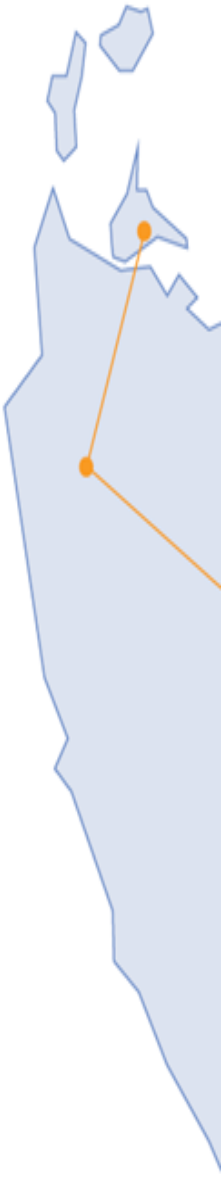
UPC AC Renewables AUSTRALIA

Jim's Plain & Robbins Island
Renewable Energy Parks



Robbins Island Renewable Energy Park

Appendix N

Preliminary Shorebird Monitoring and Management Plan

UPC Robbins Island Pty Ltd

UPC Robbins Island Pty Ltd

Robbins Island Renewable Energy Park (Approvals)

Preliminary Shorebird Monitoring and Management Plan

October 2021

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1. Introduction

1.1 Background

This **Preliminary Shorebird Monitoring and Management** Plan (PSMMP) has been developed for the Robbins Island Renewable Energy Park (the Project).

Adjacent to the Project Site, the Robbins Passage – Boullanger Bay area is an intertidal area covering over 100 km^2. This area is recognised as a significant foraging site for migratory birds, both nationally and internationally, with 17 migratory shorebird species regularly recorded during migratory surveys over the last 10 years (Table 1). There are seven resident shorebirds that have been recorded in the coastal areas of Robbins Island (Table 2) one which is listed as vulnerable under the EPBC Act. Two tern species are also recorded in the area, one listed as vulnerable under the EPBC Act and TSP Act, and one listed as endangered under the TSP Act.

Table 1 Migratory shorebird species recorded around Robbins Passage and Boullanger Bay (2011-2020)

Common Name	Scientific Name	Status	
		EPBC Act	TSP Act
Bar-tailed Godwit	*Limosa lapponica baueri*	V, M	-
Common Greenshank	*Tringa nebularia*	M	-
Curlew Sandpiper	*Calidris ferruginea*	CE, M	-
Double-banded Plover	*Charadrius bicinctus*	M	-
Eastern Curlew	*Numenius madagascariensis*	CE, M	E
Great Knot	*Calidris tenuirostris*	CE, M	-
Grey Plover	*Pluvialis squatarola*	M	-
Grey-tailed Tattler	*Tringa brevipes*	M	-
Latham's Snipe	*Gallinago hardwickii*	M	-
Lesser Sand Plover	*Charadrius mongolus*	E, M	-
Pacific Golden Plover	*Pluvialis fulva*	M	-
Red Knot	*Calidris canutus*	E, M	-
Red-necked Stint	*Calidris ruficollis*	M	-
Ruddy Turnstone	*Arenaria interpres*	M	-
Sanderling	*Calidris alba*	M	-
Sharp-tailed Sandpiper	*Calidris acuminata*	M	-
Whimbrel	*Numenius phaeopus*	M	-

Notes: 'CE' = Critically Endangered, 'E' = Endangered, 'V' = Vulnerable, 'M' = Migratory, '-' = Not listed, 'TSP Act' = Tasmanian Threatened Species Protection Act 1995.

Table 2 Resident shorebird species

Common Name	Scientific Name	Status	
		EPBC Act	TSP Act
Australian Pied Oystercatcher	*Haematopus longirostris*	-	-
Banded Lapwing	*Vanellus tricolor*	-	-
Black-fronted Dotterel	*Elseyornis melanops*	-	-
Eastern Hooded Plover	*Thinornis cucullatus cucullatus*	V	-
Masked Lapwing	*Vanellus miles*	-	-

Common Name	Scientific Name	Status	
		EPBC Act	TSP Act
Red-capped Plover	*Charadrius ruficapillus*	-	-
Sooty Oystercatcher	*Haematopus fuliginosus*	-	-

Notes: 'V' – Vulnerable, '-' = Not listed.

Further to the above species, the Australian Fairy Tern (*Sternula nereis nereis*) listed as vulnerable under the TSP Act and EPBC Act, and Little Tern (*Sternula albifrons sinensis*), listed as endangered under the TSP Act, are also included within this Management Plan. Whilst these species are not shorebirds, impacts and management measures relevant to shorebirds are also applicable, and as such the measures described in this Preliminary SMMP will be applied to the two species.

There has been a strong focus on migratory and threatened shorebird species during the avifauna and radio-tracking surveys undertaken for the Project. Details on bird surveys undertaken and analysis of the potential impact of the development on shorebirds is provided in the Robbins Island Renewable Energy Park Development Proposal and Environmental Management Plan (DPEMP). The site layout plan and the key shorebird habitat areas are presented in Figure 1 and Figure 2.

The shorebird collision risk with turbines is considered low, as evidence indicates that shorebird occurrence and movement is along coastal areas rather than over Robbins Island. To reduce this risk further, the Project design has incorporated turbine exclusion zones as outlined below:

- 500 m buffer inland from the Robbins Island coastline.
- the north-western portion of Robbins Island which forms the western boundary of Mosquito Inlet, has been excluded from the development area.

While the Project almost entirely avoids shorebird habitat, there is low potential for indirect impacts, including changes to coastal sedimentation, introduction of weeds and changes in water quality (associated with run-off). These will be managed via the Construction Environmental Management Plan and the Project's Operational Environmental Management Plan.

1.2 PSMMP Objectives

The objectives of this PSMMP are to:

1. Provide details of the targeted shorebird surveys and shorebird habitat monitoring that will be undertaken on Robbins Island.
2. Detail mitigation measures to reduce risk to shorebirds during construction and operations.
3. Detail collision mitigation and response measures.
4. Outline how mitigation measures will be monitored and improved overtime using adaptive management principles.

This plan adopts an adaptive management approach. Management measures set out in this PSMMP may be amended to ensure effective mitigation is implemented in response to the findings of monitoring, new information and/or the latest best practices.

It is intended that this **Preliminary SMMP** provides sufficient information to facilitate Project approvals.

It is anticipated that a **Final Shorebird Monitoring and Management Plan** will be developed prior to construction commencing. The **Final SMMP** will be submitted to the Tasmanian

Environment Protection Authority (EPA) and the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for approval.

1.3 Project Staging

The Project may be constructed in two stages, depending on external factors such as transmission infrastructure developments including the proposed Marinus Link, or an increase in electricity demand in Tasmania due to the establishment of new hydrogen production facilities.

Should staging occur, the conceptual model is to construct 68 wind turbines in Stage 1 and 54 wind turbines in Stage 2. This will be confirmed as a part of the detailed design process and presented in the **Wind Farm Design Report**. At that time, the need for an updated **Shorebird Monitoring and Management Plan** will be discussed and agreed with the Tasmanian Environmental Protection Authority and the Commonwealth Department of Agriculture, Water and the Environment. If a new Plan is required, it will be submitted to both Regulators for approval prior to the second stage of construction commencing.

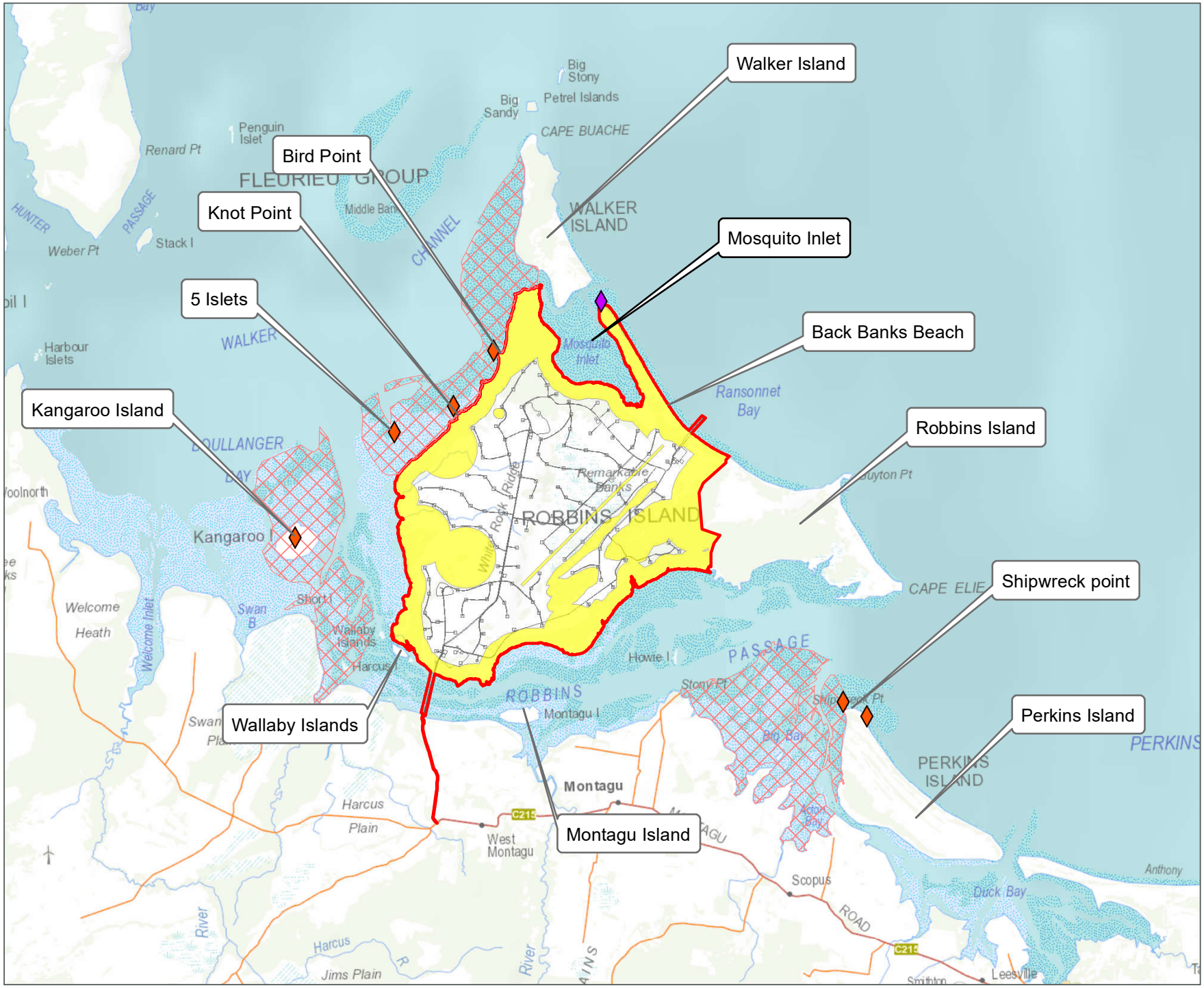

Figure 1: Shorebird roosting and foraging at Robbins Island

Project: Robbins Island Windfarm
Client: GHD Pty Ltd
Date: 11/06/2021

- Proposed wind farm site
- High tide shorebird roost
- Likely nocturnal high tide roost
- Main low tide shorebird foraging areas

N

Metres
0 2,200

Nature Advisory
PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
03 9815 2111 - info@natureadvisory.com.au

1:80,000 @ A3

0 0.5 1 1.5 2

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

The Project Site
Operational footprint
WTG exclusion zone
Wharf access
Wharf
Bridge alignment
Watercourse

Avifauna values

- Little Tern *(Sterna albifrons* subsp. sinensis) - Nesting territories
- Fairy Tern *(Sternula nereis)* - Nesting territories
- Pied Oystercatcher *(Haematopus longirostris)* - Nesting territories
- Red-capped Plover *(Charadrius ruficapillus)* - Nesting territories
- Sooty Oystercatcher *(Haematopus fuliginosus)* - Nesting territories
- Short-tailed Shearwater *(Puffin tenuirostris)* - Colony

UPC Robbins Island Pty Ltd
Robbins Island Renewable Energy Park

SMMP
Avifauna Values - Key Shorebird Breeding Areas

Job Number 32-1855801
Revision A
Date 06 Jul 2021

Figure 2

G:\32\1855801\GIS\Maps\Deliverables\SMMP\32_1855801_03-02_AviFauna_ShoreBirds_RevB.mxd

Data source: UPC Renewables - Boundary. GHD - Bridge, wharf, env. constraints. North Barker Environmental Systems (NBES) - Threatened fauna and habitat. Natural Values Atlas (NVA) - Threatened avifauna. The List - Roads, veg communities. Created by:tdcoates

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2. Shorebird Monitoring

Shorebird monitoring has been instrumental in the impact assessment process, with the data from bird utilisation surveys, a radio-telemetry study, and Birdlife Tasmania counts[1] supplementing knowledge on migration, roosting and foraging patterns of the migratory and resident shorebirds of Robbins Island. This research has informed the design decision to provide a development exclusion zone near key roosting and foraging areas.

In the impact assessment process, there was some uncertainty on the flight path of shorebirds in the northern portion of Robbins Island, involving a potential flight from Robbins Island to Walker Island or shorebirds taking a “short cut” of approximately 2.5 km by flying directly over the northernmost end of White Rock Ridge. As a result, turbines in this area were excluded to reduce shorebird collision risk with turbines.

Observational studies by Nature Advisory and its team over several years during the day and at night under full moon visibility indicated that shorebirds using roosts on the west coast of Robbins Island did not fly eastwards over Robbins Island at night. Shorebirds were observed to consistently disperse in low flights over mud and water as the tide receded, returning in the same flight pathway as the tide rose.

Ongoing monitoring will continue to build a localised knowledge of shorebirds and their use of Robbins Island. Monitoring will also test the adequacy of the mitigation measures adopted and will inform the adaptive management approach.

The objectives of the monitoring program are to*:*

1. Monitor changes to shorebird populations and their habitat on Robbins Island
2. Continue to build detailed knowledge of shorebird use of Robbins Island, including behaviours and risks, and linkages to season, weather, and tidal events
3. Provide data to inform further management and mitigation measures should unanticipated impacts be detected.

2.1 Migratory Shorebird Monitoring

Ongoing population monitoring will be undertaken to provide details of the use of Robbins Island by migratory shorebirds.

Data from bi-annual shorebird counts undertaken by BirdLife Tasmania provide a sound dataset for migratory bird populations over time, including threatened migratory birds. In order to strengthen this site-specific knowledge, additional surveys will be undertaken in the initial development years, with a total of four surveys per annum. The surveys will focus on the roost sites with the counts conducted over the summer to provide data on population numbers and utilisation of the roost sites during the migratory season. The suggested timing for surveys is each December, January, February (the Birdlife Tasmania count) and a final survey each March.

[1] Bird utilisation surveys were undertaken in Summer 2002, Autumn 2003, Winter 2003, Spring 2003, Summer 2009 and Summer 2017. This data was built on through a radio-telemetry study in Dec 2010-January 2011 and supplemented with *BirdLife Tasmania* shorebird counts from 2004 –2018.

The surveys will be primarily conducted as high tide surveys of roosting habitat by appropriately experienced observers. Roosting shorebirds will be counted from a distance using a telescope and/or binoculars to minimise disturbance.

Each survey will cover the six roost sites as shown in Figure 1 with the data aggregated from the UPC surveys and BirdLife Tasmania counts.

The surveys will commence in the first year of Project construction and continue for the first three years of Project operation.

A **Migratory Shorebird Survey Report** will be prepared after the last survey for the reporting year, with the report provided to the Tasmanian EPA and DAWE as an annex to the Annual Environmental Report. The migratory shorebird surveys will continue until the third year of the Project's operation where the requirement for future surveys will be assessed in conjunction with the Tasmanian EPA and DAWE.

2.2 Resident Shorebird Monitoring

Monitoring of resident shorebirds will focus on the species listed as vulnerable under the EPBC Act, the Eastern Hooded Plover and Australian Fairy Tern, both which occur on Back Banks Beach. During surveys, the abundance and distribution of resident shorebirds relative to project infrastructure and the location of nests will be mapped. Whilst all shorebird sightings will be recorded, the focus of the transects will be the two listed species. The monitoring will be undertaken as a linear transect walked along the areas of Hooded Plover habitat as identified in previous surveys. Each transect survey will take place over one day and will be conducted three times over the breeding season.

To minimise disturbance to resident shorebirds, surveyors will scan foreshores frequently throughout the surveys to ensure the locations of resident shorebirds are known before their breeding territory is entered.

Three surveys per annum will be undertaken during the resident shorebird breeding season from October to March, commencing as a pre-construction baseline, and annually during construction and for the first three years of the Project's operational phase.

A **Resident Shorebird Survey Report** will be prepared after the last seasonal survey in each reporting year, with the report provided to the Tasmanian EPA and DAWE as an annex to the Annual Environmental Report. The requirement for future surveys will be assessed after the third year of operation conjunction in with the Tasmanian EPA and DAWE.

2.3 Habitat Monitoring

Biannual habitat monitoring at key roost sites (Bird Point, Knot Point and Five Islets) will be undertaken. The final SMMP will include specific monitoring locations at each of these sites.

Habitat monitoring will take place

1. prior to construction;
2. every year during construction; and
3. for the first three years of Project operation.

Habitat condition will be recorded at each of the monitoring locations to document changes over time. Each survey will record the condition of nominated key roost sites and foraging habitats, including photographic records, noting:

- vegetation condition (e.g. weeds, dieback or recruitment)
- evidence of erosion or accretion

- evidence of predation
- any other factors of significance to shorebird habitat.

Habitat monitoring will also note the likely cause of any disturbance observed, as there are a range of other activities that occur in some areas, such as cattle farming.

The results of habitat monitoring will be summarised in a **Shorebird Habitat Monitoring Report** which will be prepared after the second survey with the report provided to the Tasmanian EPA and DAWE as an annex to the Annual Environmental Report. The shorebird habitat monitoring will commence prior to Project construction and will continue annually until the third year of the Project's operation when the requirement for future surveys will be assessed in conjunction with the Tasmanian EPA and DAWE.

2.4 Reporting and Review

In summary:

- Migratory shorebird surveys will commence in the first year of Project construction and will continue for the first three years of Project operation.
- A **Migratory Shorebird Survey Report** will be prepared after the last seasonal survey for each reporting year with the report provided to the Tasmanian EPA and DAWE as an annex to the Annual Environmental Report.
- Resident shorebird surveys will be undertaken on Back Banks beach during the resident shorebird breeding season from October to March, as a pre-construction baseline, and annually during construction and for the first three years of the Project's operational phase.
- A **Resident Shorebird Survey Report** will be prepared after the last seasonal survey in each reporting year, with the report provided to the Tasmanian EPA and DAWE as an annex to the Annual Environmental Report.
- Shorebird habitat monitoring at key roost sites will commence prior to Project construction and will continue annually until the third year of the Project's operational phase.
- A **Shorebird Habitat Monitoring Report** will be prepared annually, with the report provided to the Tasmanian EPA and DAWE as an annex to the Annual Environmental Report.
- At the completion of the first three years of operations, the requirement for future monitoring surveys will be assessed in conjunction with the Tasmanian EPA and DAWE.

3. Avian Mortality Monitoring

3.1 Avian Mortality Monitoring Plan

To understand the frequency of shorebird collisions with wind turbines, avian mortality monitoring will be undertaken once the wind farm is operational. The monitoring program will also include other avian mortalities, particularly threatened avian species. Monitoring for eagles and Orange-bellied Parrots is covered in more detail in the **Preliminary Eagle Monitoring and Management Plan** and the **Preliminary Orange-bellied Parrot Monitoring and Management Plan**.

The following provides a summary of the information that will be collected at the site post-approvals as inputs to the **Final Avian Mortality Monitoring Plan**. A **Preliminary Avian Mortality Monitoring Plan** is detailed below based on methodologies used at other operational Tasmanian wind farms.

The **Final Avian Mortality Monitoring Plan** will be developed prior to construction commencing and will be submitted to the EPA and DAWE for approval.

3.1.1 Monitoring Trials

Scavenger trials and a detectability trial will be carried out pre-construction and will inform the development of the avian mortality monitoring program for the Project. Details of the methodology is provided in Section 5.3.1 of the **Preliminary Eagle Monitoring and Management Plan** (DPEMP Appendix M).

3.1.2 Avian Mortality Search Methodology

The avian post-collision turbine search methodology proposed for the Project is a circular transect model which is detailed in Section 5.3.2 of the **Preliminary Eagle Monitoring and Management Plan** (DPEMP Appendix M). In summary, the methodology proposed[2] is:

- 10 transects 6 metres apart for the first 60 metres from the tower base. This is to search for any small birds.
- Six transects 10 metres apart for the next 60 metres from the tower base to search for larger birds.
- A 'pulsed survey' approach which means that a subset of turbines representative of the various conditions across the site will be surveyed on Week 1, with the remaining turbines to be surveyed on Week 2.

As noted in Appendix M, the final post-collision turbine search methodology will be provided in the **Final Avian Mortality Monitoring Plan.** This Plan will be developed prior to construction commencing and will be submitted to the EPA and DAWE for approval. As well as details of the final search methodology, the **Final Avian Mortality Monitoring Plan** will include protocols for mortality reporting, avian carcass removal and the management of injured avian species.

3.1.3 Frequency of Searches

The frequency of searches around the turbines will be informed by the analysis of data collected by the scavenger trials and detectability trial. A carcass does not have to remain intact or be

[2] The overall search area of 120 metres from the tower base will need to be reviewed should larger turbines with a tip height greater than 200 metres be installed at the site. The number of inner transects will also need to be adjusted accordingly.

complete to allow detection of a collision event. Partial remains or 'feather spots[3]' are also considered to be indicative of collision.

All WTGs will be searched at least once over the first summer season when migratory birds are present.

The mortality search methodology will be provided in the Final Avian Mortality Monitoring Plan and will be informed by detectability and scavenger trials. The frequency and coverage of searches will be commensurate to reliable detection of impacts to threatened species.

3.2 Avian Mortality Response

3.2.1 Avian mortality reporting

Mortality reporting requirements will be included in the **Final Avian Mortality Monitoring Plan**.

The Director of the EPA will be notified should any evidence of dead or injured threatened or migratory shorebirds be identified during mortality monitoring or through on-site observation within 24 hours of the discovery of such evidence for any threatened species; and

Within three days of notification, a mortality report will be submitted to the Director and the report will include the following:

- Unique identification number
- General description of evidence
- Species identification
- Signs of injury
- Sex and estimated age (if known)
- Date and time of discovery
- Estimated date and time of incident
- Estimate of general weather conditions at the time of the incident
- Substrate and vegetation
- Position of carcass in relation to the turbine i.e. distance in metres and compass bearing of the carcass from the base of the turbine;
- Photograph of evidence
- Any other relevant information

The mortality report will be prepared by suitably qualified or experienced person(s).

The mortality report for any EPBC Act listed species will also be provided to DAWE.

3.2.2 Incidental carcass protocol

Project personnel may find carcasses within the Project site during construction, commissioning, and site operations. The carcass will be handled according to a carcass handling protocol, which will be developed as part of site documentation. All construction and operational personnel will be made aware of the carcass handling protocol as part of site training and induction.

3.2.3 Analysis of mortality results and mortality estimation

The results of the carcass searches will be analysed to provide information on:

[3] Feather spots are a clump of feathers minimum 10 feathers or three flight feathers (Hull and Muir 2010).

- The species, number, age and sex (if possible) of shorebirds being struck by the turbine blades
- Separate estimated annual mortality rates for all shorebirds (and for particular species, if required) including an estimate of the number of carcasses per turbine per year; and
- Any detected spatial or temporal variation in the number of shorebird strikes.

The search results and annual mortality estimates of any EPBC listed threatened species will be presented in the **Annual Environmental Report.** Subsequent Annual Environmental Reports will detail cumulative search results, analysis and mortality estimates and will identify if further investigations or mitigation measures are required.

3.2.4 Avian Carcass Removal

Any avian carcasses found during the mortality searches will be removed from the ground to avoid scavenger attraction and re-counting by monitoring teams.

Migratory shorebird (and other threatened resident shorebird species) carcasses will be frozen as soon as possible following detection. These carcasses will initially be offered to DPIPWE and the Tasmanian Museum and Art Gallery (TMAG), and if unwanted, the carcass will be disposed of with other carcasses collected from the site.

To manage the potential abundance of prey for eagles around wind turbines on the Project site, operations management will include carcass removal of any animal carcasses identified during wind mortality monitoring or during farm operations from within 500 m of any wind turbine[4].

Carcasses will be collected by site staff and mortality monitoring staff. Carcasses will be placed in a dedicated mortality waste container (e.g. an aquaculture mortality bin or covered skip bin) located at the site maintenance and service facility storage area and will be collected on a weekly basis by a licensed waste contractor for disposal at a licensed landfill facility. Agricultural lime will be added to the waste container added to reduce odour emission.

Carcass disposal will also be determined in consideration of food sources for the Tasmanian Devil, with the potential for disposal in a protected Devil habitat area that is located well away (further than 500 m) from the turbines. This will be detailed in the **Wind Farm Operational Environmental Management Plan** and the **Offset Strategy for Tasmanian Devils**. Carcass removal and disposal will continue for the life of the Project or until agreed otherwise by the EPA and DAWE.

The final **Avian Mortality and Monitoring Plan**, including carcass removal protocols, will be prepared considering the data requirements for annual mortality monitoring.

3.2.5 Injured Avian Species

Site staff involved in mortality monitoring will be trained in animal handling and care and will be responsible for handling injured or orphaned birds.

In the event an injured shorebird is identified, an appropriately qualified local wildlife care centre, as recommended by DPIPWE, will be called for advice and instruction on care. DPIPWE will be notified via the injured or orphaned wildlife hotline (03) 6165 4305 (business hours) within 24 hours of discovery.

[4] The 500 m 'carcass buffer' from wind turbines is currently used at Cattle Hill Wind Farm under its EPBC Act approval (2009/4839) and under its EMPC Act approval (EPN No. 10105/1).

UPC will provide funding for the care and rehabilitation of any shorebirds injured by the wind farm.

3.3 Reporting and Review

In summary:

- Turbine search results and analysis of shorebird mortalities will be presented in the **Annual Environmental Report.** Subsequent Annual Environmental Reports will detail cumulative search results, analysis and mortality estimates and will identify if further investigations or mitigation measures are required.
- A **Final Avian Mortality Monitoring Plan** will be developed prior to construction commencing and will be submitted to the Tasmanian EPA and DAWE for approval. The Plan will include details of the final search methodology to be used on site for wind turbines and met masts, informed by detectability and scavenger trials. The frequency and coverage of searches will be commensurate to reliable detection of impacts to threatened species. The Plan will also include protocols for mortality reporting, avian carcass removal and the management of injured avian species.

4. Shorebird Impact Mitigation Measures

4.1 Operations - Collision Mitigation

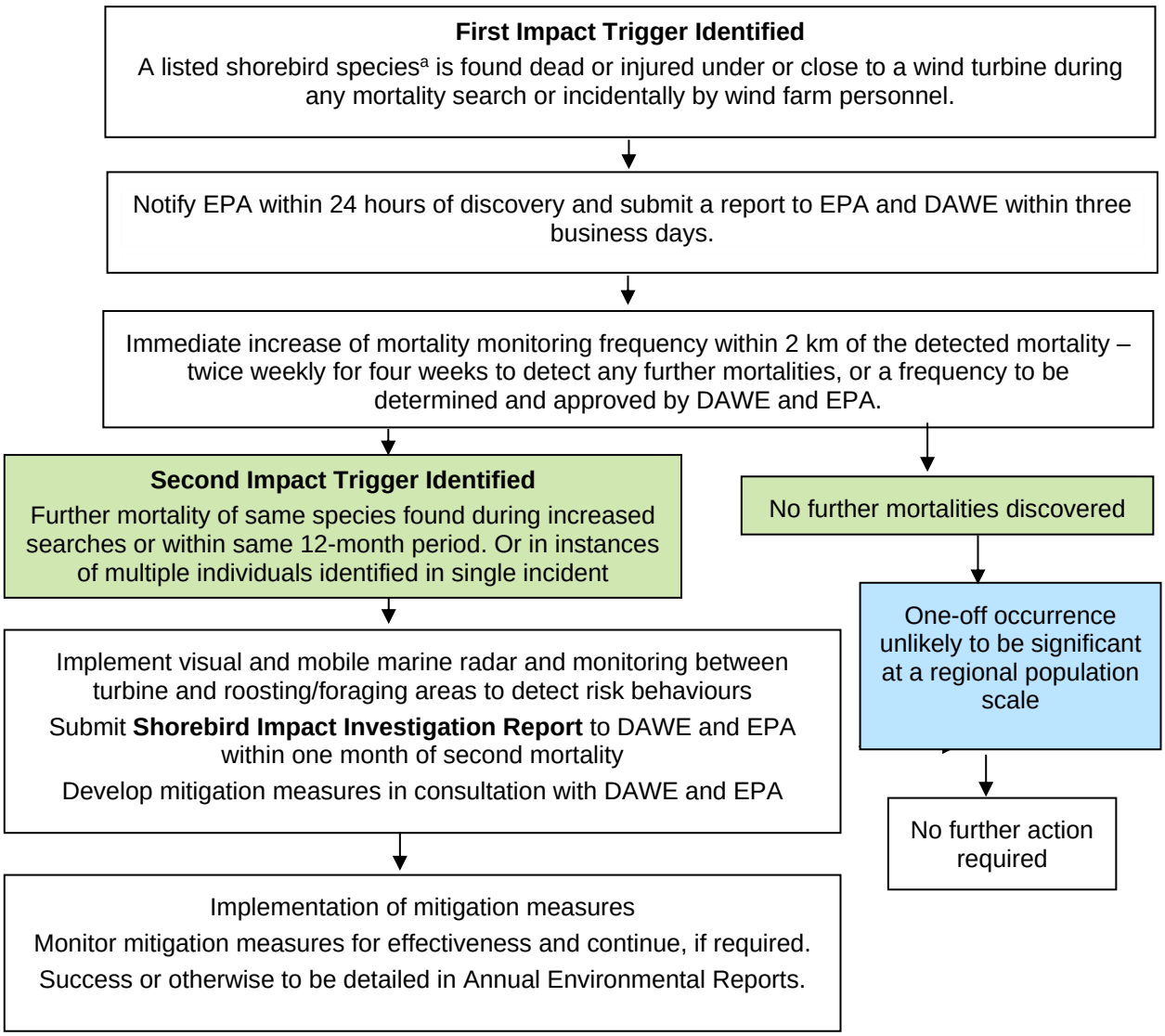
A shorebird turbine collision impact trigger is a threshold of direct mortality that requires investigation and where required, implementation of mitigation measures to prevent further shorebird collisions with turbines.

Figure 3 provides an overview of:

- The shorebird impact trigger notification framework
- The response following one mortality of a threatened and/or migratory shorebird (including any listed resident shorebird)
- The response if a second carcass of the same species is found in intensified mortality searches or if another mortality event occurs of the same species within the same 12-month period. The second impact trigger is also engaged if multiple individual carcasses are discovered in a single incident.

For shorebirds that are not migratory or listed as threatened, mortality events detected through avian mortality monitoring or as incidental events will be recorded, including species if this is able to be identified. Mortality data, including cumulative mortalities over time will be presented in annual reports, along with analysis of any patterns relating to seasons or timeframe.

Figure 3 Turbine collision impact triggers and response



[a] Any migratory or resident shorebird (or tern), listed as threatened under the TSP Act or listed as threatened or migratory under the EPBC Act

4.1.1 Visual and Marine Radar Monitoring

Visual and portable marine radar monitoring of shorebird flight paths from their foraging and roosting habitats, and to the area where the carcasses were identified, will be undertaken to ascertain if shorebirds are flying in the vicinity of turbines at rotor height. Should this be detected, further investigations using visual and radar methods will be implemented to determine flight paths and identify if and when high risk behaviour (i.e. habitual flight by numbers or flocks of shorebirds at rotor height within the turbine array) is occurring. The findings from this investigation will inform mitigation measures, if required, to reduce collision risk.

Radar detection of birds provides an important tool to detect birds during periods of cloud cover or at night. Even when there is good visibility, the radar can detect birds from greater heights and distances than visual observations. Having sound data is an important basis to then develop appropriate mitigation measures.

4.1.2 Shorebird Impact Investigation Report

The design of the additional monitoring, and any adaptive management responses to the data, will be developed in consultation with EPA and DAWE. Within one month of a second impact trigger event, a **Shorebird Impact Investigation Report** will be submitted to EPA and DAWE. Species specific mitigation measures aimed at reducing collision risk will be implemented as appropriate.

Investigations will include but not be limited to:

- Observations of shorebird flight behaviour within 2 km of the strike, with complimentary observations of shorebird flight behaviour at the nearest foraging and roosting areas on the coast of Robbins Island. Such investigations will include a combination of daytime visual and nocturnal (portable marine radar) studies.
- Data will be linked to times, weather conditions, and tide, seeking to understand triggers for high risk flights.

4.1.3 Adaptive Management

The mobile marine radar detection system proposed for shorebird monitoring after an impact trigger is the first component of the adaptive management system, providing a means to better understand risk behaviours. In the event of shorebird mortalities, the radar and visual monitoring will assist in the area specific documentation of behaviours.

Mitigation measures will then be developed in response to these risks, for example:

- In the event of risk flights being linked to particular times or weather conditions, a turbine curtailment schedule may be required, proposing location, timing within the season, time of day, tidal or weather events, and end-date. If for example, there is an increased risk of shorebirds flying over the northern most tip of White Rock Ridge during a high tide event that converges with a cold front from the west, the relevant turbine(s) could be curtailed during this confluence of events, using weather and tidal data as an automated response in times of elevated risk.
- In the event that ongoing shorebird impacts require a more targeted response, evaluation will be undertaken as to whether the automated turbine shutdown system

installed at the site can be adapted to detect incoming shorebirds and automatically shut down turbines, particularly during high risk times[5].

4.2 Design and Construction Mitigation Measures

The following site design, management and mitigation features are relevant to shorebirds:

- Lighting design will be in accordance with *National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds, Commonwealth of Australia 2020*
- Substations, site buildings and maintenance sheds will be fitted with low level security lighting which will be baffled to ensure directional lighting and activated by motion detectors
- Selected wind turbines on the wind farm boundary will be fitted with red night-time aviation lights which will be activated by a radar-based system which detects aircraft flights and so will be used intermittently
- Navigational and operational lighting on the wharf and bridge will only be used when required for operational or safety requirements and will be designed to minimise light spill
- Prior to construction, a shorebird survey will be conducted by a suitably qualified environmental practitioner, for the area within 500 m of the proposed works area for the wharf and bridge landings. This will be undertaken in summer to capture peak shorebird activity, noting the breeding season between October and March for the Eastern Hooded Plover. Any areas requiring protection will be identified and flagged as no-go zones as part of this assessment and relevant management measures included in the CEMP
- Access to coastal areas will be restricted for site staff, and will only be allowed for specific construction works, emergency works and environmental monitoring activities
- A construction zone for the bridge across Robbins Passage and for the wharf along Back Banks beach will be established with a 45 m width corridor, restricting access beyond this zone
- Where practical, temporary perimeter fencing may be installed and maintained to minimise access to intertidal areas or areas such as Hooded plover habitat in proximity of construction areas during the breeding season.
- Night works for construction will be minimised
- The bridge will be fitted with a gate system designed to prevent cats and other feral animals accessing Robbins Island from mainland Tasmania

[5] Automated turbine curtailment is one of the most commonly implemented measures to reduce avifauna collision risk on wind farm sites across the world, particularly for raptors and eagles. An avifauna detection and turbine curtailment system will be installed prior to operation of turbines on Robbins Island. The focus of the curtailment strategy will be eagles, given the demonstrated effectiveness of this technological approach for larger avifauna species. There are some uncertainties in relation to the effectiveness of the detection systems for all species, particularly smaller flocking birds. However, the technology is evolving, and if there is a requirement for curtailment as an adaptive response to shorebird mortalities, this will be investigated.

- A feral cat eradication program is also being conducted on Robbins Island and this program will continue throughout Project construction and operation. Additionally, staff will not be allowed to bring pets to site at any stage of the Project.
- Noise and vibration emissions from quarry activities will be addressed in the Quarry Management Plan. The quartzite quarry (QZ2) is located approximately 2.5 kms from Bird Point, where there are significant roosting and foraging sites, or 1.9 kms from the closest edge of the quarry extent. At this distance, the impact is likely to be negligible. The frequency of blasting will occur weekly, or once every 10 days depending on quarry material demands, with an operational period of 20 months. Given that the birds alight, fly then settle approximately 3-4 times per high tide roosting cycle, an additional event once a week through startling is within the range of natural variation. Therefore, no significant impact is expected such as reducing their capacity to forage, roost, and conserve energy resources. In the event of unanticipated impacts, adaptive management and mitigation strategies will be developed in consultation with the Tasmanian EPA and DAWE.
- In the initial site mobilisation, there will be a requirement to bring minimal machinery across the existing low tide crossing utilised by the land owners. This movement of vehicles across the inter-tidal zone will only be used for early start-up requirements, with the wharf and/or bridge used for site access as soon as possible.
- Speed limits will be enforced in all construction areas (40 km/hr), along with vehicle access and safe driving procedure. Movement of vehicles to Robbins Island will be minimised by using bus transport of workers to and from the site.
- A Marine Oil Spill Response Plan will be developed as part of the CEMP and OEMP.

Potential impacts from construction activities, such as sedimentation, erosion, and weeds will be detailed and managed through the Project's **Construction Environmental Management Plan**. Operational activities that may impact shorebirds will be managed under the site's **Operational Environmental Management Plan.**

4.3 Reporting and Review

In summary:

- In the event of a mortality of a shorebird species[6] listed under the EPBC Act and/or TSP Act, EPA and DAWE will be notified within 24 hours, with a follow-up **Shorebird Mortality Report** submitted within 3 days
- In the event of a second threatened, migratory or resident shorebird mortality in one reporting year, this will trigger visual and portable marine radar monitoring of shorebird flight paths to further investigate risk and inform potential mitigation measures. A **Shorebird Impact Investigation Report** will be provided to EPA and DAWE within one month of the trigger event.
- Construction activities that may have the potential to impact shorebirds will be detailed and managed through the Project's **Construction Environmental Management Plan**.
- Operational activities that may impact shorebirds will be managed under the site's **Operational Environmental Management Plan.**

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[6] Any migratory or resident shorebird (or tern), listed as threatened under the TSP Act or listed as threatened or migratory under the EPBC Act

5. Commitments

Commitments for the Project under the preliminary SMMP are summarised in Table 3. The below commitments should be read in conjunction with the broader commitments for the Project outlined within the DPEMP.

Table 3 Shorebird management commitments

Number	Commitment
1	The following turbine exclusion zones have been incorporated into the Project design to reduce potential impacts to key shorebird roosting and foraging areas: • A 500 m buffer inland from the Robbins Island coastline • The north-western portion of Robbins Island which forms the western boundary of Mosquito Inlet, has been excluded from the development area
2	A **Final Shorebird Monitoring and Management Plan** will be submitted to the Tasmanian EPA and the Commonwealth Department of Agriculture, Water and the Environment for approval prior to construction commencing.
3	Migratory shorebird population monitoring at roosting habitat will be conducted four times a year during the summer migration period, commencing in the first year of Project construction and continuing for the first three years of Project operation. The requirement for future surveys will be assessed after the third year of operation in conjunction with the Tasmanian EPA and DAWE. A **Migratory Shorebird Survey Report** will be prepared after the last survey for the reporting year with the report provided to the Tasmanian EPA and DAWE as an annex to the Annual Environmental Report.
4	Surveys for resident shorebirds will be undertaken in previously identified Hooded Plover habitats during the resident shorebird breeding season from October to March, as a pre-construction baseline, and annually during construction and for the first three years of the Project's operational phase. The requirement for future surveys will be assessed after the third year of operation in conjunction with the Tasmanian EPA and DAWE. A **Resident Shorebird Survey Report** will be prepared after the final survey each year, with the report provided to the Tasmanian EPA and DAWE as an annex to the Annual Environmental Report.
5	Biannual habitat monitoring at key roost sites (Bird Point, Knot Point and Five Islets) will be undertaken. Habitat monitoring will commence prior to Project construction and will continue annually until the third year of the Project's operation when the requirement for future surveys will be assessed in conjunction with the Tasmanian EPA and DAWE. The results of habitat monitoring will be summarised in a **Shorebird Habitat Monitoring Report** which will be prepared after the second survey, with the report provided to the Tasmanian EPA and DAWE as an annex to the Annual Environmental Report.
6	Scavenger trials and a detectability trial will be carried out pre-construction and will inform the development of an avian mortality monitoring program for the Project.
7	A **Final Avian Mortality Monitoring Plan** will be developed prior to construction commencing and will be submitted to the EPA and DAWE for approval. The mortality search methodology will be informed by detectability and scavenger trials, with the frequency and coverage of searches commensurate to reliable detection

Number	Commitment
	of impacts to threatened species. The Plan will consider data requirements for annual reporting, and include protocols for mortality reporting, avian carcass removal and the management of injured avian species.
8	Turbine search results and annual mortality assessment of shorebird mortalities will be presented in the **Annual Environmental Report.** Subsequent Annual Environmental Reports will detail cumulative search results, analysis and mortality estimates and will identify if further investigations or mitigation measures are required.
9	An impact trigger framework has been developed in response to: • one mortality of a threatened and/or migratory shorebird (including any listed resident shorebird) • a second carcass of the same species being detected during intensified mortality searches, or multiple carcasses of the same species discovered in the one incident, or a second mortality event occurring for the same species within the same 12-month period. Should a trigger event occur, visual and portable marine radar monitoring of shorebird flight paths from their foraging and roosting habitats, and in the vicinity of the area where the carcasses were identified, will be undertaken. The design of the additional monitoring, and any adaptive management responses, will be developed in consultation with EPA and DAWE. Within one month of the trigger event, a **Shorebird Impact Investigation Report** will be submitted to EPA and DAWE. Species-specific mitigation measures aimed at reducing collision risk will be implemented as appropriate.
10	The EPA will be notified of all mortalities or injuries of threatened/migratory shorebird species within 24 hours of discovery. A **Shorebird Mortality Report** will be submitted to the EPA and DAWE within three business days.
11	Following a threatened/migratory shorebird mortality, carcass searches within 2 kms of the turbine will be increased to twice weekly over four weeks.
12	The **Construction Environmental Management Plan** and the **Operational Environmental Management Plan** will outline mitigation measures to reduce impacts on shorebird species, including establishment of construction and exclusion zones, stormwater management, weed and pathogen control, lighting controls, a Marine Oil Spill Response Plan and ongoing feral cat detection and eradication.

6. Limitations

This report has been prepared by GHD for UPC Robbins Island Pty Ltd and may only be used and relied on by UPC Robbins Island Pty Ltd for the purpose agreed between GHD and UPC Robbins Island Pty Ltd as set out in Section 1 of this report.

GHD otherwise disclaims responsibility to any person other than UPC Robbins Island Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD have no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described throughout this report. GHD and Nature Advisory Pty Ltd disclaims liability arising from any of the assumptions being incorrect.

GHD have prepared this report on the basis of information provided by UPC Robbins Island Pty Ltd and others who provided information to GHD (including Government authorities)], which GHD have not independently verified or checked beyond the agreed scope of work. GHD do not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

7. References

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