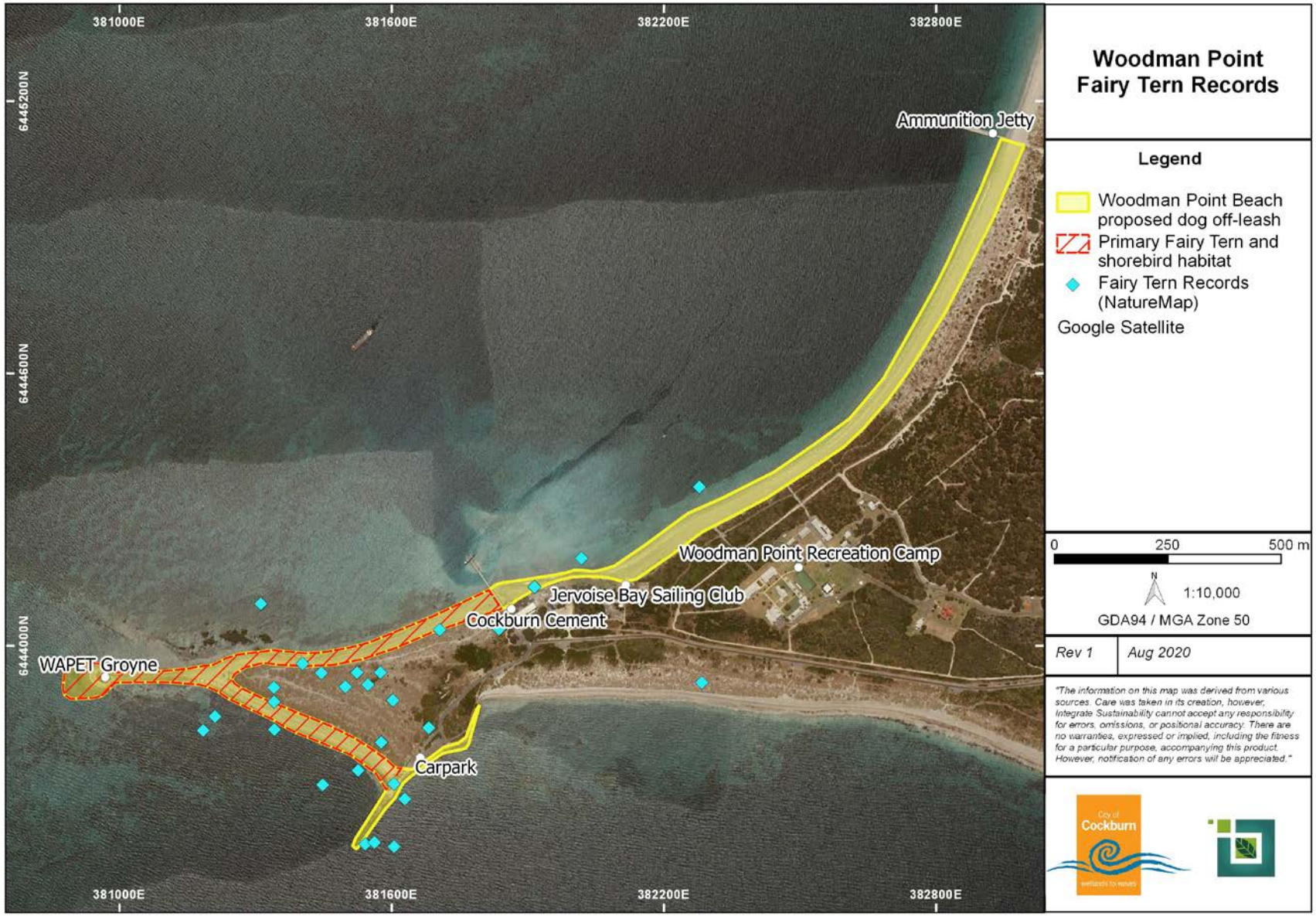

Figure 2.6 Fairy Tern (*Sternula nereis nereis*) records at Woodman Point (NatureMap, 2020)

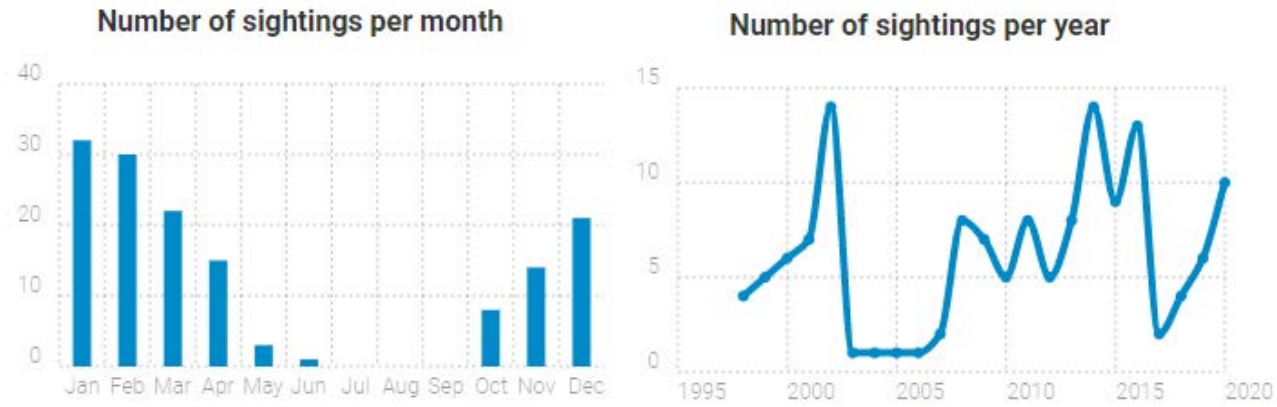

Figure 2.7 Fairy Tern sightings by month and year at Woodman Point (Birdata, 2020)

2.2.5 Other conservation significant shorebirds and migratory birds at Woodman Point

Table 2.1 highlights that other conservation significant shorebirds have also been recorded at Woodman Point and are likely to occur in the future. In particular, the following listed species have been recorded in recent years:

- Great Knot (*Calidris tenuirostris,* critically endangered);
- Curlew Sandpiper (*Calidris ferruginea*, critically endangered);
- Red Knot (*Calidris canutus*, endangered);
- Lesser Sand Plover (*Charadrius mongolus*, endangered); and
- Greater Sand Plover (*Charadrius leschenaultia*, vulnerable).

Other resident shorebirds like the Pied Oystercatcher, Sooty Oystercatcher, Hooded Plover and Red-capped Plover may also utilise the beach and coastal areas for nesting. Human and dog activity in the area has reduced the selection of this site as breeding grounds in recent years (Birdlife Australia Pers Comm, 2020).

2.2.6 Threats to shorebirds

One of the most significant threats to shorebirds is the loss of wetland and coastal habitat. On the Swan Coastal Plain up to 75% of wetlands have been filled or drained and coastal areas have been heavily developed (Weller & Lee, 2017). As described by Weller & Lee (2017), other threats to shorebirds and migratory shorebirds include:

- Habitat loss or modification of stop-over areas within migratory flight paths;
- Foraging habitat modification from weed infestations, pollution and altered hydrological regimes;
- Disturbance during foraging and roosting periods causing birds to move from an area at high energetic cost potentially compromising the birds ability to undertake a migratory flight; and
- Unsustainable harvesting of baitfish and other prey species.

In addition, beach nesting shorebirds face an additional suite of threats described by Maguire (2018) as including:

- Breeding habitat loss and modification from weed infestations, coastal developments, sea level rise and beach or dune erosion;
- Crushing of nests, eggs and chicks by people, horses and vehicles;
- Predation of eggs and chicks from cats, foxes, dogs and birds of prey; and
- Disturbance to nesting pairs leaving unattended eggs and chicks which can cause starvation of chicks and even abandonment of the breeding attempt.

Figure 2.8 shows dog and human activity along the stretch of beach at Woodman Point which is shorebird breeding habitat.

Figure 2.8 Evidence of dogs within shorebird habitat at Woodman Point

3 Environmental impact assessment

It is important to note that Fairy Terns and shorebirds have already been somewhat impacted by increased activity along this section of beach at Woodman Point. This environmental impact assessment has been completed to assess the further impacts to Fairy Terns and other shorebirds which utilise a 2.7km section of beach at Woodman Point under the following scenario:

- The 2.7km section of beach from Ammunition Jetty to the Carpark at the Woodman Point Headland will be zoned a 'dog off-leash' exercise area and will be closed to dogs during the Australian Fairy Tern (*Sternula nereis nereis*) nesting season which, for this purpose, is assumed to be the full extent of the months from October to March.

Consideration has also been given to impacts on public safety, operational activities/management and legal obligations under the above scenario.

The following risk matrix has been used to classify and rank the impacts. Definitions from Birdlife Australia risk assessments (Commonwealth of Australia, 2019; Weller & Lee, 2017) have been used or refined for the purpose of this risk assessment.

Table 3.1. Risk matrix

		Consequence		
		Minor	*Moderate*	*Major*
Likelihood	*Very Likely*	Medium	High	High
	Likely	Low	Medium	High
	Unlikely	Low	Low	Medium
Definitions	**Consequence:** *Minor* – Impacts will be short-term (0-6 months) and minor in scale on habitat; and abundance of Fairy Tern and other shorebirds remains the same or reduces temporarily. *Moderate* – Impacts will have a medium-term effect (lasting up to 18 months) on Fairy Terns and other shorebirds, with localised loss/degradation of habitat and some displacement of fauna or decrease in shorebird abundance. *Major* – Impacts will have a long-term effect (lasting 2 years or more) and widespread impact on habitat, and persistent decrease in Fairy Tern and other shorebird abundance. **Likelihood:** *Unlikely* – event/impact has a little to nil chance of occurring. *Likely* – event/impact has a relative chance of occurring. *Very Likely* – event/impact will occur. **Impact Rating:** *Low* – No or small impact to Fairy Terns and other shorebirds from the current baseline (e.g. habitat quality and/or area remains the same as the baseline, numbers of Fairy Terns and shorebirds using Woodman Point stays the same as the baseline). *Medium* – Moderate impact to the Fairy Terns and other shorebirds from the current baseline (e.g. numbers of Fairy Terns and shorebirds using Woodman Point decreases, habitat quality and/or area has changed but can still be utilised for foraging and roosting, local population is reduced). *High* – Significant impact to Fairy Terns and other shorebirds from the current baseline (e.g. Fairy Terns and shorebirds stop using Woodman Point, habitat is no longer conducive for foraging, roosting or breeding, loss of local populations).		

Table 3.2. Risk assessment

Site	Value	Impact	Likelihood	Consequence	Rating	Comments
Woodman Point Beach South of Ammo Jetty – off-leash dog exercise with beach closure from October to March	*Fairy Terns and beach-nesting shorebirds*					
	Foraging and roosting.	Degradation of suitable habitat.	Likely	Moderate	Medium	• Beach access during the winter months will lead to the degradation of habitat.
		Birds are deterred from foraging and roosting at Woodman Point.	Likely	Major	High	
	Breeding habitat and breeding attempts.	Degradation of suitable habitat.	Likely	Moderate	Medium	• People with dogs are likely to disregard signage and fencing. • Beach closure during the summer months may be confusing as this is when people are more likely to frequent the beach.
		Birds are deterred from nesting due to foot traffic along the beach or the presence of perceived threats (dogs, feral cats, people).	Likely	Major	High	
		Predation or destruction of nests, eggs or chicks (from feral cats, dogs and people).	Likely	Major	High	
		Disturbance from dogs and people (causing flight) during courtship and early nesting period deterring the breeding attempt.	Likely	Major	High	
		Disturbance from people and unleashed dogs (causing flight) and abandonment of eggs / chicks.	Likely	Major	High	
	Other shorebirds and migratory shorebirds					
	Foraging and roosting habitat.	Degradation of suitable habitat.	Likely	Moderate	Medium	• People with dogs are likely to disregard signage and fencing. • Beach closure during the summer months may be confusing as this is when people are more likely to frequent the beach.
		Disturbance from dogs and people (causing flight) of roosting and resting migratory birds.	Likely	Moderate	Medium	
		Birds are deterred from roosting due to foot traffic along the beach / groyne or the presence of perceived threats (dogs, feral cats, people).	Unlikely	Major	Medium	
	Community					
	Public safety.	Incompatible recreation activities along the beach (off-leash dogs, children at Woodman Point Recreation Camp, sailing club).	Very Likely	Major	High	• Community conflict. • Potential liability for the City of Cockburn.
		Dog attack.	Likely	Major	High	
		Limited accessibility in case of an emergency.	Likely	Major	High	
	Regulation.	Disregard for signs, fencing and other mechanisms	Very Likely	Moderate	High	• Isolation and access to the

Site	Value	Impact	Likelihood	Consequence	Rating	Comments
		to limit or restrict access				beach is limited and challenging to police
	Environment and Aesthetics					
	Environmental Approvals.	Non-compliance with EPBC Act.	Likely	Major	High	• Rezoning may trigger 'controlled action' under the EPBC Act requiring referral and formal assessment.
	Woodman Point Regional Management Plan.	Rezoning incompatible with the vision and strategy of the Plan.	Very Likely	Minor	Medium	• Misalignment.
	Aesthetics.	Increased litter including dog excrement and plastic bags.	Very Likely	Minor	Medium	• Community may not recognise the conservation value of the area.
		Increased use of the beach reduces the visual aesthetic and natural value to the community.	Likely	Minor	Low	

3.1 Discussion of impacts

3.1.1 Impacts on Fairy Terns and beach nesting shorebirds

3.1.1.1 Habitat Degradation

Loss of habitat, in particular breeding habitat is one of the greatest threats to Fairy Terns and beach-nesting shorebirds (Commonwealth of Australia, 2019). Shorelines and coastal areas are also one of the most favoured locations for development and recreation which puts added pressure on beach-nesting species as suitable habitat may be lost or become subject to greater disturbance and predation (Commonwealth of Australia, 2019).

This can lead to a situation where Fairy Terns and other beach nesting birds are prevented from breeding successfully leading to the further decline of populations (Dunlop, 2018). Fairy Terns are known to have utilised Woodman Point for breeding habitat in the past and breeding attempts have been recorded in the 90's and early 2000's (CCWA Pers Comm, 2020). Increased foot traffic and access to the section of beach south of Ammunition Jetty will further reduce the likelihood of Fairy Terns selecting the site for breeding in the future.

3.1.1.2 Disturbance to breeding colonies

In this context, disturbance refers to the behaviour and physiological response of an animal to an anthropogenic stimulus (such as dogs and people) (Glover, et al., 2011). Disturbance to breeding colonies of Fairy Terns, particularly during the courtship, pre-laying and early incubation stages has been found to lead to the abandonment of the nesting attempt (Dunlop, 2018). This forces pairs into further sub-optimal or hazardous nesting locations and a lower chance of breeding success later in the season (Dunlop, 2018).

Domestic dogs are known to chase adult shorebirds and beach nesting birds which can impact the birds' ability to rest, seek food and can also lead to prolonged absences from eggs and chicks (Maguire, 2018). Chasing and unpredictable movement, proximity and speed of unrestrained dogs are traits that do not lead to shorebirds adapting to the presence of dogs (Maguire, 2018). Rather, those attributes promote increased sensitisation, enhanced response frequencies and response intensities, meaning shorebirds are more likely to take flight more often (Maguire, 2018).

In addition, research has also shown that walkers accompanied by dogs often evoke greater flight responses from shorebirds than walkers alone (Maguire, 2018). This suggests that dogs are seen by shorebirds as much more of a threat than people, as dogs are more likely to catch and kill them or their chicks (Maguire, 2018). The highest frequencies of shorebird nest absences are often in response to people accompanied by unleashed dogs, and is more than double that of people approaching alone or with a leashed dog (Maguire, 2018).

3.1.1.3 Predation

Predation on eggs and chicks is a major impact affecting Fairy Terns and other beach nesting shorebirds (Maguire, 2008; Maguire, 2018). Dogs, cats and foxes have all been attributed to shorebird egg and chick predation (Maguire, 2008; Williams, et al., 2009; Greenwell, et al., 2019). The presence of a high number of predators can also impact the feeding of chicks causing prolonged nest absences compromising survival rates (Maguire, 2008).

In Mandurah, a single cat was responsible for the depredation of a colony of nesting Fairy Terns (~220 birds) over several nights resulting in the abandonment of the colony and breeding attempt (Greenwell, et al., 2019). This demonstrates the importance of safe breeding habitat for Fairy Terns and beach nesting shorebirds to ensure the persistence of populations.

3.1.1.4 Management considerations

In conservation situations where habitat suitability, disturbance and predation are concerns for Fairy Tern populations and other beach nesting shorebirds; management measures have been successfully implemented to protect beach nesting shorebirds and improve breeding success. This includes enhancing the attractiveness of potential breeding sites through the application of additional shell material, signage with temporary fencing to restrict access, predator control programs and education to increase public awareness (Commonwealth of Australia, 2019; Department of Environment and Climate Change, 2008; Dunlop, 2018; Maguire, 2008).

At Rous Head in Fremantle, a Fairy Tern breeding sanctuary has been established with an artificial beach constructed from dredge spoil and shell material (Fremantle Ports, 2020), see Figure 3.1. Due to the location of the sanctuary within the Fremantle Port, the area has been fenced and access by people and dogs can be successfully managed (Fremantle Ports, 2020). This has seen successful breeding by Fairy Terns over the last six years since its establishment in 2013 (Fremantle Ports, 2020).

Further to this, the establishment of temporary fencing and signage at the Point Walter spit in the 2018 breeding season saw 70 pairs of breeding Fairy Terns utilise the area (Corlette, 2020). In the 2019 breeding season the fencing was moved 50m closer inland, increasing the area available for Fairy Terns and decreasing disturbance which saw 130 breeding pairs use the site (Corlette, 2020).

Figure 3.1 Fairy Tern sanctuary at Rous Head, Fremantle Port (Dunlop, 2018)

3.1.2 Impacts on migratory shorebirds

Migratory shorebirds rely on undisturbed feeding and roosting sites to build body condition to make their long migratory flights (Weller & Lee, 2017). Safe foraging and roosting habitat within coastal areas is vital for migratory shorebirds to rest, feed and accumulate the energy resource required to successfully migrate back to breeding grounds in the northern hemisphere (Weller & Lee, 2017).

Disturbance to migratory shorebirds from dogs, people and other stimulus imposes a high energetic cost, potentially compromising the ability for the birds to build sufficient energy reserves for migration (DBCA, 2018). Continued disturbance at a site can render the habitat as unsuitable (DBCA, 2018).

Studies have found the presence of people at foraging and roosting sites can reduce the time migratory shorebirds spend consuming prey and reduce the number of migratory shorebirds using the area; both of which can compromise the ability for migratory shorebirds to complete a migration (DBCA, 2018; Martin, et al., 2014).

3.1.3 Misalignment with Woodman Point Regional Management Plan

Under the Woodman Point Regional Management Plan (2010), the beach south from Ammunition Jetty and the Woodman Point Headland, is gazetted as a no-dog area. The environmental impacts of dogs to coastal wildlife utilising beaches across Australia has been well documented (Maguire, 2008; Dunlop, 2018; Maguire, 2018; Schlacher, et al., 2015). Allowing dog access, both leashed and off-leash, is a misalignment with this Plan. It would also compromise the Vision and Strategy of the Park which focuses on conservation and preservation of environmental values (Conservation Commission, 2010).

3.1.4 Public safety

Concerns have been raised on previous occasions about the safety of children that utilise the Woodman Point Recreation Camp (Pers Comm C.Beaton, 2020). The camp conducts over 65,000 hours of structured physical activity programs primarily for children on school and community camps, on behalf of its owner agency, the Department of Local Government, Sport and Cultural Industries. The camp has operated since 1982, utilising the former Quarantine Station which operated in the area from 1852 until 1979.

The beach in this area is heavily utilised by children attending camps at Woodman Point, both during structured and unstructured recreational activities. The presence of off-leash dogs on the beach used by camp participants adds a new risk to the safe conduct of these activities, without suitable controls within the camp's authority to reduce such a risk (Pers Comm C.Beaton, 2020).

Other beach users may also be at risk from dog attack. The beach is isolated which may adversely impact the ability of emergency vehicles to access the site should a dog attack or other emergency occur. This could impose legal liability issues for the City of Cockburn.

3.1.5 Operational Activities and Management

It is currently proposed that the off-leash dog exercise beach will be closed to dogs during the Fairy Tern nesting season between October to March each year during the 24-month trial period. This would allow dogs to access the beach for five months over the winter and be closed over summer. Closing the beach to dogs during the Fairy Tern nesting season coincides with peak beach use over the summer months, a time when most dog owners would have an expectation that they can access the beach. This is likely to be unpopular with dog owners.

3.1.5.1 Communication

Signage and advertising could be used to inform dog owners; however, it would be assumed that owners caught with their dog off-leash during the summer months would likely suggest that they were not aware of the restrictions. Signage may not always be seen and not everyone will notice or take heed of advertising or social media. Research completed by the City of Cockburn has also shown that there is a low compliance with dog leashing regulations with many dog owners allowing their dogs to be off-leash even when in on-leash areas (City of Cockburn, 2020). This is likely to be more common in isolated areas such as the beach south of Ammunition Jetty. The isolation of this beach also makes it difficult for Rangers to regulate and monitor given the limited access points to the beach. To enforce the seasonal closure more resources would need to be directed to the area which may not be available to adequately implement these measures (Pers Comm C.Beaton, 2020).

3.1.5.2 Litter

Increased beach usage, particularly with off-leash dog access, has the potential to increase litter along the stretch of beach south of Ammunition Jetty. Most dog owners do the right thing and collect their dogs waste and dispose of it properly. Unfortunately, there are dog owners who either do not collect their dogs waste or collect it and leave the bag on the beach as they are not prepared to carry it to the nearest bin. Access to bins on this section of the beach would be limited and bins would only be stationed at the entry points to the beach as access is already restricted. This means that more than 2.7km of beach would have no rubbish bins in place and limited patrols from Rangers to enforce the litter laws (Pers Comm C.Beaton, 2020).

3.1.6 Controlled Action under the EPBC Act

Under the EPBC Act, an action which is likely to have, will have or has a significant impact on a 'Matter of National Environmental Significance' may result in a "Controlled Action" requiring approval by the Federal Minister of the Environment (DoEE, 2013). A matter of national environmental significance includes species which are listed as nationally threatened and migratory species (DoEE, 2013). Under the EPBC Act, shorebirds which have been recorded at Woodman Point and are listed as threatened species include:

- Great Knot (*Calidris tenuirostris,* critically endangered);
- Curlew Sandpiper (*Calidris ferruginea*, critically endangered);
- Red Knot (*Calidris canutus*, endangered);
- Lesser Sand Plover (*Charadrius mongolus*, endangered);
- Greater Sand Plover (*Charadrius leschenaultia*, vulnerable); and
- Fairy Tern (*Sternula nereis nereis*, vulnerable).

A variety of migratory shorebirds also utilise and have been previously recorded at Woodman Point and fall into the category of 'Matters of National Environmental Significance' under the EPBC Act (see Table 2.1).

Within the significant impact criteria of the EPBC Act, an action is likely to have a 'significant impact' on a vulnerable species (such as Fairy Terns) if there is a real chance it will:

- Lead to a long-term decrease in the size of an important population of a species;
- Reduce the area of occupancy of an important population;
- Fragment an existing important population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of an important population;
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
- Introduce disease that may cause the species to decline; or
- Interfere substantially with the recovery of the species. (DoEE, 2013).

The proposed action (to zone the 2.7km section of beach from Ammunition Jetty to the Carpark at the Woodman Point Headland a 'dog off-leash' exercise area that is closed to dogs during the Fairy Tern nesting season from October to March) has the potential to adversely impact on Fairy Terns and other listed shorebirds. Due to increased development and human activity across coastal areas in the Perth region, there are now few sites that provide suitable habitat for resident and migratory shorebirds (Birdlife Australia Pers Comm, 2020). There is significant potential that a 'dog off-leash' exercise zone could "modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that Fairy Terns, resident and

migratory shorebird species is likely to decline". This may trigger the need for referral to the Department of Agriculture, Water and the Environment for assessment under the EPBC Act.

Should the City of Cockburn decide not to refer the activity and choose to implement, there is the potential that:

- A member of the public could refer the activity resulting in an unplanned assessment process, prevent further action occurring until a decision is reached; or
- Civil or criminal penalties may apply for breaches of the EPBC Act including failure to refer an action. A member of the public can report the action if they believe it breaches the EPBC Act commencing an investigation.

4 Conclusions and recommendations

4.1 Conclusion

The risk assessment ranked potential impacts to Fairy Terns and other beach-nesting shorebirds as high. This primarily relates to habitat degradation, disturbance and predation which is likely to increase with use of the beach by people and dogs even if the beach is closed to dogs over the summer months. These impacts may trigger the need for referral to the Department of Agriculture, Water and the Environment for assessment under Part 9 of the EPBC Act.

Furthermore, the public safety impacts were ranked as high due to the isolation and incompatible recreational activities which occur along this stretch of beach.

In summary, allowing dog access to a 2.7km section of beach from Ammunition Jetty to the Carpark at the Woodman Point Headland with the exception of during the Fairy Tern (*Sternula nereis nereis*) nesting season between October to March, is unfeasible for the following reasons:

- Shorebird populations, including Fairy Terns, may be adversely impacted by:
    - Loss of breeding, roosting and foraging habitat;
    - Increased predation;
    - Increased disturbance rendering the site unsuitable;
- Fairy Tern nesting season and beach closure coincides with peak beach access periods over the summer months;
- Other shorebirds, including migratory species listed under the EPBC Act, also utilise this stretch of beach;
- There is significant potential that impacts will modify, destroy, remove or decrease the availability or quality of habitat for Fairy Terns, other shorebirds and migratory shorebirds and triggers the need to refer the action under the EPBC Act;
- Re-zoning is not in alignment with the Woodman Point Regional Park Management Plan;
- The area is isolated making it difficult to patrol and manage beach closures;
- Litter may become an issue along the beach and bins could only be installed and emptied at the entry point near the Ammunition Jetty;
- Closing the beach for the summer months could lead to confusion and be unpopular amongst dog owners; and
- The possibility of a dog attack would be increased if dogs were permitted off-leash increasing public safety issues and incompatible recreational activities with the Woodman Point Recreational Camp. Isolation is also a primary concern as access by emergency vehicles in the event of a severe dog attack or other emergency is limited.

4.2 Recommendation

Based on this assessment, it is recommended that the beach south of Ammunition Jetty to the Carpark at Woodman Point Headland be zoned as a 'no dog' area.

Having the beach designated as a 'no dog' area would provide a safe refuge for Fairy Terns, shorebirds and seabirds as well as give dog owners a clear understanding that the area is a 'no dog' area regardless of the season. In addition, it would minimise the need to allocate additional resources to police the area and to install and monitor rubbish bins as well as address public safety concerns around potential for dog attacks and the Woodman Point Recreational Camp. This recommendation is in line with the Woodman Point Regional Park Management Plan and the Vision and Strategy for Woodman Point documented within this Plan.

As outlined in Section 3.1.1.4, alternative management measures for further protection of Fairy Tern breeding habitat are available and have been successful when implemented at Rous Head and Point Walter.

The recommendation to make the 2.7km section of beach south of Ammunition Jetty a 'no-dog' area will assist with Fairy Tern conservation and protection of important breeding and foraging habitat for Fairy Terns and other resident and migratory shorebirds. It is likely to encourage Fairy Terns to return to the area for breeding.

Any further management measures to improve Fairy Tern breeding habitat at Woodman Point will also provide conservation benefits for other beach-nesting shorebirds including Red-Capped Plovers and Sooty Oystercatchers as well as migratory shorebirds.

5 References

Birdata, 2020. *Birddata Species List for Woodman Point,* s.l.: Birdlife Australia.

Birdlife Australia Pers Comm, 2020. *Personal Communication. Letter Re: Draft Animal Management and Exercise Plan 2020-2025.* Perth, WA: s.n.

CCWA Pers Comm, 2020. *Personal Communication. Letter Re Animal Management Plan,* s.l.: Conservation Council of WA.

City of Cockburn, 2020. *Draft Animal Management and Exercise Plan 2020-2025,* Perth, WA: City of Cockburn.

Commonwealth of Australia, 2019. *Draft National Recovery Plan for the Australian Fairy Tern (Sternula nereis nereis),* Canberra, ACT: Department of the Environment and Energy.

Conservation Commission, 2010. *Woodman Point Regional Park Management Plan,* Perth, WA: Conservation Commission of WA.

Corlette, A., 2020. *Perth Now.* [Online] Available at: https://www.perthnow.com.au/community-news/melville-gazette/bumper-fairy-tern-season-at-popular-perth-spot-as-the-birds-abandon-port-sanctuary-c-898000 [Accessed 20 August 2020].

DAWE, 2020. *EPBC Act Protected Matters Search Report for Woodman Point,* Canberra, ACT: Department of Agriculture, Water and the Environment.

DBCA, 2017. *Shorebirds and seabirds of the Pilbara coast and islands,* Perth, WA: Department of Biodiversity, Conservation and Attractions.

DBCA, 2018. *Wildlife Conservation Plan for Migratory Shorebirds, Commonwealth of Australia 2015. Adopted as an Interim Recovery Plan for the Threatened Migratory Shorebirds visiting Western Australia,* Perth, WA: Wildlife Management program No.65. Department of Biodiveristy, Conservation and Attractions.

Department of Environment and Climate Change, 2008. *Best practice Guidelines Managing threatened beach-nesting shorebirds,* Sydney, NSW: Department of Environment and Climate Change NSW.

DoEE, 2013. *Matters of National Environmental Significance: Significant Impact Guidelines 1.1 under the Environmental Protection and Biodiversity Conservation Act 1999,* s.l.: Commonwealth of Australia.

Dunlop, J. N., 2018. *Fairy Tern (Sternula nereis) Conservation in South Western Australia. Second Edition,* Perth, WA: Conservation Council of WA.

Fremantle Ports, 2020. *Fairy Terns.* [Online] Available at: https://www.fremantleports.com.au/environment/supporting-wildlife-research/fairy-terns [Accessed 20 August 2020].

Gibson, N. et al., 1994. *A floristic survey of the southern Swan Coastal Plain,* Perth, WA: Department of Conservation and Land Management and Conservation Council of WA.

Glover, H. et al., 2011. Towards ecologically meaningful and socially acceptable buffers: Respones distances of shorebirds in Victoria, Australia to human disturbance. *Landscape and Urban Planning,* 103(3-4), pp. 326-334.

Greenwell, C. N., Calver, M. C. & Loneragan, N. R., 2019. Cat gets its Tern: A case study of predation on a threatened coastal seabird. *Animals,* 9(445).

Maguire, G., 2008. *A practical guide for managing beach-nesting birds in Australia,* Melbourne, Vic: Birds Australia.

Maguire, G., 2018. *A Review of Dog Impacts to Beach-nesting Birds and Management Solutions,* s.l.: Birdlife Australia.

Martin, B. et al., 2014. Effects of human presence on the long-term trends of migrant and resident shorebirds: evidence of local populations declines. *Animal Conservation,* Volume 18, pp. 73-81.

NatureMap, 2020. *NatureMap Species Report - Woodman Point,* Perth, WA: Department of Biodiversity, Conservation and Attractions.

Pers Comm C. Greenwell, 2020. *Personal Communication. Letter Re Draft Animal and Exercise Management Plan 2020-2025,* s.l.: Claire Greenwell PhD Candidate.

Pers Comm C.Beaton, 2020. *Personal Communication via email 14th August 2020,* s.l.: s.n.

Perth Birds and Bush, 2020. *Shorebirds, Gulls and Terns.* [Online] Available at: https://perthbirdsandbush.com.au/portfolio/shorebirds-gulls-and-terns/ [Accessed 20 August 2020].

Schlacher, T. et al., 2015. Conservation gone to the dogs: when canids rule the beach in small coastal reserves. *Biodiversity Conservation,* Volume 24, pp. 493-509.

Urban Bushland Council, 2020. *Woodman Point Regional Park.* [Online] Available at: https://www.bushlandperth.org.au/treasures/woodman-point-regional-park/ [Accessed 18 August 2020].

Wathern, P., 2013. *Environmental Impact Assessment: Theory and Practice.* 4 ed. London, UK: Taylor & Francis Group.

Weller, D. R. & Lee, C. C., 2017. *Migratory Shorebird Conservation Action Plan,* s.l.: Birdlife Australia unpublished report.

Williams, K., Weston, M., Henry, S. & Maguire, G., 2009. Birds and Beaches, Dogs and Leashes: Dog owners' sense of obligation to leash dogs on beaches in Victoria, Australia. *Human Dimensions of Wildlife,* 14(2), pp. 89-101.

Appendix A – Baseline Data

A1 – NatureMap Report

A2 – Protected Matters Search Tool Report

A3 – Birdata Species List

Appendix B – Stakeholder Feedback Letters Re: Draft Animal Management and Exercise Plan

B1 – Birdlife Australia

B2 – Conservation Council of WA

B3 – Claire Greenwell

Appendix C – Figures