Version 2

Shorebird Monitoring Plan: Lee Point, Darwin, Northern Territory

Prepared for

Defence Housing Australia

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Ecology and Heritage Partners Pty Ltd

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Document Control

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Version 1	Report sent to the client for review	JM	AO	06/11/2023
Version 2	Minor revision to Section 2	JM	AO	04/12/2023

Ecology and Heritage Partners acknowledge the Traditional Owners of the country we live and work on, and we pay our respect to Elders past, present and emerging.

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Document History

This monitoring program was prepared in 2017 by Dr Amanda Lilleyman (CDU) as Chapter 4 in a Report on potential impacts from disturbance to migratory shorebirds in Darwin: Defence Housing Australia, Lee Point Master-planned Urban Development which was an appendix of the EIS for the project.

For submission with a development application, a few minor changes were made to contemporise this version of the program. These included reference to the NT EPA's recommendations and inclusion of specific timeframes, with the resulting document being *Shorebird Monitoring Program: Lee Point Master-planned Urban Development* prepared by EcOz Pty Ltd in September 2022. A minor update was made in August 2023, specifying that the plan had been 'reviewed by' Brydie Hill from the Flora and Fauna Division, of the Department of the Environment, Parks and Water Security, and Dean McAdam from the Parks and Wildlife Division, rather than 'developed in consultation with' (EcOz 2023).

Following this approval (and subject to other obligations under the development permit conditions and other approvals) the shorebird monitoring program was implemented and construction works were commenced early July 2023. Over-wintering shorebird monitoring was undertaken at the five nominated locations by three zoologists on 27 and 28 July 2023 (Ecology and Heritage Partners 2023) in accordance with the approved shorebird monitoring program (EcOz 2023).

This document is largely consistent with the previously approved *Shorebird Monitoring Program: Lee Point Master-planned Urban Development* (EcOz 2023), with a minor change to the minimum tide height, being reduced from 6.5 metres to six metres due to the limited number of tides exceeding 6.5 metres during daylight hours, with additional information on project approvals also included in the introduction.

1 Introduction

Through the environmental approvals' process, it was identified that the Lee Point Master-planned Urban Development project being undertaken by Defence Housing Australia (DHA) has the potential to impact migratory shorebirds through increased anthropogenic disturbance (due to a significant increase in the number of beach users) to the important roosting and feeding site Sandy Creek and Lee Point-Buffalo Creek, on the northern beaches of Darwin, Northern Territory.

There are no shorebird monitoring requirements under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval for the project (EPBC 2015/7591), only that the Construction Environmental Management Plan (CEMP) includes measures to avoid, mitigate and manage impacts to migratory shorebirds (Condition 2Ab of EPBC 2015/7591).

In its assessment report for this project, the Northern Territory Environment Protection Agency (NT EPA) provided the following recommendation:

> *Recommendation 3*
>
> *That approvals for the proposal should include a condition that requires DHA to develop and implement a monitoring program to quantify impacts from the Proposal on local shorebirds. The program is to be designed in consultation with Flora and Fauna Division, Department of Environment Natural Resources, and Wildlife and Heritage Division, Department of Tourism and Culture Parks, and implemented before commencement of construction activities. Results and annual updates from the program should be made publicly available on the internet. (NT EPA 2018)*

This recommendation was recognised within Development permit DP18/0409:

> *Conditions Precedent 2*
>
> *Prior to the endorsement of plans and prior to the commencement of works (including site preparation), the proponent is to develop and commence implementation of a monitoring program to quantify impacts on shorebirds. The program is to be developed on the advice of the Flora and Fauna division, Department of Environment and Natural Resources, Wildlife and Heritage division, Department of Tourism and Culture, to the satisfaction of the consent authority.*
>
> *General Condition 17*
>
> *The monitoring program to quantify impacts on shorebirds is to be implemented on the advice of the Flora and Fauna division, Department of Environment and Natural Resources, Wildlife and Heritage division, Department of Tourism and Culture, to the satisfaction of the consent authority. The results and annual updates from the program must be made publically available.*

The EIS included a comprehensive report by Dr Amanda Lilleyman (Charles Darwin University) entitled *Report on potential impacts from disturbance to migratory shorebirds in Darwin: Defence Housing Australia, Lee Point Master-planned Urban Development* (Appendix N of the EIS). Chapter 4 of that report contained a monitoring program. That program was duplicated within being *Shorebird Monitoring Program: Lee Point Master-planned Urban Development* prepared by EcOz Pty Ltd in September 2022, and updated in August 2023 (EcOz 2023), with a few minor changes made to contemporise this version of the report. These included reference to the NT EPA's recommendations and inclusion of specific timeframes. This monitoring program was reviewed by

Brydie Hill from the Flora and Fauna Division, of the Department of the Environment, Parks and Water Security, and Dean McAdam from the Parks and Wildlife Division. Their assessment of this program is that the methodology proposed has been determined adequate for detecting impacts to shorebirds from this development. This document is largely consistent with the previously approved *Shorebird Monitoring Program: Lee Point Master-planned Urban Development* (EcOz 2023), with a minor change to the minimum tide height, being reduced from 6.5 metres to six metres due to the limited number of tides exceeding 6.5 metres during daylight hours.

2 Monitoring Program

This monitoring program has been developed to detect any significant changes in shorebird usage of Sandy Creek that are attributable to the impacts of the development and not external or regional factors. Therefore, the program intensively surveys two sites (Sandy Creek and Lee Point) that are expected to be exposed to higher rates of anthropogenic disturbance as a result of the DHA housing development. Three additional sites are surveyed (Nightcliff Rocks, East Point and Spot on Marine) so that the wider Darwin region shorebird population is adequately surveyed.

It is important that any variation in species and abundances are detected over the migration months. Therefore, all months during the austral summer season when shorebirds are expected to occur in Darwin are included in the monitoring program. The population of shorebirds in Darwin varies over the summer months and it is important to monitor those months – which include the southern migration period, the core nonbreeding period and the northern migration period.

Monitoring data from this period will be compared against BirdLife Australia's Shorebirds 2020 data and the data presented in the EIS (Appendix N) to detect any local changes to shorebirds at the monitoring sites.

The uptake of houses in the DHA development area will be staggered and so the increased use of the Casuarina Coastal Reserve, Sandy Creek and Lee Point beaches will take some time. Consequently, and consistent with the development permit conditions, monitoring is tied to development works within the western (i.e. coastal) side of the development, being development works within lot 4873 Town of Nightcliff. If construction works are paused for a continuous period in excess of six months at any time prior to residential occupation of housing in lot 4873 (aside from standard wet-season weather restrictions) monitoring shall be similarly paused.

A monitoring period of five years should be sufficient to detect local changes to the shorebird population due to the DHA housing development. However, additional monitoring over several years (e.g. another five years) may be required if it is determined (by a suitably qualified ecologist in consultation with the regulator) that after five years additional shorebird population data is required to document any impacts to shorebirds associated with the development. Accordingly, monitoring will continue:

- For a period of at least 5 years after all approved lots within lot 4873 are titled; and
- For a further 5 years if determined by a suitably qualified ecologist in consultation with the regulator.

The survey methodology outlined in Section 2.1 exceeds EPBC Act survey requirements for detecting migratory shorebirds as outlined in the EPBC Act Policy Statement 3.21 – see Table 1 for survey guidelines (Commonwealth of Australia 2015; DEWHA 2009). The outcomes of the monitoring program will be reviewed

and evaluated using the steps outlined in Figure 1. Resources for the monitoring program are listed in Appendix A.

The aim of the monitoring program is to quantify the magnitude of impact of disturbances to migratory shorebirds associated with the proposal (Commonwealth of Australia 2015). A significant impact on the regional population of migratory shorebirds would be:

1) A decrease in the size of the population that visits the northern beaches of Darwin each year that cannot be reasonably attributed to other factors or broader population trends and;
2) An increase in the number of disturbances (> 10 per survey session) that these shorebirds are exposed to at the monitoring sites.

Table 1. Survey guidelines for migratory shorebirds set out in the EPBC Act Policy Statement 3.21 (Commonwealth of Australia 2015)

Coverage	Timing	Effort	Minimum data requirements
All of the habitat thought to be used by the same population of shorebirds. The entire area of contiguous habitat where shorebirds may occur.	The months when the majority of migratory shorebirds are present in the area. Numbers of shorebirds may vary during these months, particularly in the north of the country, due to presence of additional shorebirds during inbound and outbound migration at the beginning and end of the non-breeding season. Local knowledge should be sought to determine optimum survey times. The northern hemisphere breeding season (mid – April to mid – August) to obtain data on nonbreeding nonmigrating populations of immature migratory shorebirds.	Four surveys for roosting shorebirds during the period when the majority of shorebirds are present in the area. Replicate surveys over this period are important to measure population variability. Some areas will meet the importance criteria only during the migration periods when many birds are temporarily stopping over. In most cases, one survey in December, two surveys in January and one survey in February will be adequate.	Shorebird statistics relating to roosting areas: total abundance (total number of birds present across all species); species richness (number of species observed); species abundance (number of birds of each species present). Shorebird behaviour: activity (roosting, foraging); foraging location (spatial data of the area used by shorebirds for feeding to enable mapping of foraging habitat). Survey conditions: date, time of day; tide height; weather conditions (temperature, precipitation, wind speed & direction). Number of observers and experience level. Method used to conduct the survey. The following habitat characteristics may also be useful: dominant landform type; hydrology; dominant terrestrial and aquatic vegetation types; intertidal substrate characteristics; invasive species; current disturbance regime; presence of suitable nocturnal roosting areas.
	Surveys for roosting shorebirds should be conducted as close to the time of high tide as practicable and at a maximum of no more than two hours either side of high tide (unless local knowledge indicates a more suitable time).	One survey during the northern hemisphere breeding season to capture data on birds that remain in Australia during the breeding season.	

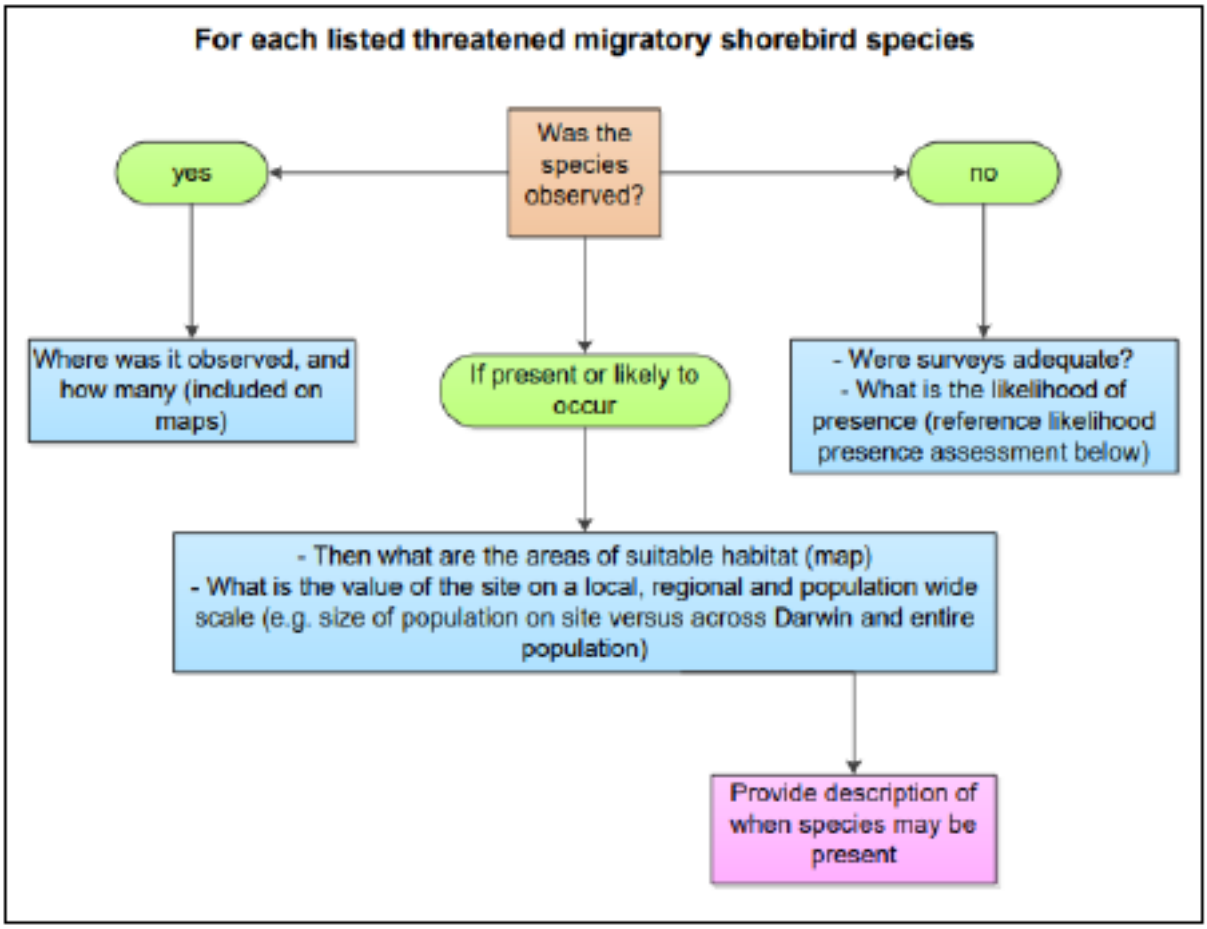

Figure 1. Flow chart for evaluating monitoring survey program for migratory shorebirds

2.1 Methods

The shorebird monitoring program should consist of one survey per month from September through to April each austral summer season at the following sites: Sandy Creek and Lee Point [performed simultaneously – e.g. two personnel]; East Point; Nightcliff Rocks; and Spot on Marine (Table 2; see Appendix 2 for suggested resources). Migratory shorebirds begin arriving in Darwin from August and depart as late as May the following year. An additional survey in July each year should be performed at all monitoring sites to capture information on shorebirds that remain at the survey sites during the northern hemisphere breeding season. Surveys will be undertaken at high tides of greater than six-metres during the spring tide cycle and during daylight hours, where possible (i.e. at a time when there is a high visibility to shorebirds at each survey location and where an accurate assessment of species and the number of birds can be obtained). Surveys will be conducted within two hours either side of the peak of the high tide. The semi-diurnal tides mean that two high tides occur per day, usually with one in the morning (sunrise) and one in the evening (sunset). Surveys should be conducted for a minimum duration of two hours. All shorebirds and all other waterbirds should be identified and counted. Shorebird activity should be recorded (foraging, roosting). The start and end time of the survey should be recorded. Any changes to the environment should be recorded. Surveys can be performed by one person (the observer) per site. The observer should be competent in shorebird identification and counting techniques. The observer should perform the survey from a distance of 100 m or more so as not to cause a disturbance. The observer should use binoculars and a zoom spotting scope of 20 – 60 x magnification. Survey areas for Lee

Point and Sandy Creek are outlined in Appendix 1.1 and the other three sites are shown in Appendix 1.2. All disturbances and potential disturbances to shorebirds and other birds should be recorded. If the disturbance stimulus is close enough to the flock of birds it should be recorded as a disturbance and the response (flight, walking away, no response) of the birds should be recorded. If the disturbance stimulus is not close enough to cause a disturbance, then it should be recorded as a potential disturbance (i.e. this is the no response category and is simply a measure of the number of people using the beach and additionally helps in creating appropriate buffer zones through recording the distance of the stimulus to the birds). The time of the disturbance should be recorded along with the details (e.g. human [walking, running, cycling etc.], human with dog [leashed or unleashed], vehicle on the beach, kite surfer, aircraft, bird of prey) and the number of each disturbance stimuli. The observer should also record where the disturbance stimulus entered the beach from (if possible) and the exit point (which access path).

Table 2. Survey timing, guidelines and effort for the migratory shorebird monitoring program.

Month	Guidelines	Effort
September October November December January February March April	Perform shorebird surveys simultaneously at Sandy Creek and Lee Point. Perform surveys at Nightcliff Rocks, East Point and Spot on Marine during the same spring tide cycle as Lee Point and Sandy Creek. Count all shorebirds (species and abundance) and all other birds in the survey area. Record all disturbances and potential disturbances to shorebirds and other birds. Record any physical changes to the environment.	One high tide survey at each of the five sites for 2 hours, each month = 10 hours per month = 80 survey hours per austral summer season
July		One high tide survey at five sites for 2 hours for the month of July = 10 hours
	Total survey hours per season	90 hours

2.2 Triggers and responses to trigger exceedances

Monthly survey monitoring data should be reviewed to detect any significant changes in the shorebird subpopulation for both Sandy Creek and Lee Point (following the steps outlined in Figure 2). DHA should review monitoring data for the five monitoring sites and calculate the combined population of shorebirds for the northern beaches region. If shorebirds are detected at all sites but not at Sandy Creek then this will cause a trigger to check the total abundance data. If the total abundance of shorebirds for Lee Point or Sandy Creek is >4,000 individuals (from October to November) then that trigger is terminated. If it is <4,000 individuals across all five sites then this will cause a trigger and DHA should investigate if the population changes are attributable to a site-specific event at Sandy Creek or other environmental changes in the Darwin region (or due to other factors). During the austral summer season surveys the monitoring guidelines need to be followed as closely as practicable as shorebirds are likely to be less concentrated (i.e. potentially dispersed across beaches / coastal areas) at tides lower than six metres, therefore potentially reducing the accuracy of species identification and population counts by observers.

If any triggers are exceeded, then DHA will need to investigate if conditions at the local sites are attributable to the changes in the shorebird population. After examination of the abundance data, DHA should examine the disturbance data to determine the rate of anthropogenic disturbance compared to the background rate of natural disturbance by birds of prey and compare this against baseline disturbance data reported in Lilleyman *et al.* (2016). For example, if the number of disturbances exceeds 10 alarm flights per survey session, then DHA should seek an increase in the number of patrols by Parks and Wildlife rangers and City of Darwin council rangers to ensure that visitors to the beach roost sites are abiding by dog zoning regulations and are not disturbing shorebirds despite educational signs and barrier fencing.

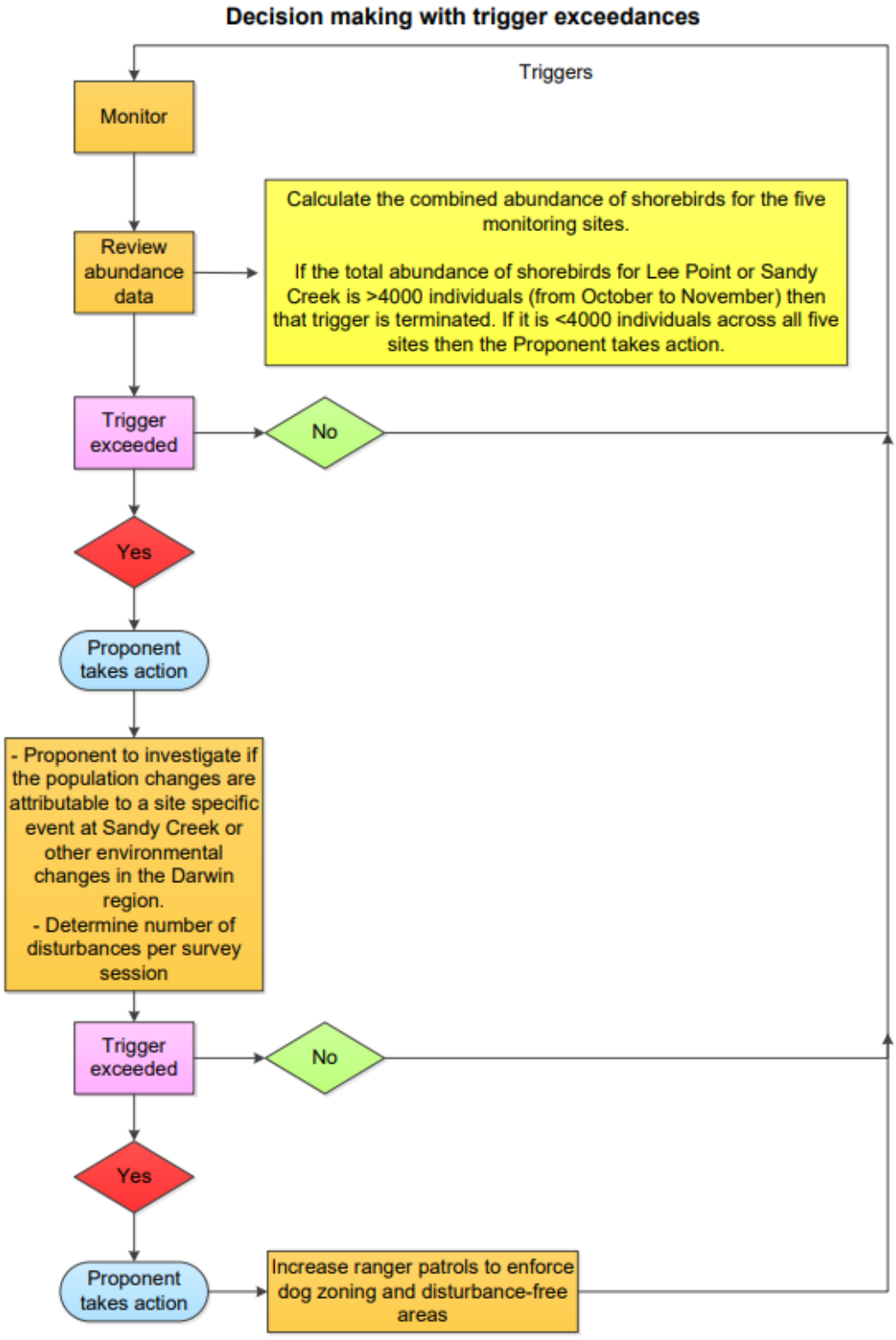

Figure 2. Flowchart to detect significant changes in the migratory shorebird population at Sandy Creek

References

Commonwealth of Australia 2015. *EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*. Commonwealth of Australia, Canberra.

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Lilleyman, A. 2017. *Report on potential impacts from disturbance to migratory shorebirds in Darwin: Defence Housing Australia – Lee Point Master-planned Urban Development*. Report prepared for EcOz Environmental Consultants, Darwin.

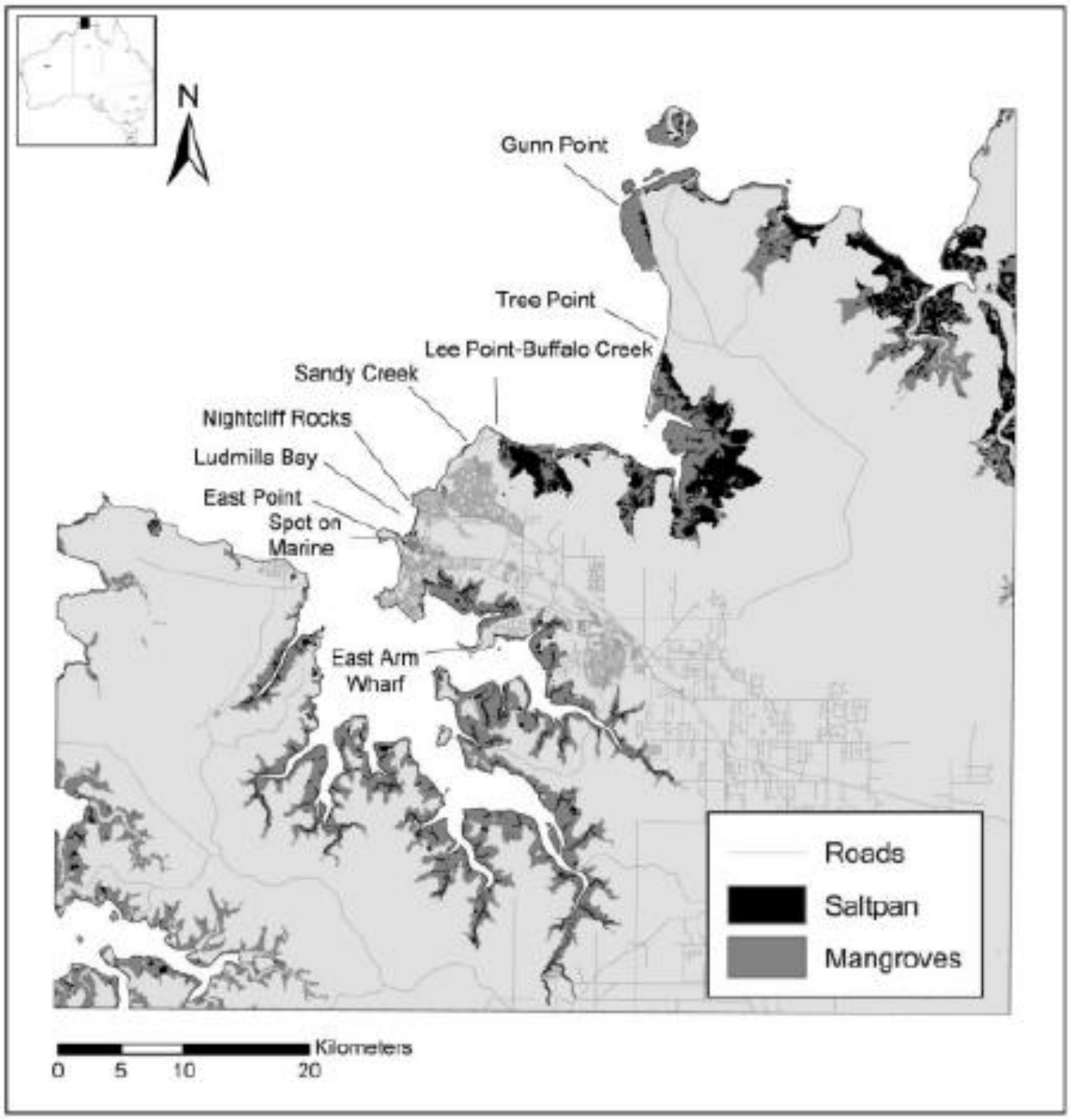
Lilleyman, A., Franklin, D.C., Szabo, J.K., and Lawes, M.J. 2016. Behavioural responses of migratory shorebirds to disturbance at a high-tide roost. *Emu*, 116 (2), pp. 111-118.

NT EPA 2018. Assessment report 88 – Lee Point master-planned urban development, Defence Housing Australia. Northern Territory Environmental Protection Authority, Darwin.

Appendix 1 – Survey Locations

Appendix 1.1 – Lee Point and Sandy Creek survey locations (EcOz 2023)

Appendix 1.2 – Nightcliff Rocks, Spot-on-Marine and East Point survey locations (EcoOz 2023)



Appendix 2 – Resources for Migratory Shorebird Monitoring Program

Shorebird identification sheets: http://birdlife.org.au/documents/SB-IDsheetsALL.pdf

Shorebirds 2020 field datasheet: http://birdlife.org.au/documents/SB-countform.pdf

Appendix 2.1 – Suggested field datasheet (with example data) to record migratory shorebirds observed during the monitoring program

Site:		Sandy Creek	High-tide time:		11.15am	Notes:		
			Tide height:		6.3m			
Time	**Date**	**Species**	**Number of Individuals**	**Direction from Surveyor**	**Distance from Observer**	**Direction of Bird Movement**	**Vertical Height**	**Behaviour**
10:15	27/07/2023	Eastern Curlew*	13	NE	100	E	0	Roosting

Note: * = migratory shorebird species

Appendix 2.2 – Disturbance observations (with example)

Date	Time of disturbance	Site Location	Duration of disturbance (min)	Disturbance Type	Shorebird Response	Shorebird Species	Number Affected	Did the affected birds leave the site?	Entry and Exit Points	Notes
27.7.23	11:48	Lee Point	15	10 humans (birding group)	Flew West	Great Knot	400+	No	Buffalo Creek Rd, accessed from car park.	Flew 100m to the West (joined other roosting flock)