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17<sup>th</sup> February 2023

**Subject: RA21/1000 – Letter of Undertaking relating to an Adaptive Management Strategy**

Dear Justin,

This Letter of Undertaking is provided to Shoalhaven City Council as part of the assessment of RA21/1000. It is anticipated that consent for the proposed extension to dredge areas to the western end and northern side of Pig Island, adjacent to Lots 1, 2, 3 and 4 / DP 1184790 below Mean High Water Mark will be conditional, and include the preparation and implementation of an Adaptive Management Strategy. This letter provides an outline for the content, performance measures and definitions that will be included in the Adaptive Management Strategy (the Strategy). Figures included in this letter are understood by the author to be accurate and in accordance with proposed extraction footprints included in other documents provided by the proponent, as part of RA21/1000.

## **Adaptive Management Strategy Content**

### **Purpose**

The key purpose of the Adaptive Management Strategy will be to avoid significant impacts to the following entities:

- Threatened and migratory shorebirds and their foraging habitat (intertidal sandflats).
- Seagrass beds (as highlighted by NSW DPI Fisheries).
- Saltmarsh habitat (a Threatened Ecological Community) that is present adjacent to and downstream of the proposed extraction area.
- Pied Oystercatcher and Little Tern potential breeding habitat (exposed sandbars and adjacent saltmarsh). Other threatened shorebirds will be subject to the Adaptive Management Strategy if located.

The above-listed entities or associated habitat features are present within or adjacent to the proposed extraction area, as well as around Pig Island. The Shoalhaven River estuary, including areas surrounding Pig Island is mapped on the NSW Biodiversity Values Map (Important Habitat Map component). Avoidance of threatened and migratory shorebird habitat and seagrass beds will provide additional protective buffers to areas of saltmarsh that are present in sections of shoreline around Pig Island.

Two species listed as potential Serious and Irreversible Impact (SAII) entities have been highlighted as part of this assessment. SAII criteria have been addressed in **Appendix A**.

### **Monitoring**

Monitoring associated with the Strategy will include physical monitoring periods, as well as monitoring of key habitat features by analysing satellite imagery. Habitat features or threatened entities to be monitored include:

- Migratory shorebirds and associated foraging habitat (intertidal sandflats). Migratory shorebird foraging habitat is broadly defined as areas of sand or mud that are either completely exposed or submerged by no more than 0.2m of water at low tide.

- Nesting shorebird breeding habitat. Potential breeding habitat for Pied Oystercatcher, Hooded Plover and Little Tern will be monitored. The presence of suitable breeding habitat for these species can be a result of dynamic processes. Current river levels are not indicative of future habitat potential for nesting shorebirds.
- Saltmarsh habitat present around Pig Island.
- Seagrass beds. Seagrass beds have been previously identified in satellite imagery and by on-ground survey. The extent of occurrence will be physically monitored concurrently during shorebird habitat assessments, as well as by analysis of satellite imagery.

Physical monitoring will occur at least twice between November and March each year, for the entire duration of extraction in Zone 1. Monitoring will continue into Zone 2, pending additional approval. Monitoring is to be conducted by a suitably qualified ecologist, as determined by Shoalhaven City Council. Additional monitoring periods may be recommended at the discretion of the project ecologist. Minimum monitoring requirements or inclusions are detailed below.

Migratory shorebird and foraging habitat monitoring will include:

- Systematic surveys to monitor shorebird populations within and adjacent to the proposal area. Surveys are to be conducted at least twice between November and March for the duration of the proposed extraction period. Survey timing will be determined by the project ecologist and will be conducted in accordance with relevant guidelines.
- Marking with GPS the outer limits of sandflat extent around Pig Island. Sandflat extent will be defined as areas of sandflats that are submerged by no more than 0.2m of water at low tide.
- Calculation of pre-extraction sandflat extent, compared to extent measured during physical and desktop analysis.

Monitoring of nesting threatened shorebird habitat will include:

- Survey for Pied Oystercatcher and Little Tern that is conducted alongside other visual surveys or monitoring events.
- Assessments of permanently exposed sandflats, to determine if they offer suitable nesting habitat for Pied Oystercatcher and/or Little Tern.

Monitoring of saltmarsh will include:

- A pre-extraction assessment of condition and extent.
- Ongoing monitoring of condition and extent, based on comparisons of photos collected at pre-determined photo points.

Monitoring of seagrass beds will include:

- Mapping the extent of seagrass beds in areas surrounding Pig Island. This will be achieved by physical survey and desktop analysis of satellite imagery.
- Monitoring and recording changes in silt/sediment deposition on seagrass beds that are present along the northern shoreline of Pig Island.

Data collected during physical and desktop monitoring periods will be analysed and presented in a letter-type report, which should be made available to Shoalhaven City Council on a six-month basis. Preparation of additional, interim reports may be required if elements of the Adaptive Management Strategy are triggered.

### **Performance Measures**

The extent of intertidal sandflats and seagrass beds surrounding Pig Island, beyond Zone 1, will be determined prior to the commencement of extraction. Areas that are quantified will establish a baseline area of extent, with a

decrease of greater than 10% deemed unacceptable. Maintaining pre-extraction areas of extent for both migratory shorebird habitat (intertidal sandflats) and seagrass beds will be the primary performance measures bound to the Adaptive Management Strategy.

Additional performance measures or potential triggers for the Adaptive Management Strategy include:

- Pied Oystercatcher or Little Tern confirmed nesting or displaying nesting behaviour, within known breeding seasons.
- Presence of threatened or migratory shorebirds roosting and/or foraging.

In the event that a decrease equal to or greater than 10% in the area of extent of either habitat feature is detected, the Adaptive Management Strategy will be implemented.

Any impact that results in performance measures not being met may result in a significant impact, requiring further assessment under state or federal legislation.

### **Triggers and Mechanisms**

The key trigger for implementation of the Adaptive Management Strategy will be a decrease in the area of extent of either migratory shorebird habitat or seagrass beds equal to or greater than 10% of the pre-extraction area of extent. If triggered, the Adaptive Management Strategy will result in the immediate cessation of extraction. A root cause analysis will be conducted, involving relevant technical professionals. The root cause analysis will determine either:

- Decrease is a direct or indirect result of extraction. Examples include, but are not limited to, slumping, resulting in loss of sandflats. Increased silt flow, smothering seagrass.
- Decrease is not related to extraction and can be attributed to natural causes that are typical of estuarine systems.

If extraction has resulted in a decrease, the Adaptive Management Strategy will require the proponent to seek approval from the consent authority prior to the resumption of extraction.

Additional triggers may include:

- Confirmation of breeding/nesting of Pied Oystercatcher or Little Tern or Hooded Plover.
- Presence of foraging or roosting migratory shorebirds.
- Any change in condition or extent of saltmarsh habitat around Pig Island. NB: no tests of significance have been conducted as part of this letter. No direct impacts will arise as a result of the proposed extraction and potential indirect impacts may arise as a result of waste deposits on Pig Island. Changes in condition or extent of saltmarsh will trigger the Strategy, with a root cause analysis conducted. The outcome of this analysis may result in a reassessment of impacts, with Council required to provide further approval prior to the re-commencement of extraction.
- Slumping or undercutting of Pig Island or nearby riverbanks. If this is noted, extraction will stop immediately, with a root cause analysis conducted. Council will be required to provide permission for extraction to re-commence pending a review of any analysis conducted.

Measures included in the Adaptive Management Strategy would ensure disturbance of foraging or nesting threatened birds is avoided. Mitigation or avoidance measures may include distance buffers from breeding, foraging or roosting shorebirds. Mitigation or avoidance measures would be further refined in collaboration with Shoalhaven City Council, pending approval.

## Extraction Zones

To demonstrate impact avoidance and minimisation to migratory shorebird habitat and seagrass beds, the proposed extraction area has been revised as part of a collaborative approach between the proponent, Lodge Environmental and Shoalhaven City Council.

The revised extraction area is proposed to include two distinct zones (**Figure 1**). Details and considerations around each zone are provided below.

### Zone 1

- Zone 1 will be the area of initial extraction, with the attached tests of significance prepared exclusively for Zone 1.
- Approximately 2.09 ha of isolated intertidal sandflats are present within Zone 1 and will be removed.
- Tests of significance prepared for Zone 1 (**Appendix B** and **Appendix C**) have concluded that no significant impact to migratory shorebirds will occur as a result of proposed extraction.
- Following the extraction of material from Zone 1, and prior to any further extraction, new tests of significance for migratory shorebirds and any other entities listed under the Biodiversity Conservation Act (2016) and Environment Protection and Biodiversity Conservation Act (1999) must be completed by a suitably qualified and experienced ecologist, as determined by Shoalhaven City Council.

### Zone 2

- Zone 2 will be subject to secondary approval, following the preparation and review of tests of significance for any threatened entities or their associated habitat.
- If tests of significance determine a significant impact is likely, the process that is legislated at the time of re-assessment will be adhered to.
- In its current form, Zone 2 includes areas of migratory shorebird habitat. Consideration has been given to the dynamic nature of estuarine systems, and it has been concluded that a re-assessment following the completion of extraction within Zone 1 is the most appropriate way to proceed. Re-assessment in approximately 10 years' time (or when extraction in Zone 1 has ended) will provide an accurate assessment of potential impacts to threatened entities under legislation that is active at that time.

## Proposed Extraction Areas



### Legend

□ Cadastre

### Proposed Extraction Zones

□ Zone 1

□ Zone 2

### Ecological Constraints

--- Seagrass Boundary - Informed by Fisheries

--- Approximate Edge of Intertidal Sandflats

0 100 200 m



**Figure 1: Proposed extraction zones and relevant ecological constraints**

### **Changes to Extraction Zones**

The Adaptive Management Strategy will be published based on approved extraction zones, which are expected to be conditionally approved as staged extraction zones. Any amendments to the extraction zones will require amendments to the Adaptive Management Strategy, with final approval granted by the consent authority prior to the resumption of extraction. Modifications may be required to avoid direct impacts to dynamic habitat features, which may move position over time.

The Adaptive Management Strategy will be prepared following approval of RA21/1000. The Strategy will ensure the proposed extractive industry:

- does not significantly impact migratory shorebirds or habitat of migratory shorebirds;
- does not significantly impact seagrass beds present in areas adjacent to the extraction area;
- does not impact saltmarsh habitat that is present around Pig Island;
- does not impact breeding/nesting habitat for other threatened species which may occur in future including Pied Oystercatcher and Little Tern.

Physical features will be monitored, with pre-determined performance measures in place. If the area of a monitored feature falls below the pre-determined area, the Adaptive Management Strategy will be triggered. Triggering the Strategy will result in:

- An immediate stop to all works within the extraction area;
- Report of failure to consent authority and any other relevant authority;
- Investigation into the process or processes that lead to a performance measure being breached;
- No extraction commencing until consent authority or other relevant authority is satisfied that the breach has been resolved and is unlikely to reoccur.

## Conclusion

Migratory shorebird habitat, saltmarsh habitat, potential nesting habitat for threatened birds and seagrass beds will be monitored as part of an Adaptive Management Strategy, aimed at avoiding indirect, direct or significant impacts to these entities.

Tests of significance prepared in February 2023 by Lodge Environmental concluded that no significant impacts to threatened and/or migratory shorebirds will arise as a result of extraction in Zone 1. An Adaptive Management Strategy will be in place to identify and reconcile any impacts that may arise.

Prior to extraction in Zone 2, tests of significance will be prepared. If significant impacts are deemed likely to occur, the correct legislative pathways that are in place at that time will be adhered to and subject to council approval.

Modifications to the Adaptive Management Strategy will require approval from the consent authority prior to the implementation of an amended form of the Strategy.

Should the reader have any further questions regarding the content of this letter, please do not hesitate to contact the author for further information or assistance.

Yours sincerely,

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# Appendix A: Serious and Irreversible Impact Criteria

Two Serious and Irreversible Impact (SAII) entities have been highlighted as potentially utilising habitat features within the proposed extraction area:

- Curlew Sandpiper (*Calidris ferruginea*) – Endangered (BC Act), Critically Endangered (EPBC Act)
- Eastern Curlew (*Numenius madagascariensis*) – Critically Endangered (EPBC Act)

Both species are listed as SAII entities due to Principle 1 set out in the Biodiversity Conservation Regulation (2017):

- Principle 1 Rapid Rate of Decline – It will cause a further decline of the species known or suspected to be in a rapid rate of decline.

Both species are known or suspected to have sustained population declines of greater than 80% in the past 10 years or 3 generations. SAII principles are addressed for both species in **Table 1**. Tests of significance (BC Act and EPBC Act) provide further detail on proposed impact areas and avoidance and should be considered in conjunction with SAII principles.

**Table 1: SAII Principles**

<p><b>(1) The action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII</b></p>	<p>1.</p> <p>The action relates to the proposed extraction of material from areas west and north of Pig Island.</p> <p>Revisions of the proposed extraction area have resulted in 8.26 ha of intertidal sandflats being retained, with 2.09 ha of intertidal sandflats to be removed. Previously proposed extraction areas included all intertidal sandflats present to the north and west of Pig Island. The revised extraction area has avoided a consolidated sandflat that is approximately 6.58 ha.</p>
<p><b>(2) Current status of the SAII</b></p> <p><b>(a) Evidence of rapid rate of decline (Principle 1. Clause 6.7(2)(a) BC Reg.)</b></p> <p><b>(b) Evidence of small population size (Principle 2. Clause 6.7(2)(b) BC Reg.)</b></p> <p><b>(c) Evidence of limited geographic range for the threatened species (Principle 3. Clause 6.7 (2) (c) BC Reg.)</b></p> <p><b>(d) Evidence that the species is unlikely to respond to management (Principle 4. Clause 6.7 (2) (c) BC Reg.)</b></p>	<p>2.</p> <p>(a) Curlew Sandpiper are believed to have undergone a population decline of 80.8% over 23 years, which equates to a &gt;80% decline in three generations (Garnett et al. 2011).</p> <p>Eastern Curlew are believed to have undergone a population decline of 81.7% over three generations (Studd et al. in prep.), with a global population estimate of 32,000 (Wetlands International 2015).</p> <p>(b) Up to 115,000 Curlew Sandpiper are believed to migrate to Australia, however this is based off old data and current numbers are unknown. An accurate estimate</p>



of the number of birds present in NSW during this time is not available.

The global population of Eastern Curlew is estimated to be less than 32,000 birds (Wetlands International 2015), with the majority found in Australia. An accurate estimate of the number of birds present in NSW during this time is not available.

(c) Neither species are considered to have a limited geographic range. Within Australia, each species can occur almost anywhere suitable habitat is present, however they are believed to display a moderate level of site fidelity.

(d) Limited evidence is available for response to management for either species. Key management categories (per TBDC) rely on avoidance of impacts and include:

- Protect and maintain known or potential habitat.
- Protect foraging and roosting areas from disturbance and inappropriate development.
- Manage estuaries and the surrounding landscape to maintain the natural hydrological regimes.
- Conduct searches for this species in suitable habitat in proposed development areas.
- Protect coastal areas from pollution.

If avoidance of impacts are achieved, both species are likely to respond favourably, with no further impacts to population decline expected.

# Appendix B: Assessments of Significance

## Migratory birds and shorebirds

A revised Assessment of Significance (AoS) for threatened and migratory shorebirds has been prepared as part of assessment requirements for RA21/1000.

The proposed extraction area is located in areas covered by the Important Habitat Map component of the Biodiversity Values Map (DPE 2022). As such, migratory shorebirds that are covered by the Important Habitat Map are assumed present for the purpose of this assessment. No survey is required. It is understood that if the proposal was lodged under present legislative requirements, a BDAR would be required, owing to the fact that the extraction area is mapped on the Important Habitat Map. This AoS has been prepared to address potential significant impacts, independent of current requirements for a BDAR, following consultation with Shoalhaven City Council.

Species considered as part of this assessment are detailed in **Table 2**. Species considered have either been previously recorded or are assumed present.

**Table 2: Threatened and migratory shorebirds considered**

Common name	Scientific name	BC Act	EPBC Act
<b>Bar-tailed Godwit</b>	<b><i>Limosa lapponica</i></b>	-	<b>V</b>
<b>Black-tailed Godwit</b>	<b><i>Limosa limosa</i></b>	<b>V</b>	-
<b>Curlew Sandpiper</b>	<b><i>Calidris ferruginea</i></b>	<b>E</b>	<b>CE</b>
<b>Eastern Curlew</b>	<b><i>Numenius madagascariensis</i></b>	-	<b>CE</b>
Eastern Hooded Dotterel (Hooded Plover)	<i>Thinornis cucullatus cucullatus</i>	CE	V
Little Tern	<i>Sternula albifrons</i>	E	-
Pied Oystercatcher	<i>Haematopus longirostris</i>	E	-

**\*Bold denotes species that are assumed present based on the Important Habitat Map or previous reporting**

Breeding habitat for Hooded Plover, Little Tern and Pied Oystercatcher is not currently present in areas within or adjacent to the proposed extraction area, however they have been considered in this assessment based on the precautionary principle.

The proposed extraction area has been divided into two distinct zones. This AoS relates to Zone 1 only. Zone 2 will be subject to revised tests of significance, and revised consent prior to extraction.

Zone 1 contains approximately 2.09ha of fragmented, intertidal sandflats that will be directly impacted. Revision of extraction zones has resulted in 6.59 ha of intertidal sandflats being avoided. In total, 8.26 ha of intertidal sandflats will remain along the northern and eastern sides of Pig Island.

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

Coastal estuaries and associated systems provide critical foraging grounds for migratory shorebirds during their non-breeding season. The proposed extraction will involve the removal of 2.09 ha of intertidal sandflats, which may provide marginal foraging habitat for migratory shorebirds present in the Shoalhaven River and estuary. Zone 1 proposes the extraction of sand from the western-most point of Pig Island, which likely represents the furthest upstream point that migratory shorebirds would utilise for foraging. Areas of retained sandflats around Pig Island will continue to provide foraging habitat for migratory shorebirds including Bar-tailed Godwit and Eastern Curlew. Hooded Plover, Little Tern and Pied Oystercatcher have not been recorded breeding on or adjacent to Pig Island, however they will be monitored as part of the Adaptive Management Strategy. As such, the proposal is not considered to immediately impact these species. Future impacts will be re-assessed if they are confirmed present.

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

- i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

Not applicable – not an endangered/critically endangered ecological community.

- c. In relation to the habitat of a threatened species or ecological community:**

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

Proposed extraction in Zone 1 will result in the removal of 2.09 ha of intertidal sandflats. 8.26 ha will be retained around Pig Island, with 6.59 ha avoided as a result of revised extraction zones. No areas of shoreline habitat will be impacted.

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

Intertidal sandflats proposed to be removed within Zone 1 are currently isolated from larger sandflats present around Pig Island. Sandflats in Zone 1 are at the western-most extent of such habitat and their removal will not result in other areas of similar habitat becoming isolated or further fragmented. Areas of habitat along the shoreline of Pig Island will not be impacted.

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

Intertidal sandflats to be removed are mapped on the NSW Important Habitat Map, with presence of migratory shorebirds functionally assumed. In the context of the broader Shoalhaven River estuary, sandflats to be removed likely provide marginal foraging habitat for a limited number of migratory shorebirds. Sandflats in Zone 1 represent the furthest upstream example of such habitat in the Shoalhaven River and likely represent less important foraging habitat than intertidal sandflats present further downstream.

Changes in the structure and tidal flow around and over retained sandflats may lead to the establishment of potential breeding habitat for Pied Oystercatcher and Little Tern. Impacts to potential, future breeding habitat cannot be assessed at this stage. The Adaptive Management Strategy will identify potential breeding habitat if it appears, with appropriate triggers in place to avoid impacts.

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

There are no areas of outstanding biodiversity value in the proposed extraction area.

**e. Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatened process.**

No key threatening processes will be introduced or exacerbated as a result of proposed extraction within Zone 1.

**Conclusion**

The proposed extraction of material within Zone 1 will result in the removal of 2.09 ha of intertidal sandflats. Sandflats to be removed likely provide marginal foraging habitat for a limited number of migratory shorebirds and are the furthest upstream point of this habitat type within the Shoalhaven River estuary.

Potential breeding habitat for Pied Oystercatcher and Little Tern has not been identified, however the Adaptive Management Strategy will identify such habitat if it is established, with mechanisms in place to avoid impacts to breeding shorebirds.

8.26 ha of intertidal sandflats are to be retained around Pig Island. An Adaptive Management Strategy will be implemented to ensure no direct or indirect impacts are imposed on retained sandflats, protecting the integrity of migratory shorebird habitat around Pig Island. No key threatening processes will be introduced as a result of the proposed extraction.

In consideration of all factors associated with proposed extraction in Zone 1, avoidance demonstrated and assessment of impacts within the broader Shoalhaven River system, the proposal is not considered likely to result in significant impact to migratory shorebirds. Any deviation from the proposed extraction zone will require reassessment and potential entrance into the Biodiversity Offset Scheme.

# Appendix C: Significant Impact Criteria

## Threatened Migratory Shorebirds

A revision of Significant Impact Criteria (SIC) for threatened migratory shorebirds has been prepared as part of assessment requirements for RA21/1000. Significant Impact Criteria for listed migratory species, and vulnerable and critically endangered species have been addressed, based on previous records of migratory shorebirds, as well as a conservative assumption of presence based on the Important Habitat Map (BC Act).

EPBC Act Policy Statement 3.21 (Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species) was reviewed as part of this assessment and definitions included where relevant.

The proposed extraction area is located in areas covered by the Important Habitat component of the NSW Biodiversity Values Map (DPE 2022). As such, migratory shorebirds that are covered by the Important Habitat Map are assumed present for the purpose of this assessment, with their presence requiring assessment under the EPBC Act. Species considered for this assessment are listed below:

Common name	Scientific name	BC Act	EPBC Act
Bar-tailed Godwit	<i>Limosa lapponica</i>	-	V
Curlew Sandpiper	<i>Calidris ferruginea</i>	E	CE
Eastern Curlew	<i>Numenius madagascariensis</i>	-	CE
Eastern Hooded Dotterel (Hooded Plover)	<i>Thinornis cucullatus cucullatus</i>	CE	V

Breeding habitat for Hooded Plover is not currently present in areas within or adjacent to the proposed extraction area, however this species has been considered in this assessment.

The proposed extraction area has been divided into two distinct zones. This SIC relates to Zone 1 only. Zone 2 will be subject to revised tests of significance, and revised consent prior to extraction.

Zone 1 contains approximately 2.09ha of fragmented, intertidal sandflats that will be directly impacted. Revision of extraction zones has resulted in 6.59 ha of intertidal sandflats being avoided. In total, 8.26 ha of intertidal sandflats will remain along the northern and eastern sides of Pig Island.

## Migratory Species EPBC Act

**An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:**

**Criterion a: substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;**

Criteria to determine important habitat for migratory shorebirds are outlined in EPBC Act Policy Statement 3.21 (Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species). Intertidal sandflats that are proposed to be removed in Zone 1 may not be considered important habitat as they do not regularly support:

- 1 per cent of the individuals in a population of one species or subspecies of waterbird;
- A total abundance of at least 20,000 waterbirds;

- 0.1 per cent of the flyway population for a single species of migratory shorebird;
- 2,000 migratory shorebirds; OR
- 15 migratory shorebird species.

**Criterion b: result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or**

The proposal will not involve the introduction of invasive species.

**Criterion c: seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species;**

Intertidal sandflats provide critical foraging resources for migratory shorebirds during their non-breeding season. Sandflats that are proposed to be removed within Zone 1 are considered to provide marginal foraging habitat for a limited number of migratory shorebirds. The extent of sandflats proposed to be removed are unlikely able to support an ecologically significant proportion of a migratory shorebird species. As such, the lifecycle of migratory shorebirds will not be seriously disrupted by the proposal.

### **Vulnerable Species EPBC Act**

- **Bar-tailed Godwit (*Limosa lapponica*)**

**An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:**

**Criterion a: lead to a long-term decrease in the size of an important population of a species;**

As defined in EPBC Significant Impact Guidelines 1.1, and 'important population' is a population that is necessary for a species' long-term survival and recovery. As such, individual migratory shorebirds present in Australia can be considered part of an important population.

The removal of intertidal sandflats within Zone 1 is considered unlikely to lead to a long-term decrease in the size of migratory shorebird populations or Hooded Plover population. Sandflats proposed to be removed are considered to provide marginal foraging habitat for a limited number of shorebirds.

**Criterion b: reduce the area of occupancy of an important population;**

2.09 ha of intertidal sandflats will be removed within Zone 1. 8.26 ha of intertidal sandflats will be retained around Pig Island.

**Criterion c: fragment an existing important population into two or more populations;**

The proposed extraction area does not support a single population for vulnerable migratory shorebirds. As such, fragmentation into two or more populations will not occur.

**Criterion d: adversely affect habitat critical to the survival of a species;**

Intertidal sandflats that are to be removed in Zone 1 are considered to provide marginal foraging habitat, to a limited number of migratory shorebirds. As such, these sandflats are not considered to be critical to the survival of a species. 8.26 ha of intertidal sandflats will be retained around Pig Island.

**Criterion e: disrupt the breeding cycle of an important population;**

Bar-tailed Godwits do not breed in Australia. Impacts to migratory shorebirds during their non-breeding season can impact reproductive success, however the retention of 8.26 ha of intertidal sandflats around Pig Island ensures that marginal foraging habitat remains available for this taxa.

Hooded Plover have not been recorded breeding around Pig Island. The Adaptive Management Strategy would have the ability to identify breeding events, with mechanisms to avoid impacts to this species. As such, no disruption to the breeding cycle of this species is considered likely to occur.

**Criterion f: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;**

The removal of 2.09 ha of marginal foraging habitat for a limited number of migratory shorebirds is not considered likely to lead to a decline in numbers of any shorebird species.

**Criterion g: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

The proposal does not involve the introduction of invasive species that are harmful to this species.

**Criterion h: introduce disease that may cause the species to decline;**

The proposal is unlikely to introduce diseases that may cause the species to decline.

**Criterion i: interfere substantially with the recovery of the species;**

No recovery plan exists for this species in Australia, nor are there any local recovery actions in place. As such, the proposal will not interfere with any recovery efforts.

#### **Critically Endangered Species EPBC Act**

- **Eastern Curlew (*Numenius madagascariensis*)**
- **Curlew Sandpiper (*Calidris ferruginea*)**

**An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:**

**Criterion a: lead to a long-term decrease in the size of a population;**

The removal of 2.09 ha of intertidal sandflats that provide marginal foraging habitat for a limited number of migratory shorebirds is considered unlikely to result in a decrease in the population size of this species. Eastern Curlew have been recorded foraging on sandflats to be retained around Pig Island. 8.26 ha of known foraging habitat will be retained. Curlew Sandpiper has not been recorded around Pig Island.

**Criterion b: reduce the area of occupancy of the species;**

The proposal will remove 2.09 ha of intertidal sandflats that provide marginal foraging habitat for this species.

**Criterion c: fragment an existing population into two or more populations;**

The proposal will not fragment an existing population of this species.

**Criterion d: adversely affect habitat critical to the survival of a species;**

Intertidal sandflats proposed to be removed in Zone 1 are not considered critical to the survival of this species. 8.26 ha of intertidal sandflats will be retained around Pig Island.

**Criterion e: disrupt the breeding cycle of a population;**

Eastern Curlew and Curlew Sandpiper do not breed in Australia. Impacts to migratory shorebirds during their non-breeding season can impact reproductive success, however the retention of 8.26 ha of intertidal sandflats around Pig Island ensures that marginal foraging habitat remains available for this taxa.



**Criterion f: modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;**

The removal of 2.09 ha of marginal foraging habitat for a limited number of migratory shorebirds is not considered likely to lead to a decline in numbers of any migratory shorebird species, including Eastern Curlew and Curlew Sandpiper.

**Criterion g: result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;**

The proposal does not involve the introduction of invasive species.

**Criterion h: introduce disease that may cause the species to decline;**

The proposal is unlikely to introduce diseases that may cause the species to decline.

**Criterion i: interfere with the recovery of the species;**

No recovery plan exists for this species in Australia, nor are there any local recovery actions in place. As such, the proposal will not interfere with any recovery efforts.

**Conclusion**

The proposal is not considered to constitute a significant impact on threatened migratory or resident shorebirds and therefore a referral to the Commonwealth is not recommended. Any deviation from the proposed extraction zone will require reassessment and potential referral to the Commonwealth. It is noted that legal certainty relating to the necessity of Commonwealth referral can only be confirmed if a proposal is submitted to the Commonwealth.