Australian Government
Australian Submarine Agency

ASA

IMPACT ASSESSMENT REPORT

SUBMARINE CONSTRUCTION YARD STRATEGIC ASSESSMENT

OSBORNE, SOUTH AUSTRALIA

21 January 2025

www.asa.gov.au

Project name	Submarine Construction Yard Strategic Assessment
Document title	Impact Assessment Report, Submarine Construction Yard Strategic Assessment
This document has been prepared by GHD Pty Ltd for the Australian Submarine Agency	

Appendices

Appendix A

Strategic Assessment Agreement

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (Cth)

Part 10 Strategic Assessment

Section 146 Agreement

Agreement to undertake a Strategic Assessment of the impacts of a Plan for actions to be taken in the Strategic Assessment Area on matters protected by Part 3 of the EPBC Act.

between

THE COMMONWEALTH MINISTER FOR THE ENVIRONMENT AND WATER

and

THE AUSTRALIAN SUBMARINE AGENCY

Table of Contents

1. Parties

1.1 The Parties to this Agreement are:

The Commonwealth Minister for the Environment and Water

and

The Australian Submarine Agency

2. Commencement of agreement

2.1 This agreement will commence on the date on which the agreement is signed by both parties.

3. Definitions

3.1 Unless the context indicates otherwise in this Agreement, the definitions, meanings, and terms in the EPBC Act apply to this Agreement including its attachments.

3.2 In this Agreement:

Agreement means this Strategic Assessment agreement entered into by the Parties on the date the last party executes this Agreement and includes any attachments and any variations.

Attachment means an attachment to this Agreement.

Australian Submarine Agency (ASA) means the Commonwealth executive agency responsible for the Strategic Assessment.

Commonwealth Minister means the Minister with responsibility for administering the EPBC Act and includes a person to whom that Minister's power under section 146(1) of the EPBC Act has been delegated.

Disclosable Information means Information that both Parties agree is relevant and appropriate to be disclosed or published to third parties in the course of the Strategic Assessment or thereafter. For the purposes of this definition, Disclosable Information will not include Information that in the reasonable opinion of either of the Parties is Information:

a) that if disclosed or published, would constitute a prohibited or unauthorised disclosure or publication under any South Australian or Commonwealth written law;
b) that if disclosed or published would:

    i. be reasonably anticipated to give rise to any legal or equitable claim or liability; or

ii. constitute a waiver of privilege in the absence of consent of the Party possessing that privilege;

c) that is confidential in nature, personal Information or likely to be considered sensitive by an Aboriginal group in circumstances where authorisation or consent to disclose or publish such Information has not been obtained; or

d) is environmentally sensitive Information which, if published or published in a particular manner, may increase a risk of damage to the protected matters to which the Information relates.

Environment has the meaning given by section 528 of the EPBC Act.

Environment Department means the Commonwealth Department with responsibility for conducting environment assessments under the EPBC Act.

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

Impact has the meaning given by section 527E of the EPBC Act.

Impacts to which this Agreement relates means an Impact of actions under the Plan on a Protected Matter.

Information includes data, information, knowledge and understanding developed for the purpose of the Strategic Assessment of the Strategic Assessment Area for use in:

a) the development of the Plan and other documents; and

b) the assessment of the Impacts of implementing the Plan.

Parties means the Parties to this Agreement as set out in clause 1.

Plan means the documentation (which constitutes a 'policy, plan or program' pursuant to section 146 of the EPBC Act) to be prepared by ASA, under which the Project will be taken.

Project means the construction and operation of the nuclear-powered submarine construction yard at Osborne, South Australia.

Protected Matter means a matter protected by a provision of Part 3 of the EPBC Act.

Strategic Assessment means the assessment referred to in clause 4.1 of this Agreement.

Strategic Assessment Area means all land and sea areas identified in the map at Attachment 1.

Strategic Impact Assessment Report (SIAR) means the report describing and assessing the Impacts to which this Agreement relates, as contemplated by section 146(2)(a) of the EPBC Act and prepared in accordance with clauses 8 and 9 of this Agreement.

Supplementary SIAR means a report, provided for in clause 8.5, which includes:

a) a summary of all the public comments received in response to the draft SIAR; and
b) sets out how comments have been addressed through modification/s to the SIAR, if any, following the public comment period on the draft SIAR and draft Plan.

Sustainable development means development in accordance with the principles of ecologically sustainable development set out in section 3A of the EPBC Act, namely:

a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;

b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;

c) the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;

d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;

e) improved valuation, pricing and incentive mechanisms should be promoted.

Terms of Reference means the Terms of Reference for the SIAR prepared in accordance with clause 7 of this Agreement, unless otherwise specified.

In this Agreement references to the singular include the plural, subject to any contrary intention.

4. Background

4.1 Section 146(1) of the EPBC Act allows the Commonwealth Minister to agree in writing with a person responsible for the adoption or implementation of a policy, plan or program that an assessment be made of the impacts of actions under the policy, plan or program on a matter protected by a provision of Part 3 of the EPBC Act.

4.2 The Parties acknowledge that the Strategic Assessment Area has environmental values that must be considered alongside the economic and social benefits (including national security) of development in the region.

4.3 A Strategic Assessment Agreement is a step toward endorsement of the Plan and approval of actions under the Plan which, if endorsed and approved, will enable development and environmental protection. It will support the consideration of future land uses and opportunities in an open and transparent manner and provide greater certainty to stakeholders.

4.4 In consultation with ASA, the Environment Department will prepare a draft and then a final Terms of Reference for the SIAR that will assess the Impacts to which the Agreement relates.

4.5 In consultation with the Environment Department, ASA will prepare:

a) a draft Plan, for endorsement by the Commonwealth Minister under the EPBC Act if the relevant requirements are met; and

b) a draft and then a final SIAR, which considers the cumulative Impacts to which this Agreement relates and may include consideration of Social and Economic matters.

4.6 The draft Terms of Reference and draft SIAR will be made available for public comment, following review and comment by the Environment Department.

4.7 After considering the final SIAR, the Commonwealth Minister may decide to endorse the draft Plan if the Commonwealth Minister is satisfied that:

a) the SIAR adequately addresses the Impacts of implementing the Plan; and

b) any recommended modifications to the draft Plan, or modifications having the same effect, have been made by ASA.

4.8 The Parties acknowledge that endorsement of the Plan itself does not constitute any approval under the EPBC Act for the taking of actions within the Strategic Assessment Area.

4.9 If the Commonwealth Minister decides to endorse the draft Plan, the Commonwealth Minister may then, under section 146B of the EPBC Act, decide to approve the taking of actions in accordance with the endorsed Plan.

4.10 The Plan will aim to support sustainable development of the Strategic Assessment Area.

4.11 For the removal of doubt, the statements in this clause are intended to be statements of information only and do not form part of the operative terms of this Agreement.

5. Coordination of the Commonwealth and State Assessment Process

5.1 Steps or processes in the assessment of the Impacts to which this Agreement relates may be done concurrently with any State environment assessment processes, provided that doing so will meet the requirements of each law.

5.2 Measures to achieve streamlining between the State and Commonwealth environmental assessment processes may include but are not limited to:

a) Centralisation and coordination of public consultation periods on the draft Terms of Reference prepared under the EPBC Act.

b) The drafting and provision of a single draft and final SIAR that addresses both State and Commonwealth matters.

c) Coordinated review of the draft SIAR and draft Plan including the provision of a consolidated response document, that includes comments of South Australia and Commonwealth.

d) Centralisation and coordination of public consultation periods on the draft Plan and draft SIAR, to be managed by ASA.

5.3 Any streamlining measures, including those identified in clause 5.2, may only be implemented by written agreement from both Parties and provided doing so meets, addresses or replaces the requirements of this Agreement and the Terms of Reference, to the satisfaction of the Environment Department.

6. Development of the Plan

6.1 The Parties agree that ASA will develop a Plan that will detail the sustainable development of the Strategic Assessment Area.

6.2 The Plan will seek to ensure and promote conservation of Protected Matters that occur within the agreed Strategic Assessment Area.

6.3 The Plan must be developed in accordance with the requirements of the endorsement criteria (Attachment 2) and must include, but may not be limited to:

a) the identification of areas for development;

b) the identification of the action, or the classes of actions, proposed to be undertaken within the Strategic Assessment Area, including a description

of how these actions are related to development activities regulated and/or managed under State or Territory legislative requirements[1];

c) outcomes and commitments for the conservation of Protected Matters, based on the 'avoid, mitigate and offset' hierarchy of principles;

d) outcomes and commitments for regulatory and administrative efficiencies including for governments and third-party developers;

e) an implementation framework that describes how the Plan will be efficiently and effectively implemented (including how commitments for the conservation of Protected Matters set out in the Plan will be achieved); and

f) an assurance framework that describes how the named approval holder (or holders) will demonstrate and adaptively manage the effectiveness of proposed regulatory, administrative and Protected Matter outcomes.

6.4 ASA agrees to consult on the development of the draft Plan. The parties agree to establish an agreed list of stakeholders.

6.5 The processes for the review and publication of the draft Plan are detailed at clause 8, the processes for assessing the suitability of the Plan are at clause 9, and the established criteria for endorsement of the Plan by the Commonwealth Minister are at clause 10.

7. Terms of Reference for the SIAR

7.1 The Environment Department will prepare a draft Terms of Reference, in consultation with ASA.

7.2 Pursuant to section 146(1B)(b) of the EPBC Act, the Parties agree that the draft Terms of Reference will be prepared for a SIAR that will assess the Impacts to which this Agreement relates.

7.3 ASA must publish the draft Terms of Reference for public comment. ASA must ensure that a notification of the draft Terms of Reference:

a) is posted on the ASA website (or any other appropriate website approved by the Environment Department) at a minimum for the period of public consultation specified by the Commonwealth Minister (of at least 28 days);

[1] For an action, or a class of actions, to be covered by the Part 10 approval, they must be identified pre-endorsement and adequately assessed through the SIAR.

b) is published in a national daily newspaper on the first day of the period mentioned in clause 7.3(a);

c) invites public comment on the draft Terms of Reference for the period mentioned in clause 7.3(a); and

d) mentions:

i. that the draft Terms of Reference are available for public comment;

ii. the provision of the EPBC Act that requires the draft Terms of Reference for the SIAR to be published (i.e. section 146(1B)(b)(ii));

iii. where and how copies may be obtained in an electronic and hard copy form without charge or at a reasonable cost;

iv. contact details for obtaining further information, including reasonable access for persons with special needs; and

v. the address to which public comments should be provided.

7.4 Following consideration by ASA of the public comments (if any) on the draft Terms of Reference and the making of any revisions by ASA in consultation with the Environment Department, ASA will ensure that the following are submitted to the Commonwealth Minister for the purpose of finalising the draft Terms of Reference:

a) a copy of all public responses relating to the draft Terms of Reference;

b) a document summarising the public comments and how these public comments have, or have not, been taken into account in the revised draft Terms of Reference; and

c) a revised draft Terms of Reference taking into account the public comments (if required).

7.5 If the Commonwealth Minister is satisfied that the (revised) draft Terms of Reference will provide for an SIAR that adequately addresses the Impacts of implementing the Plan, the Commonwealth Minister will approve the draft Terms of Reference and notify ASA that the (revised) draft Terms of Reference can be finalised. On receipt of notification from the Commonwealth Minister that the (revised) draft Terms of Reference can be finalised, ASA must finalise the Terms of Reference.

7.6 The finalised Terms of Reference will be published on the Environment Department and ASA websites (or any other appropriate website approved by the Environment Department) for a period ending no earlier than the date of the decision made by the Commonwealth Minister whether or not to endorse the Plan.

8. Preparation of the Plan and SIAR

8.1 In accordance with this Agreement and the finalised Terms of Reference, ASA must prepare a draft Plan, as well as a draft SIAR that provides an assessment of the Impacts to which this Agreement relates.

8.2 The Environment Department will collaborate with ASA and provide comments on the draft Plan and draft SIAR throughout the development of these documents. The Environment Department will provide comments in a timely manner including comments on whether the Environment Department considers the draft SIAR adequately addresses the Impacts to which this Agreement relates, including the suitability of proposed avoidance, mitigation and offset measures, and the extent to which the draft Plan and draft SIAR adequately addresses the requirements for strategic assessments described in Part 10 of the EPBC Act.

8.3 ASA will amend the draft Plan and draft SIAR to incorporate the Environment Department's comments. The updated draft Plan and draft SIAR will be provided to the Environment Department accompanied by a summary document that demonstrates how any comments from the Environment Department have been or have not been addressed.

8.4 Following completion of the process set out in clauses 8.1 – 8.2 of this Agreement, ASA will publish the draft Plan and draft SIAR, and by notice invite public comment on the draft SIAR. ASA must ensure that the notification:

a) is posted on the ASA website (or any other appropriate website approved by the Environment Department) at a minimum for the period of public consultation specified by the Commonwealth Minister (of at least 28 days);

b) is published in a national daily newspaper on the first day of the period mentioned in clause 8.4(a);

c) invites public comment on the draft SIAR for the period mentioned in clause 8.4(a); and

d) mentions:

i. that the draft SIAR is available for public comment;

ii. the period for public comment specified by the Commonwealth Minister;

iii. the provision of the EPBC Act that requires the draft SIAR to be published (i.e. section 146(2)(b));

iv. where and how copies may be obtained in an electronic and hard copy form without charge or at a reasonable cost;

v. contact details for obtaining further information, including reasonable access for persons with special needs; and

vi. the address to which public comments should be provided.

8.5 Following consideration of any public comments received, ASA will prepare, and then submit to the Environment Department for further comment:

a) a copy of all public comments;

b) a revised draft SIAR (if required) that takes into account the public comments received (if any);

c) a revised draft Plan (if required) that is informed by public comments received on the draft SIAR (if any); and

d) a Supplementary SIAR which addresses how all public comments have been addressed through revisions to the draft SIAR or Plan (if required).

8.6 The Environment Department agrees to assist ASA in ensuring that the draft SIAR and draft Plan provided under clause 8.5 adequately addresses the requirements for Strategic Assessments described in Part 10 of the EPBC Act by providing comments on the documents provided under clause 8.5 in a timely manner.

8.7 ASA will update and finalise the draft Plan and draft SIAR (if required) to reflect any further comments provided by the Environment Department following the public comment period, and prepare another summary document that demonstrates how any comments from the Environment Department following the public comment period have been or have not been addressed.

8.8 ASA must then finalise and submit the following documents to the Commonwealth Minister for endorsement under clause 10.1, as required by section 146(2)(f) of the EPBC Act:

a) the final SIAR prepared under clause 8.7;

b) the draft Plan prepared under clause 8.7; and

c) if required, the Supplementary SIAR.

9. Consideration of the SIAR and the Plan

9.1 Following receipt of the final SIAR, the draft Plan and, if required, the Supplementary SIAR (as detailed in clause 8.8of this Agreement), the

Commonwealth Minister may make recommendations to ASA about the draft Plan, including recommendations for the modification of the draft Plan.

9.2 The Commonwealth Minister may request any additional Information they consider necessary in order to consider whether the final SIAR adequately addresses the Impacts to which this Agreement relates.

9.3 If the Commonwealth Minister makes recommendations about the draft Plan as outlined in clause 9.1(specified in section 146(2)(e) of the EPBC Act), ASA:

a) may seek clarification from the Commonwealth Minister on the recommendations;

b) must, unless otherwise agreed, modify the draft Plan to give effect or in a manner that has the same effect to the Commonwealth Minister's recommendations.

9.4 Where ASA modifies the draft Plan in response to the Commonwealth Minister's recommendations, ASA must submit to the Commonwealth Minister for consideration:

a) the modified draft Plan; and

b) a summary of how the Commonwealth Minister's recommendations were given effect.

10. Endorsement of the Plan

10.1 The Commonwealth Minister may endorse the draft Plan prepared under clause 8.8 or the modified draft Plan prepared under clause 9.4 (as the case may be) if satisfied that:

a) the final SIAR adequately addresses the Impacts to which this Agreement relates; and

b) if relevant, either the recommended modifications to the draft Plan, or modifications having the same effect, have been made.

10.2 In considering whether to endorse the draft Plan, the Commonwealth Minister will have regard to the criteria for endorsement of the Plan Attachment 2.

10.3 If the draft Plan is endorsed by the Commonwealth Minister, ASA and the Environment Department must publish agreed versions of the final SIAR, endorsed Plan and (if relevant) Supplementary SIAR on ASA and Environment Department's websites (or any other appropriate website approved by the Environment Department).

11. Approval of actions

11.1 The Parties acknowledge that, under section 146B of the EPBC Act, the Commonwealth Minister may approve the taking of an action, or class of actions, in accordance with an endorsed Plan. The effect of this approval decision is that any actions or classes of actions approved under section 146B would not need further approval by the Commonwealth Minister under the EPBC Act if taken in accordance with the endorsed Plan and any conditions attached to the approval.

11.2 The Parties agree that an approval holder (or holders) may be named for any approval of actions, or classes of actions, granted under section 146B of the EPBC Act, noting that any approval may, by reference to the endorsed Plan, permit persons other than the named approval holder to undertake actions in accordance with the endorsed Plan.

11.3 If the Commonwealth Minister decides to approve the taking of an action, or class of actions, in accordance with the endorsed Plan, the Commonwealth Minister will:

a) provide a copy of draft conditions of approval to the named approval holder (or holders) for comment prior to finalising the conditions;

b) where appropriate, seek to ensure that conditions are outcomes-based;

c) where appropriate, identify in the condition a named approval holder with responsibility for the condition; and

d) where the approval relates to actions to be taken in a State or self-governing Territory, tell the appropriate Minister of the State or Territory that this Agreement has been made and what those actions are (in general terms).

11.4 The approval must be provided to anyone upon request. However, this may be subject to section 146B(4) of the EPBC Act.

12. Information management

12.1 The Parties agree to work cooperatively and share Information, to the fullest extent practical, so as to avoid duplication of work in undertaking the Strategic Assessment pursuant to this Agreement. The Parties commit to the following open access objectives with respect to Disclosable Information:

a) It is accessible and can be used by the community, business, government and other stakeholders.

b) It is published under an open licence (preferably Creative Commons licence), and available in the public domain.

c) It is published and described in a way that maximises discovery and reuse, preferably online, and in open formats.

d) It is published at the highest resolution and accuracy available.

e) It is released electronically at no cost to users or, if other formats are required, at minimal cost.

12.2 Nothing in this Agreement derogates from any legal obligation on the part of the Parties or their respective officers in respect of disclosure of information generally or the exercise of any legal right or privilege of the Parties in respect of disclosure of information as between the Parties, but otherwise the Parties will not disclose information other than Disclosable Information.

12.3 The exchange or submission of Information to the other Party will be subject to appropriate agreed information management practices and protocols.

12.4 The Parties agree to develop and maintain a data management plan to record the key pieces of data and information generated for the Strategic Assessment.

13. Governance arrangements and dispute resolution

13.1 The parties acknowledge that this Agreement is not legally binding but nevertheless agree to carry out their respective obligations and conduct themselves as though they were bound.

13.2 The Parties agree to use best endeavours to establish agreed timelines for arrangements to progress the Strategic Assessment in a cooperative, timely and efficient manner.

13.3 The Parties agree to use reasonable efforts to resolve by negotiation any problem that arises between them in the course of carrying out this Agreement (a Dispute). A Party will not terminate this Agreement as a result of a Dispute until the following process has been exhausted:

a) If there is a Dispute between the Parties concerning this Agreement, either Party may give written notice of the Dispute to the other party which will state that it is a notice under this clause and will specify the details of the Dispute concerned.

b) Management representatives (Director equivalent) of each of the Parties will endeavour in good faith to agree upon a resolution to a Dispute.

c) Should management representatives fail to reach a resolution within 10 business days of receipt of a notice of Dispute (or another timeframe agreed to in writing between the Parties), the Dispute will be taken to Senior Executive Service (SES) or equivalent representatives of each of the Parties.

d) SES representatives will endeavour in good faith to agree upon a resolution of the Dispute.

e) Should the SES representatives fail to resolve the Dispute within 10 business days (or other timeframe agreed to in writing between the Parties), the Dispute will be taken to the:

i. relevant Deputy Secretary of the Environment Department, and

ii. relevant Deputy Director General of ASA who will endeavour to reach agreement regarding the Dispute.

14. Variation

14.1 The Parties may vary this Agreement by written agreement only to the extent that the varied Agreement is consistent with the provisions of the EPBC Act.

14.2 Any variation to this Agreement shall be published on the Environment Department and ASA websites (or any other appropriate website approved by the Environment Department).

15. Termination

15.1 This Agreement may be terminated at any time by written notice from either Party, except where the termination relates to a dispute and the procedure at clause 13.2 has not been followed.

16. General

16.1 Any notice given by a Party under this Agreement must be in writing and hand delivered or sent by pre-paid post, or email, to the appropriate representative at the specified address. The appropriate representative for each Party is:

a) First Assistant Director General of the Division managing the construction of the Osborne, South Australia, Submarine Construction Yard, within ASA (First Assistant Director General SSN Construction Division, Building 26 Brindabella Business Park, Canberra ACT 2609)

b) Branch Head of the Branch managing the strategic assessment within the Environment Department (Assistant Secretary, Environment Assessments West (NT, SA & WA) Branch, Nature Positive Regulation Division, GPO 787 Canberra ACT 2601).

16.2 Notwithstanding any other provision of this Agreement, the Parties may disclose information about this Agreement, including personal information, where required or permitted to be disclosed by law.

16.3 Notwithstanding the power of the Commonwealth Minister to charge fees for assessing the relevant impacts of a controlled action by conducting a strategic

assessment under section 170CA of the EPBC Act, the understanding of the Parties is that no fees will be payable for this strategic assessment under Division 1 of Part 10 of the Act.

16.4 This Agreement may be executed in counterparts. All executed counterparts constitute one document.

Signatures

SIGNED by delegate of the Commonwealth Minister for the Environment:

Rachel Parry
Acting Deputy Secretary
Department of Climate Change, Energy, the Environment and Water

Kerry Smith

Name of Witness

Signature

Signature of Witness

24/11/2023

Date

SIGNED by the Australian Submarine Agency:

Jonathan Mead, AO
Vice Admiral, Royal Australian Navy
Director-General
Australian Submarine Agency

DAVID HALLINAN

Name of Witness

Signature

Signature of Witness

22 November 2023

Date

Attachment 1: Indicative map of the Strategic Assessment Area

***Figure 1**: indicative map of the Strategic Assessment Area in and around the Osborne Submarine Construction Yard on the Lefevre Peninsula, Osborne, South Australia.*

Attachment 2: Endorsement Criteria for the Plan (Clause 10)

In determining whether or not to endorse the draft Plan, the Commonwealth Minister may consider the following criteria.

General

1) In determining whether they are satisfied that the SIAR adequately addresses the Impacts to which this agreement relates, the Commonwealth Minister must have regard to the extent of which the draft Plan meets the objectives of the EPBC Act, including how it:
   a) protects those aspects of the environment that are Protected Matters under Part 3 of the EPBC Act;
   b) promotes ecologically sustainable development (as per section 3A of the EPBC Act);
   c) promotes the conservation of biodiversity and provides for the protection and conservation of heritage;
   d) promotes a cooperative approach to the protection and management of the environment; and
   e) assists in the cooperative implementation of Australia's international environmental responsibilities.

Scope

2) The Plan will:
   a) describe how the Plan is to operate;
   b) use plain English and be written in a way that assists readers who do not have background in or detailed knowledge of the EPBC Act;
   c) provide a named approval holder (or holders);
   d) describe the role and responsibilities of the named approval holder (or holders), the Environment Department and other relevant agencies;
   e) define the action or classes of actions that have been assessed in the SIAR, including how these are related to development activities regulated and/or managed under State or Territory legislative requirements;
   f) define persons who can take an action under the Plan;
   g) define the timeframe of the Plan;
   h) define the spatial area of the strategic assessment;
   i) define the class of action boundary; and
   j) define matters excluded from the scope of the Plan, including but not limited to:
      i) actions that have already been found not to be controlled actions under section 75(1) of the EPBC Act;

ii) actions that have already been approved under section 133(1) of the EPBC Act; and

iii) actions not assessed or specifically excluded from the Plan.

Environmental, administrative and regulatory strategic assessment outcomes

3) The Plan will:

a) identify the Protected Matters that are relevant to the Plan;

b) summarise the expected duration, extent and likely severity of the Impacts of implementing the Plan on Protected Matters;

c) demonstrate how the cumulative Impacts to which this agreement relates identified in the SIAR will be avoided and mitigated;

d) provide for appropriate offsets in accordance with the *EPBC Act Environment Offsets Policy*[2], in the event that impacts to which this agreement relates cannot be fully avoided or mitigated;

e) define clear and measurable outcomes and commitments for the management and conservation of Protected Matters that are relevant to the Plan, including specific, measurable, achievable, relevant and timely performance indicators to demonstrate progress towards achieving these outcomes and commitments; and

f) define clear and measurable outcomes and commitments for the achievement of administrative and regulatory efficiencies, including specific, measurable, achievable, relevant and timely performance indicators to demonstrate progress towards achieving these outcomes and commitments.

Implementation and Assurance

4) The Plan must commit to, and outline, an effective and efficient:

a) implementation framework that:

i) describes a verification process to administer and track the use of the Part 10 approval by persons who are undertaking an action in accordance with the endorsed Plan;

ii) ensures persons undertaking actions under the Part 10 approval are informed of, and understand, their obligations under the endorsed Plan and approval;

iii) details how outcomes and commitments for protected matters and regulatory and administrative efficiencies will be monitored, documented, delivered, and adequately resourced throughout the life of the Plan; and

[2] As amended from time to time, or any other Commonwealth policy relating to offsets that replaces this policy.

iv) details all governance arrangements including the roles and responsibilities of the Parties and the named approval holder (or holders), including in the post approval phase, for the implementation of the Plan and Part 10 approval.

b) assurance framework that:

i) outlines how the named approval holder (or holders) will monitor, evaluate, review, audit and adaptively manage the effectiveness of proposed regulatory, administrative and protected matter outcomes, commitments and approval conditions, including a process for auditing and reporting to provide transparency for stakeholders; and

ii) identifies the timing and frequency of all assurance activities.

c) process for adaptive management and corrective action;

d) process for data management and sharing of data (in line with any arrangement for handling sensitive and classified information); and

e) process for stakeholder engagement (including with the Commonwealth).

Attachment 3: Strategic Assessment Scope

The Strategic Assessment for the Osborne Submarine Construction Yard (SCY) will include construction and operation of the SCY as defined below.

Construction of the Osborne SCY is defined to include:

- Early civil works;
- Site wide civil works;
- Construction of office accommodation, amenities and industrial facilities;
- Construction of marine facilities, including a wet basin and wharf; and
- Dredging of the Port River to support the construction of marine infrastructure and initial dredging to allow the transport of the submarine from the Osborne SCY to open water.

Operation of the Osborne SCY is defined to include:

- Processing of raw steel material to manufacture submarine pressure hull, large structures and small to medium sized components;
- General steel processing including cutting, forming, welding and non-destructive evaluation;
- General and specialist machining in support of fabrication and outfitting;
- Outfitting of submarine sections and other structures with welded components such as submarine decks and fixed pipework;
- Outfitting units and other structures with electrical, mechanical and piping components;
- Assembly, testing, commissioning and services installation in support of combat system integration;
- Contained (or temporarily contained) abrasive blasting of units;
- Application of protective paint coatings;
- Manufacture of pipe and electrical components;
- Assembly, testing and commissioning of the nuclear propulsion system;
- Consolidation of large submarine sections into a complete submarine;
- Submarine system testing and set-to-work activities;
- Testing and commissioning of the submarine will utilise river water cooling;
- Pre-commissioning testing and contractor sea trials of the completed submarine;

- Use supporting facilities:
  - Guard houses;
  - Car parking;
  - Warehousing;
  - Office accommodation;
  - Health centre;
  - Data centre and general Information and Communication Technology services;
  - Sleeping quarters; and
  - General amenities.
- Temporary storage of low-level waste;
- Routine dredging to allow the transport of the submarine from the Osborne SCY to open water; and
- It is expected that further construction will be required at Osborne SCY during the life of the approval. These activities may include decommissioning, dismantling, recycle and or refurbishment of existing facilities; and are likely to include further construction.

The following is considered out of scope of the Strategic Assessment for the Osborne SCY:

- The operation, sustainment and decommissioning of the submarines built at the Osborne SCY is considered out of scope of the Strategic Assessment and will be managed via separate environmental assessment processes and approvals as necessary.
- The reactor power module will be sealed and delivered to Osborne SCY for assembly into the nuclear propulsion system. The manufacture and delivery of the reactor power module is considered outside of the scope of the Strategic Assessment, however the assembly into the submarine is included.
- Australia has committed to the disposal of low-level radioactive waste and the nuclear reactor and, this facility would be on Defence land, current or future. This facility is considered outside the scope of the Strategic Assessment and will be managed via separate environmental assessment processes and approvals as necessary.

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (Cth)

Part 10 Strategic Assessment

Section 146 Agreement

Variation Agreement (No.1) to Agreement to undertake a Strategic Assessment of the impacts of a Plan for actions to be taken in the Strategic Assessment Area on matters protected by Part 3 of the EPBC Act.

between

THE COMMONWEALTH MINISTER FOR THE ENVIRONMENT AND WATER

and

THE AUSTRALIAN SUBMARINE AGENCY

Parties

The Parties to this Agreement are:

The Commonwealth Minister for the Environment and Water

and

The Australian Submarine Agency

Background

A. On 24 November 2023, the Commonwealth Minister for the Environment and the Australian Submarine Agency entered into a Strategic Assessment Agreement (**SAA**) under section 146 of the *Environment Protection and Biodiversity Protection Act 1999 (Cth).*

B. Pursuant to clause 14 of the SAA, the Parties have agreed to vary the SAA in accordance with the terms of this Agreement. The new text and new figures are set out in this Agreement.

Agreed provisions

1. Commencement of agreement

1.1 This Agreement will commence on the date on which it is signed by the last party.

2. Definitions

2.1 Unless the context indicates otherwise, in this Agreement the definitions, meanings and terms in the SAA apply to this Agreement including its attachments.

2.2 In this Agreement references to the singular include the plural, subject to any contrary intention.

3. Variation of the SAA

3.1 With effect from the commencement of this Agreement, the SAA is varied as follows:

a) Delete paragraph (b) of the definition of Supplementary SIAR on page 5 from the SAA and replace it with: "(b) *sets out how comments have been addressed through modification/s to the SIAR, if any, following the public comment period on the draft SIAR".*

b) Delete clause 5.2(d) from the SAA and replace it with: *"(d) Centralisation and coordination of public consultation periods on the draft SIAR, to be managed by ASA".*

c) Delete clause 6.5 from the SAA and replace it with: *"6.5 The processes for the review of the draft Plan are detailed at clause 8, the processes for assessing the suitability of the Plan are at clause 9, and the established criteria for endorsement of the Plan by the Commonwealth Minister are at clause 10".*

d) Delete clause 8.4 from the SAA and replace it with: "8.4 *Following completion of the process set out in clauses 8.1 – 8.2 of this Agreement, ASA will publish the draft SIAR, and by notice invite public comment on the draft SIAR. ASA must ensure that the notification:*

a) *is posted on the ASA website (or any other appropriate website approved by the Environment Department) at a minimum for the period of public consultation specified by the Commonwealth Minister (of at least 28 days);*

b) *is published in a national daily newspaper on the first day of the period mentioned in clause 8.4(a);*

c) *invites public comment on the draft SIAR for the period mentioned in clause 8.4(a); and*

d) *mentions:*

i. *that the draft SIAR is available for public comment;*

ii. *the period for public comment specified by the Commonwealth Minister;*

iii. *the provision of the EPBC Act that requires the draft SIAR to be published (i.e. section 146(2)(b));*

iv. *where and how copies may be obtained in an electronic and hard copy form without charge or at a reasonable cost;*

v. *contact details for obtaining further information, including reasonable access for persons with special needs; and*

vi. *the address to which public comments should be provided."*

e) Delete Attachment 1 from the SAA (indicative map) and replace it with Attachment 1 to this Agreement.

f) Delete Attachment 3 from the SAA (strategic assessment scope) and replace it with Attachment 2 to this Agreement.

4. Counterparts

4.1 This Agreement may be executed in any number of counterparts, each of which may be executed electronically or in handwriting; and will be deemed an original whether kept in electronic or paper form, and all of which taken together will constitute one and the same document.

Execution

SIGNED by authorised delegate of the Commonwealth Minister for the Environment and Water:

Rachel Parry
Deputy Secretary
Department of Climate Change, Energy, the Environment and Water

Signature

19 December 2024

SIGNED for and on behalf of the Australian Submarine Agency:

Jonathan Mead, AO
Vice Admiral, RAN
Director-General
Australian Submarine Agency

Tim HODGSON

Digitally signed by Tim HODGSON
Date: 2024.12.19 14:20:50 +11'00'

Signature

December 2024

Attachment 1: Indicative map of the Strategic Assessment Area

***Figure 1**: indicative map of the Strategic Assessment Area in and around the Osborne Submarine Construction Yard on the Lefevre Peninsula, Osborne, South Australia.*

Attachment 2: Strategic Assessment Scope

The Strategic Assessment for the Osborne Submarine Construction Yard (SCY) will include construction and operation of the SCY as defined below.

Construction of the Osborne SCY is defined to include:

- Early civil works;
- Site wide civil works;
- Construction of office accommodation, amenities and industrial facilities to support the operation of the Osborne SCY;
- Construction of marine facilities, including a wet basin and wharf; and
- Dredging of the Port River to support the construction of marine infrastructure and initial dredging to allow the transport of the submarine from the Osborne SCY to open water.

Operation of the Osborne SCY is defined to include:

- Processing of raw steel material to manufacture submarine pressure hull, large structures and small to medium sized components;
- General steel processing including cutting, forming, welding and non-destructive evaluation;
- General and specialist machining in support of fabrication and outfitting;
- Outfitting of submarine sections and other structures with welded components such as submarine decks and fixed pipework;
- Outfitting units and other structures with electrical, mechanical and piping components;
- Assembly, testing, commissioning and services installation in support of combat system integration;
- Contained (or temporarily contained) abrasive blasting of units;
- Application of protective paint coatings;
- Manufacture of pipe and electrical components;
- Integration of the power module into the nuclear steam-raising plant;
- Consolidation of large submarine sections into a complete submarine;
- Submarine system testing and set-to-work activities, excluding active commissioning;

- Use supporting facilities:
  - Guard houses;
  - Car parking;
  - Warehousing;
  - Office accommodation;
  - Health centre;
  - Data centre and general Information and Communication Technology services;
  - Sleeping quarters; and
  - General amenities.
- Routine dredging to allow the transport of the submarine from the Osborne SCY to open water; and
- It is expected that further construction will be required at Osborne SCY during the life of the approval. These activities may include decommissioning, dismantling, recycle and or refurbishment of existing facilities; and are likely to include further construction.

The following is considered out of scope of the Strategic Assessment for the Osborne SCY:

- The operation, sustainment and decommissioning of the submarines built at the Osborne SCY is considered out of scope of the Strategic Assessment and will be managed via separate environmental assessment processes and approvals as necessary.
- The reactor power module will be sealed and delivered to Osborne SCY for integration into the nuclear steam-raising plant. The manufacture, delivery and subsequent operation of the reactor power module is considered outside of the scope of the Strategic Assessment, however the assembly into the submarine is included.
- As a responsible nuclear steward, Australia will manage all radioactive waste generated by Australia's nuclear powered submarine program. The disposal pathway for such radioactive waste is considered outside the scope of the Strategic Assessment and will be managed via separate environmental assessment processes and approvals as necessary.
- Development associated with the 'Existing Naval Shipyard Buildings' in the outlined area in Figure 2 below. This includes:
  i. Alterations and additions to the Existing Naval Shipyard Buildings;
  ii. Industrial buildings to manufacture componentry; or
  iii. Any related ancillary development.

***Figure 2**: Existing Naval Shipyard Buildings within the Strategic Assessment Area on the Lefevre Peninsula, Osborne, South Australia.*

Appendix B

Terms of Reference

TERMS OF REFERENCE FOR A STRATEGIC IMPACT ASSESSMENT REPORT FOR THE OSBORNE SUBMARINE CONSTRUCTION YARD UNDER THE EPBC ACT

On 24 November 2023 the Australian Submarine Agency (**ASA**) entered into an agreement (**the Agreement**) with the Commonwealth Minister for the Environment (**the Commonwealth Minister**), pursuant to section 146(1) of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EPBC Act**), to undertake a strategic assessment of the impacts of actions or classes of actions to be taken to construct and operate a Submarine Construction Yard in a defined area on the Lefevre Peninsula in Adelaide, South Australia (**Strategic Assessment Area**), on matters protected by a provision of Part 3 of the EPBC Act (**Protected Matters**).

The Agreement requires the ASA to, among other requirements, prepare the following documents which will be considered by the Commonwealth Minister:

- The Strategic Assessment Plan (**the Plan**). The Plan will describe:
    - the actions, or classes of actions that are to be undertaken to construct and operate the Osborne Submarine Construction Yard in the Strategic Assessment Area;
    - the outcomes that will be achieved for Protected Matters, to which actions under the Plan relate, in accordance with the requirements of the EPBC Act.
- The Strategic Impact Assessment Report (**the Report**). The Report will include:
    - a description of the environment to which actions under the Plan relate;
    - an assessment of the impact of implementing the Plan on Protected Matters; and,
    - details of how likely or potential impacts will be avoided, mitigated and offset (where necessary or appropriate) to make sure that Protected Matters are protected and managed in the long term.

These Terms of Reference specify what must be included in the Report to satisfy the Commonwealth Minister's requirements under Part 10 of the EPBC Act.

Steps or processes in the assessment of the impacts of the actions to be taken in accordance with the Plan under Part 10 of the EPBC Act may be done concurrently with the South Australian impact assessed development assessment process under the *Planning, Development and Infrastructure Act 2016* (SA) as provided for in Clause 5 of the Agreement.

1. DEFINITIONS

1.1. Unless otherwise stated, the definitions, meanings, and terms in the EPBC Act apply to these Terms of Reference.

1.2. In these Terms of Reference:

Agreement means the Strategic Assessment Agreement entered into by the Parties on the 24 November 2023 and includes any attachments and any variations agreed by the Parties.

Approval Holder means the person or entity responsible for implementing the endorsed Plan identified and granted such status by an approval decision and ensuring the conditions attached to the strategic assessment approval are met, including the delivery of commitments for the protection of the Protected Matters.

Commonwealth Minister means the Minister with responsibility for administering the EPBC Act and includes a person to whom that Minister's power under section 146(1) of the EPBC Act has been delegated.

Environment means 'environment' as defined in section 528 of the EPBC Act. It includes:

a) ecosystems and their constituent parts including people and communities ('ecosystem' is defined in the EPBC Act as 'a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functioning unit'); and

b) natural and physical resources; and

c) the qualities and characteristics of locations, places and areas; and

d) heritage values of places ('heritage value' is defined in the EPBC Act as including 'the place's natural and cultural environment having aesthetic, historic, scientific or social significance, or other significance, for current and future generations of Australians.' 'Indigenous heritage value' is defined as meaning 'a heritage value of the place that is of significance to Indigenous persons in accordance with their practices, observances, customs, traditions, beliefs or history'); and

e) the social, economic and cultural aspects of a thing mentioned in paragraph a), b), c) or d).

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

Parties means the ASA and the Commonwealth Minister.

Plan means the documentation (which constitutes a 'policy, plan or program' pursuant to section 146 of the EPBC Act) to be prepared by ASA that describes the actions or classes of actions that are to be undertaken to construct and operate the Osborne Submarine Construction Yard.

Protected Matter means a matter protected by a provision of Part 3 of the EPBC Act. The specific matter protected by each provision is set out in section 34 of the EPBC Act.

Report means the Strategic Impact Assessment Report to be developed to assess the impact of implementing the Plan.

Strategic Assessment Area means the area displayed within the Strategic Assessment Area in Attachment 1 of the Agreement (Figure 1).

2. PURPOSE OF THE REPORT

2.1. The purpose of the Report is to assess the impacts of implementing the Plan, including the impacts of actions or classes of actions proposed under the Plan on all relevant Protected Matters.

2.2. The Report will enable the Commonwealth Minister to evaluate the ability of the Plan to ensure the protection and conservation of all relevant Protected Matters.

2.3. The Report must demonstrate how the Plan has been developed to meet the requirements of the Agreement, including the endorsement criteria (Attachment 2 of the Agreement).

3. DESCRIPTION OF THE PLAN

3.1. The Report must describe and summarise the key elements of the Plan to which the Agreement relates, including:

a) A summary of the Plan's overall purpose, key elements, spatial extent and timeframes, including how long the Plan is to be in effect.

b) The conservation outcomes and commitments to be delivered for Protected Matters, including measures to avoid the impacts of implementing the Plan.

c) The conservation outcomes and commitments to be delivered for Protected Matters including measures to mitigate the impacts of implementing the Plan.

d) If a significant residual impact is assessed, measures to be undertaken to offset the impacts of implementing the Plan.

e) The identification of an action or classes of actions to be taken under the Plan over the life of the Plan.

f) To avoid doubt, the identification of relevant actions or classes of actions that are beyond the scope of the Plan.

g) The relationship of the Plan to other relevant Commonwealth and South Australian State policies, laws (including international treaties), plans, guidelines, commitments, regulations and legislation (including environmental approvals).

h) The legal and administrative frameworks that will be implemented to ensure compliance with the Plan, and the persons and authorities responsible for the implementation of and compliance with the Plan, including, but not limited to, breach protocols or reporting/notification requirements.

i) Management and funding arrangements for implementing the Plan and complying with any approval given with respect to the Plan under Part 10 of the EPBC Act, including but not limited to a description of the mechanism(s) that will be used by the Approval Holder(s) to verify the persons who are proposing to take an action in accordance with the Plan, and to inform those persons of any relevant obligations and conditions of the approval.

3.2. The Report must describe the need and justification for the Plan, including the environmental, social and economic drivers for its implementation.

3.3. The Report must describe the decision-making framework used in developing the outcomes and commitments for the Plan. It should identify the alternative options

that were evaluated to reach the draft Plan, and why these options were not supported.

3.4. The Report must describe how the principles of ecologically sustainable development are considered and incorporated into the development and implementation of the Plan.

4. DESCRIPTION OF PROTECTED MATTERS THAT RELATE TO THE PLAN

4.1. The Report must describe the nature of the Environment to which actions under the Plan relate. This must include, at a minimum:

a) A description and map of current and historical land use.

b) A description of the extent, type and quality of vegetation present.

c) A description of the condition of natural and physical resources, ecological processes, and current and plausible threatening processes.

d) A description of the landscape scale values, such as habitat connectivity, habitat fragmentation, and ecological processes.

e) A description of heritage values in the Strategic Assessment Area.

f) A map or maps of areas that are protected (including national parks, nature reserves, and known offset areas) under Commonwealth and/or South Australian State legislation.

4.2. The Report must identify and describe all Protected Matters to which actions under the Plan relate; including, but not limited to:

a) The location of any declared World Heritage properties and/or National Heritage places within or relevant to the Strategic Assessment Area, including a description of the associated heritage values (Part 3, Division 1, Subdivision A and AA).

b) A description of the ecological character of any Ramsar wetland within or relevant to the Strategic Assessment Area (including Ramsar wetlands within the same catchment as the Strategic Assessment Area) including the biological, physical and chemical components of the wetland ecosystem, and their interactions, which maintain the wetland and its products, functions, and attributes (Part 3, Division 1, Subdivision B).

c) A description of, and spatial information for EPBC Act-listed ecological communities found within or relevant to the Strategic Assessment Area, outlining their known and potential extents (in hectares), condition, listing status, threatening processes, habitat quality and landscape context (Part 3, Division 1, Subdivision C). The Report must also consider matters that are potentially eligible for listing as a result of inclusion in a final priority assessment listing held by the Commonwealth, or a recommendation to the Commonwealth Minister for listing by the Threatened Species Scientific Committee, prior to the Report being submitted.

d) A description of, and spatial information for listed threatened and/or migratory species within or relevant to the Strategic Assessment Area. Details are to include listing status, documented habitat type and documented or surveyed estimates of population size or abundance and distribution, habitat presence quality and area (in hectares), landscape context and existing threatening processes (Part 3, Division 1, Subdivision C and D). The Report must also consider matters that are potentially eligible for listing as a result of inclusion in a final priority assessment listing held by the Commonwealth, or a recommendation to the Commonwealth Minister for listing by the Threatened Species Scientific Committee, prior to the Report being submitted.

e) The identification of critical or important areas for Protected Matters, including consideration of the importance of areas of habitat, habitat connectivity, position in the landscape and areas likely to be important for maintaining ecological processes.

f) Maps detailing habitat type and extent for the listed threatened species, migratory species and ecological communities that are known, likely or may occur within or relevant to the Strategic Assessment Area.

g) A description of the Environment within or relevant to the Strategic Assessment Area (Part 3, Division 1, Subdivision E and F, and Part 3, Division 2, Subdivision A and B).

h) Justification as to the suitability of the methodologies, surveys or processes used to identify/estimate the presence/absence and potential extent of Protected Matters within the Strategic Assessment Area.

i) Details of any information gaps or uncertainties in identifying the Protected Matters found within the Strategic Assessment Area, including any further studies or measures required to address these gaps.

4.3. The Report, in identifying the Protected Matters potentially impacted by the Plan, must:

a) Be compiled and assessed with regard to relevant Commonwealth statutory documents and policies, including but not limited to: recovery plans, conservation advice, threat abatement plans and referral guidelines.

b) Be compiled and assessed in accordance with the mitigation hierarchy (in line with the *EPBC Act Environmental Offsets Policy*, 2012[1]).

c) Describe how uncertainty will be dealt with in accordance with the precautionary principle, up to and including worst-case scenarios.

5. ASSESSMENT OF THE IMPACTS OF IMPLEMENTING THE PLAN ON PROTECTED MATTERS

[1] Published by the former Department of Sustainability, Environment, Water, Population and Communities. As amended from time to time, or any other Commonwealth policy that replaces this policy.

5.1. The Report must describe and assess the likely direct, indirect and cumulative impacts on Protected Matters of implementing the Plan. The detail provided will be proportionate to the level of likely severity of impacts to each Protected Matter in consideration of intensity, scale, duration and frequency of the potential impact.

5.2. The Report must describe and provide justification for the method used to assess impacts to all Protected Matters arising from actions proposed to be taken under the Plan. The method must:

a) Be appropriate for assessment at the temporal and spatial scales as applicable to the proposed actions and consider the intensity, scale, duration and frequency of the potential impact of implementing the Plan.

b) Rely on the best available information including by collection of site-specific data (e.g. field surveys).

c) Discuss uncertainty, including by reference to the data and information sources relied upon. Identify where there is a high degree of uncertainty (in line with the precautionary principle).

d) Detail the approach to the assessment of impacts, including, a detailed risk assessment of the Plan, that details potential impacts, their likelihood and consequence.

5.3. The Report must identify:

a) The duration, extent, area and likely severity of the impacts of implementing the Plan.

b) How impacts to Protected Matters will be avoided.

c) How impacts to Protected Matters will be mitigated, including a description of mitigation measures that will be implemented and their likely effectiveness to reduce impacts to Protected Matters.

d) How residual impacts to Protected Matters that cannot be avoided or mitigated will be offset in accordance with the principles of the *EPBC Act Environmental Offsets Policy*, 2012[2].

e) The proposed funding arrangements and timeframes for the delivery of avoidance, mitigation and offset requirements.

f) Environmental outcomes and commitments for the management and conservation of Protected Matters for the life of the Plan.

5.4. The Report should also consider matters that are potentially eligible for listing as a Protected Matter as a result of inclusion in a final priority assessment listing held by the Commonwealth, or a recommendation to the Commonwealth Minister for listing by the Threatened Species Scientific Committee, prior to the Report being

[2] As above.

submitted, to ensure that all Protected Matters listed at the time of the endorsement decision have been considered.

5.5. The Report must provide evidence as to the adequacy and likely effectiveness of the environmental outcomes and commitments proposed in the Plan in conserving and managing Protected Matters. To do this, the Report must:

a) Demonstrate how the environmental outcomes and commitments will effectively protect and manage Protected Matters for the life of the Plan.

b) Demonstrate how environmental outcomes and commitments for Protected Matters are to be documented, delivered and adequately resourced throughout the life of the Plan.

c) Demonstrate the anticipated effectiveness of implementation frameworks (including other permitting and future licencing requirements), funding arrangements and administrative processes to deliver the environmental outcomes and commitments proposed in the Plan.

d) Outline how the proposed environmental outcomes and commitments will be tracked and managed to improve their implementation, especially in situations where monitoring demonstrates the delivery of the outcomes and commitments is not leading to the effective management and conservation of Protected Matters.

e) Identify how new information relating to Protected Matters, including legislative changes, will be assessed and accounted for in the implementation of the Plan.

f) Provide evidence to demonstrate how the proposed outcomes and commitments will be enforced and administered to third-parties to ensure Protected Matters are managed and protected over the life of the Plan.

5.6. The Report must detail the plausible future climatic conditions of the Strategic Assessment Area in the assessment of impacts on Protected Matters of implementing the Plan (where such data exists). This should include, but not be limited to:

a) How changes in climate would affect the impacts of implementing the Plan on Protected Matters over time, and what (if any) effect this would have on the outcome for Protected Matters.

b) Discussion of loss, fragmentation, or drying of potential climate refugia for threatened species or communities as a result of the proposed Plan – consider the potential impacts of removing or otherwise impacting this climate refugia for the long-term survival of the species in the region.

c) Discussion of increased risk of fire as a result of the Plan under drier conditions and periods of extreme heat.

d) Discussion of changes in the frequency and intensity of extreme weather events that may exacerbate impacts to Protected Matters within and downstream of the Strategic Assessment Area.

e) Inclusion of different climate scenarios in any site water management modelling, including flooding, storm surge events and sea level rise.

5.7. The Report must consider the extent to which the impacts from actions proposed under the Plan on Protected Matters would be consistent with the requirements and objectives of the EPBC Act (in accordance with Part 10, Division 1, Subdivision C), including but not limited to:

a) To the extent the Plan relates to a declared World Heritage property, an assessment of how approving an action or class of actions to be taken in accordance with the Plan, if endorsed, would not be inconsistent with:

i. Australia's obligations under the World Heritage Convention; or

ii. the Australian World Heritage management principles; or

iii. a plan that has been prepared for the management of the declared World Heritage property under section 316 or as described in section 321 (see section 146G of the EPBC Act).

b) To the extent the Plan relates to a National Heritage place, an assessment of how approving an action or class of actions to be taken in accordance with the Plan, if endorsed, would not be inconsistent with:

i. the National Heritage management principles; or

ii. an agreement to which the Commonwealth is a party in relation to the National Heritage place; or

iii. a plan that has been prepared for the management of the National Heritage place under section 324S or as described in 324X (see section 146H of the EPBC Act).

c) To the extent the Plan relates to a declared Ramsar wetland, an assessment of how approving an action or class of actions to be taken in accordance with the Plan, if endorsed, would not be inconsistent with Australia's obligations under the Ramsar Convention (see section 146J of the EPBC Act).

d) To the extent the Plan relates to a listed threatened species or ecological community:

i. an assessment of how approving an action or class of actions to be taken in accordance with the Plan, if endorsed, would not be inconsistent with:

a. Australia's obligations under:

i. The Biodiversity Convention; or

ii. The Apia Convention; or

iii. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); or

b. A recovery plan for the species or community or a threat abatement plan; and

ii. How regard has been given to any relevant approved conservation advice for the species or community (see section 146K of the EPBC Act).

e) To the extent the Plan relates to a listed migratory species, an assessment of how approving an action or class of actions to be taken in accordance with the Plan, if endorsed, would not be inconsistent with whichever of the following conventions or agreements because of which the species is listed:

i. The Bonn Convention;

ii. The China - Australia Migratory Bird Agreement (CAMBA);

iii. The Japan - Australia Migratory Bird Agreement (JAMBA);

iv. An international agreement approved under subsection 209(4) of the EPBC Act (see section 146L of the EPBC Act).

f) To the extent the Plan relates to approving an action or class of actions listed in section 146M of the EPBC Act, an assessment of how approving such an action or class of actions to be taken in accordance with the Plan, if endorsed, would not be inconsistent with section 146M.

6. IMPLEMENTATION AND ASSURANCE FRAMEWORK

6.1. As established in the Agreement, The Plan must include:

a) An implementation framework (Endorsement Criteria 4a) that describes how the Plan will be efficiently and effectively implemented (including how outcomes and commitments for the conservation of Protected Matters set out in the Plan will be achieved); and

b) An assurance framework (Endorsement Criteria 4b) that describes how the Approval Holder will address and adaptively manage the effectiveness of proposed regulatory, administrative and Protected Matter outcomes.

6.2. The Report must assess the effectiveness and efficiency of the proposed implementation framework and assurance framework to explain how:

a) If applicable, the administrative process that will be used to track the use of the Commonwealth Minister's Part 10 Approval by persons who are undertaking an action in accordance with the Plan.

b) Third parties undertaking actions under the Commonwealth Minister's Part 10 Approval are informed of, and understand, their obligations under the Plan and approval.

c) Outcomes and commitments for Protected Matters will be monitored, documented, delivered, and adequately resourced throughout the life of the Plan.

d) Governance arrangements will be developed to implement the Commonwealth Minister's Part 10 Approval, including the roles and responsibilities of the Parties and the named Approval Holder throughout the life of the Plan.

e) The named Approval Holder will monitor, evaluate, review and manage the effectiveness of proposed regulatory, administrative and Protected Matter outcomes, commitments and approval conditions; this must include a process for auditing and reporting to provide transparency for stakeholders.

7. EVALUATION OF THE OVERALL OUTCOMES OF THE PLAN

7.1. The Report must evaluate the overall conservation commitments and environmental outcomes for Protected Matters, taking into account likely impacts to Protected Matters from implementing the Plan. The evaluation must include:

a) The extent to which Protected Matters are represented in the Strategic Assessment Area.

b) The extent to which Protected Matters are represented in areas to be protected or managed under the Plan.

c) The extent to which any areas to be protected or managed under the Plan will provide for the long-term protection of each Protected Matter within the Strategic Assessment Area, including maintaining the function of key ecosystem services needed for the viability of Protected Matters.

d) Whether there will be serious and irreversible impacts to any Protected Matters.

e) The extent to which the outcomes and commitments proposed under the Plan address vulnerabilities of Protected Matters including climate change projections modelled under plausible climate change scenarios.

f) The likely effectiveness of the outcomes and commitments of the Plan in protecting and managing Protected Matters and any risks and uncertainties.

g) An assessment of how the Plan meets the endorsement criteria, as set out in Attachment 2 of the Agreement.

h) An analysis and justification, with regards to matters the Commonwealth Minister must consider, as to why the ASA considers that the impacts to Protected Matters of implementing the Plan are acceptable.

7.2. The Report must evaluate how the Plan meets the objectives of the EPBC Act.

8. ADDRESSING UNCERTAINTY AND RISK

8.1. The Report must identify key uncertainties and risks associated with implementing the Plan, responses to these and proposed adaptations to changing circumstances. Key uncertainties may include:

a) Knowledge gaps in scientific understanding and responding to new knowledge.

b) Assumptions made in assessing potential impacts and benefits.

c) How changes to Commonwealth, South Australian State and relevant local government legislation, policies, plans and advice are to be accounted for in the management of the Strategic Assessment Area.

d) The capability and capacity of the Approval Holder to make sure that the Plan is implemented.

9. INFORMATION SOURCES

9.1. The Report must identify:

a) The sources of information and data relied upon including the reliability and currency of the data.

b) Any other relevant supporting information.

9.2. If sources of information, data, or other relevant supporting information are publicly available, the Report will provide details of where they are publicly available.

Appendix C

Terms of Reference index

Table C-1 *Terms of Reference index*

Clause	Details	Response	Reference in The Report
1. Definitions			
1.1.	Unless otherwise stated, the definitions, meanings, and terms in the EPBC Act apply to these Terms of Reference.	Definitions, meanings and terms in the EPBC Act have been used where applicable. Any other terms used are included in the glossary.	Glossary
1.2.	In these Terms of Reference:		
	Agreement means the Strategic Assessment Agreement entered into by the Parties on 24 November 2023 and includes any attachments and any variations agreed by the Parties.	The Strategic Assessment Agreement is provided in Appendix A for reference.	Appendix A
	Approval Holder means the person or entity responsible for implementing the endorsed Plan identified and granted such status by an approval decision and ensuring the conditions attached to the Strategic Assessment approval are met, including the delivery of commitments for the protection of the Protected Matters.	The term 'Approval Holder(s)' is included in the glossary.	Glossary
	Commonwealth Minister means the Minister with responsibility for administering the EPBC Act and includes a person to whom that Minister's power under section 146(1) of the EPBC Act has been delegated.	The term 'Minister' is included in the glossary.	Glossary
	Environment means 'environment' as defined in section 528 of the EPBC Act. It includes:	The definition of the environment from the EPBC Act is included in the glossary. A description of the existing environment of the Strategic Assessment Area is included in Chapter 5.	Glossary Chapter 5
	a) ecosystems and their constituent parts including people and communities ('ecosystem' is defined in the EPBC Act as 'a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functioning unit'), and		
	b) natural and physical resources, and		
	c) the qualities and characteristics of locations, places and areas, and		
	d) heritage values of places ('heritage value' is defined in the EPBC Act as including 'the place's natural and cultural environment having aesthetic, historic, scientific or social significance, or other significance, for current and future generations of Australians.' 'Indigenous heritage value' is defined as meaning 'a heritage value of the place that is of significance to Indigenous persons in accordance with their practices, observances, customs, traditions, beliefs or history'), and		
	e) the social, economic and cultural aspects of a thing mentioned in paragraph a), b), c) or d).		

Clause	Details	Response	Reference in The Report
	EPBC Act means the Environment Protection and Biodiversity Conservation Act 1999 (Cth).	'EPBC Act' is included in the acronyms list.	Acronyms and abbreviations
	Parties means the ASA and the Commonwealth Minister.	The Parties to the Strategic Assessment Agreement are identified in Chapter 1.	Chapter 1, Section 1.2
	Plan means the documentation (which constitutes a 'policy, plan or program' pursuant to section 146 of the EPBC Act) to be prepared by ASA that describes the actions and classes of actions that are to be undertaken to construct and operate the Osborne Submarine Construction Yard.	'The Plan' is included in the glossary. A summary of the Actions and Classes of Actions of The Plan is provided in Chapter 3.	Chapter 3
	Protected Matter means a matter protected by a provision of Part 3 of the EPBC Act. The specific matter protected by each provision is set out in section 34 of the EPBC Act.	'Protected Matter' is included in the glossary. A summary of the relevant matters protected by a provision of Part 3 under the EPBC Act is provided in Chapter 2, with a full response to the table in section 34 of the EPBC Act included in Appendix D. Relevant Protected Matters to the assessment are identified in Chapter 5.	Glossary Chapter 2, Section 2.5 Appendix D Chapter 5
	Report means the Strategic Impact Assessment Report to be developed to assess the impact of implementing The Plan.	'The Report' is included in the glossary. This document is the Strategic Impact Assessment Report ('The Report').	Glossary
	Strategic Assessment Area means the area displayed within the Strategic Assessment Area in Attachment 1 of the Agreement (Figure 1).	'Strategic Assessment Area' is included in the glossary. A visual depiction of the Strategic Assessment Area is included as Figure 2.	Glossary Figure 2
2. Purpose of The Report			
2.1.	The purpose of The Report is to assess the impacts of implementing The Plan, including the impacts of actions and classes of actions proposed under The Plan on all relevant Protected Matters.	The Purpose of The Report is stated / confirmed in Chapter 1, and reflects the wording of the Terms of Reference.	Chapter 1, Section 1.3
2.2.	The Report will enable the Commonwealth Minister to evaluate the ability of the Plan to ensure the protection and conservation of all relevant Protected Matters	Matters required by the Terms of Reference, including the endorsement criteria are addressed in The Report as indicated. Requirements that the Minster must consider in relation to a Strategic Assessment under Subdivision C of the EPBC Act are included in Section 4.2.2.	Section 4.2.2
2.3.	The Report must demonstrate how The Plan has been developed to meet the requirements of the Agreement, including the endorsement criteria (Attachment 2 of the Agreement).	Details as to how The Plan addresses the requirements of the Strategic Assessment Agreement is summarised in Chapter 11 for reference.	Chapter 11, Section 11.3

Clause	Details	Response	Reference in The Report
3. Description of The Plan			
3.1.	The Report must describe and summarise the key elements of The Plan to which the Agreement relates, including:	Key elements of The Plan are included in sections of The Report as indicated.	See below
	a) A summary of The Plan's overall purpose, key elements, spatial extent and timeframes, including how long The Plan is to be in effect.	The following is provided in The Report (this document): – A summary of the need for and purpose of The Plan – Key elements of The Plan – The spatial extent of the Strategic Assessment Area, and general operational regions – Approximate timeframes for The Plan	Chapter 1 Chapter 3, Section 3.4 Chapter 3 Figure 2 Figure 5 Figure 12
	b) The conservation outcomes and commitments to be delivered for Protected Matters, including measures to avoid the impacts of implementing The Plan.	A summary of commitments and respective outcomes to manage potential impacts of The Plan on Protected Matters is included in Chapter 9. Whilst there are no specific areas within the Strategic Assessment Area to be protected under The Plan, mitigation measures will manage the potential impacts to the marine area. As outlined in Section 3.4.3, the preferred site has been selected for several reasons including the ability to avoid some potential environmental impacts due to the existing condition of the area. The outcomes and commitments in Chapter 9 detail how a cooperative approach to the protection and management of the environment will be achieved, including through engagement, governance arrangements and implementation and assurance. Mitigation measures outlined in Chapter 8 are to be implemented as part of delivering the outcomes and commitments of The Plan.	Chapter 9 Chapter 3, Section 3.4.3 Chapter 8

Clause	Details	Response	Reference in The Report
	c) The conservation outcomes and commitments to be delivered for Protected Matters including measures to mitigate the impacts of implementing The Plan.	A summary of commitments and respective outcomes for Protected Matters, including measures to mitigate the potential impacts of implementing The Plan is included in Chapter 9. Whilst there are no specific areas within the Strategic Assessment Area to be protected under The Plan, mitigation measures will manage the potential impacts to the marine area. As outlined in Section 3.4.3 the preferred site has been selected for several reasons including the ability to avoid some potential environmental impacts due to the existing condition of the area. The outcomes and commitments in Chapter 9 detail how a cooperative approach to the protection and management of the environment will be achieved, including through engagement, governance arrangements and implementation and assurance. Mitigation measures outlined in Chapter 8 are to be implemented as part of delivering the outcomes and commitments of The Plan.	Chapter 9 Chapter 3, Section 3.4.3 Chapter 8
	d) If a significant residual impact is assessed, measures to be undertaken to offset the impacts of implementing The Plan.	An assessment of the potential impacts to Protected Matters associated with the Actions and Classes of Actions of The Plan is included in Appendix H (Significance of Impact Assessments). The Plan has been assessed to be not likely to result in a significant residual impact to a Protected Matter. No formal offsets under the EPBC Act are proposed or required. If required at time of approval, a significant environmental benefit payment would be made to the South Australian Native Vegetation Fund for any reduction in seagrass resulting from The Plan (Section 6.9 – Clearing of vegetation).	Appendix H Chapter 6, Section 6.9
	e) The identification of an action or classes of actions to be taken under the Plan over the life of the Plan.	Actions and Classes of Actions to be undertaken to construct and operate the Submarine Construction Yard are described in Chapter 3.	Chapter 3
	f) To avoid doubt, the identification of relevant actions or classes of actions that are beyond the scope of the Plan.	Excluded actions that are not to be considered as part of The Plan are included in Chapter 3.	Chapter 3, Section 3.5
	g) The relationship of The Plan to other relevant Commonwealth and South Australian State policies, laws (including international treaties), plans, guidelines, commitments, regulations and legislation (including environmental approvals).	The legislative context associated with construction and operation of the Submarine Construction Yard is provided in Chapter 4.	Chapter 4

Clause	Details	Response	Reference in The Report
	h) The legal and administrative frameworks that will be implemented to ensure compliance with The Plan, and the persons and authorities responsible for the implementation of and compliance with The Plan, including, but not limited to, breach protocols or reporting / notification requirements.	Legal and administrative frameworks are provided in Chapter 6 for each impact factor, they are included under the heading 'Related legal and administrative framework', within each section. A summary of the overarching legislative process for the Strategic Assessment is included in Section 4.9. The Approval Holders are required to report and maintain compliance, as per the future conditions of approval, to: – The State agency responsible for permits and licensing (currently the South Australian Environmental Protection Authority) will be responsible for checking compliance with The Plan. – The regulator for nuclear safety. Chapter 10 provides a summary of the legal and administrative frameworks that will be implemented to for compliance with The Plan	Chapter 6 Section 4.9 Chapter 10
	i) Management and funding arrangements for implementing the Plan and complying with any approval given with respect to the Plan under Part 10 of the EPBC Act, including but not limited to a description of the mechanism(s) that will be used by the Approval Holder(s) to verify the persons who are proposing to take an action in accordance with the Plan, and to inform those persons of any relevant obligations and conditions of the approval.	Funding arrangements are briefly summarised in Chapter 3. Environmental management, and other requirements that will be obligations of third parties will be outlined through formal arrangements including contracts and lease agreements. This information and conceptual environmental management approach is outlined in Section 10.2.	Chapter 3, Section 3.4 Chapter 10, Section 10.2
3.2.	The Report must describe the need and justification for The Plan, including the environmental, social and economic drivers for its implementation.	Section 3.4 provides a description of the need and justification of The Plan including environmental, social and economic drivers. The primary driver for The Plan is the AUKUS tri-lateral agreement. The Strategic Assessment Area has been identified as the preferred site due to the location in an existing industrial precinct, with minimal impacts to vegetation and threatened species. The following is provided in The Report (this document): – The need and justification for The Plan in terms of national security – Environmental drivers in terms of appropriate siting in an appropriately zoned, and formerly cleared area of land – Relevant social and economic aspects (outlined in Section 7.2.6)	Chapter 3, Section 3.4 Chapter 7, Section 7.2.6

Clause	Details	Response	Reference in The Report
3.3.	The Report must describe the decision-making framework used in developing the outcomes and commitments for The Plan. It should identify the alternative options that were evaluated to reach the draft Plan, and why these options were not supported.	The decision-making framework used to develop the commitments is included in Chapter 9, as well as alternative options and reasons they were not pursued.	Chapter 9, Section 9.1
3.4	The Report must describe how the principles of ecologically sustainable development are considered and incorporated into the development and implementation of The Plan.	The principles of ecologically sustainable development, and how these measures will be considered for incorporation into The Plan are described in Chapter 4.	Chapter 4, Section 4.2
4. Description of Protected Matters that relate to The Plan			
4.1.	The Report must describe the nature of the Environment to which actions under The Plan relate. This must include, at a minimum:		
	a) A description and map of current and historical land use.	A description of current and historical land use is included in Chapter 5. Aerial photos of current land use are provided in **Section 6.1.1,** of the **Heritage Summary Report** (Appendix J). Historical aerial photos are provided in **Section 6.1.1** of the **Heritage Summary Report** (Appendix J).	Chapter 5 Appendix J
	b) A description of the extent, type and quality of vegetation present.	A description of vegetation is included in Chapter 5 and **Section 3.1,** of the **Biodiversity Values Report** (Appendix G).	Chapter 5 Appendix G
	c) A description of the condition of natural and physical resources, ecological processes, and current and plausible threatening processes.	A description of the existing environment is included in Chapter 5 and **Appendix F and Appendix G of the Biodiversity Values Report** (Appendix G).	Chapter 5 Appendix G
	d) A description of the landscape scale values, such as habitat connectivity, habitat fragmentation, and ecological processes.	A description of landscape values including connectivity is included in Chapter 5 and **Section 3.1.4** of the **Biodiversity Values Report** (Appendix G).	Chapter 5 Appendix G
	e) A description of heritage values in the Strategic Assessment Area.	A description of heritage values is included in Chapter 5 and the **Heritage Summary Report** (Appendix J).	Chapter 5 Appendix J
	f) A map or maps of areas that are protected (including national parks, nature reserves, and known offset areas) under Commonwealth and/or South Australian State legislation.	A visual depiction of protected areas under South Australian legislation is provided in Chapter 5, Figure 20	Chapter 5, Figure 20
4.2.	The Report must identify and describe Protected Matters to which actions under The Plan relate. This must include:	An assessment of matters protected by a provision of Part 3 under the EPBC Act, is provided in Appendix D.	Appendix D
	a) The location of any declared World Heritage properties and/or National Heritage places within or relevant to the Strategic Assessment Area, including a description of the associated heritage values (Part 3, Division 1, Subdivision A and AA).	This Protected Matter is not relevant to the Strategic Assessment as there are no National Heritage places within, or in the region of, the Submarine Construction Yard that are likely to be directly or indirectly impacted as a result of implementing The Plan.	N/A

Clause	Details	Response	Reference in The Report
	b) A description of the ecological character of any Ramsar wetland within or relevant to the Strategic Assessment Area (including Ramsar wetlands within the same catchment as the Strategic Assessment Area) including the biological, physical and chemical components of the wetland ecosystem, and their interactions, which maintain the wetland and its products, functions, and attributes (Part 3, Division 1, Subdivision B).	This Protected Matter is not relevant to the Strategic Assessment as there are no Ramsar wetlands of international importance within, or in the region of, the Submarine Construction Yard that are likely to be directly or indirectly impacted as a result of implementing The Plan.	N/A
	c) A description of, and spatial information for EPBC Act-listed ecological communities found within or relevant to the Strategic Assessment Area, outlining their known and potential extents (in hectares), condition, listing status, threatening processes, habitat quality and landscape context (Part 3, Division 1, Subdivision C). The Report must also consider matters that are potentially eligible for listing as a result of inclusion in a final priority assessment listing held by the Commonwealth, or a recommendation to the Commonwealth Minister for listing by the Threatened Species Scientific Committee, prior to the Report being submitted.	A description and map of coastal saltmarsh is included in **Section 3.1.2** of the Biodiversity Vaues Report (Appendix G), as well as **Table F1 and Figure F1** in **Appendix F of the Biodiversity Values Report** (Appendix G). A description of matters potentially eligible for listing is included in **Section 3.1.2,** of the **Biodiversity Values Report** (Appendix G).	Appendix G
	d) A description of, and spatial information for listed threatened and/or migratory species within or relevant to the Strategic Assessment Area. Details are to include listing status, documented habitat type and documented or surveyed estimates of population size or abundance and distribution, habitat presence quality and area (in hectares), landscape context and existing threatening processes (Part 3, Division 1, Subdivision C and D). The Report must also consider matters that are potentially eligible for listing as a result of inclusion in a final priority assessment listing held by the Commonwealth, or a recommendation to the Commonwealth Minister for listing by the Threatened Species Scientific Committee, prior to the Report being submitted.	A description of threatened species and migratory species relevant to the Strategic Assessment Area is included in Chapter 5. A description of species potentially eligible listing is included in **Section 3.2.1,** of the **Biodiversity Values Report** (Appendix G), for flora species, and **Section 4.3.1,** of the **Biodiversity Values Report** (Appendix G), for fauna species. A specific **Migratory Shorebird Survey** is included as **Appendix B of the Biodiversity Values Report** (Appendix G).	Chapter 5 Appendix G
	e) The identification of critical or important areas for Protected Matters, including consideration of the importance of areas of habitat, habitat connectivity, position in the landscape and areas likely to be important for maintaining ecological processes.	Critical or important areas for Protected Matters are associated with Protected areas in the region surrounding the Strategic Assessment Area. South Australian Protected areas are shown on Figure 20 and are considered important for connectivity and maintaining ecological processes. These areas have some overlap with the Strategic Assessment Area.	Figure 20
	f) Maps detailing habitat type and extent for the listed threatened species, migratory species and ecological communities that are known, likely or may occur within or relevant to the Strategic Assessment Area.	Maps depicting relevant habitat types and extents are included in: – **Figure 6,** of the **Biodiversity Values Report** (Appendix G) – **Figure 5,** in **Appendix B of the Biodiversity Values Report** (Appendix G)	Appendix G

Clause	Details	Response	Reference in The Report
	g) A description of the Environment within or relevant to the Strategic Assessment Area (Part 3, Division 1, Subdivision E and F, and Part 3, Division 2, Subdivision A and B).	The environmental context is described in Chapter 5, with further detail provided in the **Significance of Impact Assessments** (Appendix H).	Chapter 5 Appendix H
	h) Justification as to the suitability of the methodologies, surveys or processes used to identify / estimate the presence / absence and potential extent of Protected Matters within the Strategic Assessment Area.	The suitability of the assessment approach used is included in Chapter 2.	Chapter 2, Section 2.9
	i) Details of any information gaps or uncertainties in identifying the Protected Matters found within the Strategic Assessment Area, including any further studies or measures required to address these gaps.	Uncertainties in relation to Protected Matters are described in Chapter 5. Other assessments to be conducted, including for other approvals processes, are included in Chapter 4.	Chapter 5, Section 5.13 Chapter 4, Section 4.9
4.3.	The Report, in identifying the Protected Matters potentially impacted by The Plan, must:		
	a) Be compiled and assessed with regard to relevant Commonwealth statutory documents and policies, including but not limited to: recovery plans, conservation advice, threat abatement plans and referral guidelines.	A summary of information sources (which include the identified documents) used for the preparation of The Report are included in Section 2.6.2, with a full reference list included in Chapter 12. An overview of the recovery plans, conservation advice, threat abatement plans and referral guidelines used in the assessment is included in the Biodiversity Values Report (Appendix G). An analysis of the reference material reliability is included in Appendix E.	Chapter 12 Appendix E Appendix G
	b) Be compiled and assessed in accordance with the mitigation hierarchy (in line with the EPBC Act Environmental Offsets Policy, 2012).	The approach, which includes reference to the mitigation hierarchy is included in Chapter 2. Specific reference to the application of mitigation hierarchy is included in Section 2.7. Discussion on the application of the mitigation hierarchy to the Strategic Assessment is included in Chapter 8.	Chapter 2, Section 2.7 Chapter 8
	c) Describe how uncertainty will be dealt with in accordance with the precautionary principle, up to and including worst-case scenarios.	A description of uncertainties and how they have been addressed is included in Chapter 2.	Chapter 2, Section 2.8

Clause	Details	Response	Reference in The Report
5. Assessment of the impacts of implementing The Plan on Protected Matters			
5.1.	The Report must describe and assess the likely direct, indirect and cumulative impacts on Protected Matters of implementing the Plan. The detail provided will be proportionate to the level of likely severity of impacts to each Protected Matter in consideration of intensity, scale, duration and frequency of the potential impact.	The direct, indirect and cumulative impacts on Protected Matters are described in Chapter 6 for each impact factor and Chapter 7. An assessment of the potential impacts of The Plan on Protected Matters is included in Chapter 7. The **Significance of Impact Assessments** (Appendix H) provide additional details for specific Protected Matters with respect to the likely severity, intensity, scale, duration and frequency of the potential impact.	Chapter 6 Chapter 7 Appendix H
5.2.	The Report must describe and provide justification for the method used to assess impacts to all Protected Matters arising from actions proposed to be taken under the Plan. The method must:		
	a) Be appropriate for assessment at the temporal and spatial scales as applicable to the proposed actions and consider the intensity, scale, duration and frequency of the potential impact of implementing the Plan.	The suitability of the approach is included in Chapter 2.	Chapter 2, Section 2.9
	b) Rely on the best available information including by collection of site-specific data (e.g. field surveys).	A description of the supporting information used, including field surveys, is provided in Chapter 2.	Chapter 2, Section 2.2
	c) Discuss uncertainty, including by reference to the data and information sources relied upon. Identify where there is a high degree of uncertainty (in line with the precautionary principle).	A description of uncertainties and how they have been addressed is included in Chapter 2.	Chapter 2, Section 2.8
	d) Detail the approach to the assessment of impacts, including, a detailed risk assessment of the Plan, that details potential impacts, their likelihood and consequence.	The approaches taken for the assessment of potential impacts, and the risk assessment, are detailed in Chapter 2. A summary of the environmental risk assessment is included in Chapter 7, with the detailed risk assessment included within the **Environmental Risk Assessment** (Appendix K).	Chapter 2, Section 2.6 Chapter 7, Section 7.1 Appendix K
5.3.	The Report must identify:		
	a) The duration, extent, area and likely severity of the impacts of implementing The Plan.	An assessment of the potential impacts of The Plan on Protected Matters is included in Chapter 7. The **Significance of Impact Assessments** (Appendix H) provide additional details for specific Protected Matters with respect to the likely severity, intensity, scale, duration and frequency of the potential impact.	Chapter 7 Appendix H

Clause	Details	Response	Reference in The Report
	b) How impacts to Protected Matters will be avoided.	The approach taken for the assessment of potential impacts, including mitigation, is outlined in Chapter 2. Chapter 3 provides a description of the Actions and Classes of Actions including engineering controls to be implemented to avoid potential impacts. Mitigation measures proposed to control, manage, monitor and mitigate residual impacts are well-established and typically required to meet and maintain compliance with South Australian environmental legislation. Details on these measures to reduce or avoid potential impacts to Protected Matters are provided in Chapter 8.	Chapter 2, Section 2.6 Chapter 3 Chapter 8
	c) How impacts to Protected Matters will be mitigated, including a description of mitigation measures that will be implemented and their likely effectiveness to reduce impacts to Protected Matters.	The development of mitigation measures within a "SMART" framework is outlined in Chapter 2, and how they relate to the identified impact factors, is included in Chapter 8.	Chapter 2, Section 2.7 Chapter 8
	d) How residual impacts to Protected Matters that cannot be avoided or mitigated will be offset in accordance with the principles of the EPBC Act Environmental Offsets Policy, 2012.	The **Significance of Impact Assessments** (Appendix H) provide an assessment of potential impacts for specific Protected Matters with respect to the likely severity, intensity, scale, duration and frequency of the potential impact. The Plan has been assessed as unlikely to result in a significant residual impact to a Protected Matter, therefore no formal offsets under the EPBC Act are proposed or required. The mitigation hierarchy as described in the EPBC Act Offsets Policy (2012) is discussed in Chapter 2 and Chapter 8.	Appendix H Chapter 2, Section 2.7 Chapter 8
	e) The proposed funding arrangements and timeframes for the delivery of avoidance, mitigation and offset requirements.	A summary of the responsibility for funding and relevant timeframes is included in Section 3.4. The Plan has been assessed as unlikely to result in a significant residual impact to a Protected Matter, therefore no formal offsets under the EPBC Act are proposed or required (**Significance of Impact Assessments** in Appendix H).	Chapter 3, Section 3.4 Appendix H

Clause	Details	Response	Reference in The Report
	f) Environmental outcomes and commitments for the management and conservation of Protected Matters for the life of The Plan.	Commitments to achieve the stated outcomes are included in Chapter 9. The outcomes and commitments outlined in The Plan are intended to provide a framework of requirements for environmental management of the construction and operation of the Submarine Construction Yard. These outcomes and commitments are intended to manage potential impacts and provide for management of Protected Matters for the life of The Plan.	Chapter 9, Section 9.2
5.4.	The Report should also consider matters that are potentially eligible for listing as a Protected Matter as a result of inclusion in a final priority assessment listing held by the Commonwealth, or a recommendation to the Commonwealth Minister for listing by the Threatened Species Scientific Committee, prior to The Report being submitted, to ensure that all Protected Matters listed at the time of the endorsement decision have been considered.	A description of species potentially eligible listing is included in **Section 3.2.1,** the **Biodiversity Values Report** (Appendix G), for flora species, and **Section 4.3.1,** of the **Biodiversity Values Report** (Appendix G), for fauna species.	Appendix G
5.5.	The Report must provide evidence as to the adequacy and likely effectiveness of the environmental outcomes and commitments proposed in The Plan in conserving and managing Protected Matters. To do this, The Report must:		
	a) Demonstrate how the environmental outcomes and commitments will effectively protect and manage Protected Matters for the life of The Plan.	The commitments outlined in Chapter 9, demonstrate the approach to effectively manage potential impacts to Protected Matters for the life of The Plan. The outcomes and commitments are intrinsically linked to the implementation of the well-established mitigation measures described in Chapter 8. These mitigation measures are expected to be adequate to manage potential impacts to Protected Matters for the life of The Plan.	Chapter 9 Chapter 8
	b) Demonstrate how environmental outcomes and commitments for Protected Matters are to be documented, delivered and adequately resourced throughout the life of The Plan.	A description of the Implementation Plans to be developed for the delivery of The Plan, is provided in Chapter 10. Implementation Plans are to be developed following the endorsement of The Plan. The intent of outcomes and commitments in The Plan are intrinsically linked to the implementation of the well-established mitigation measures described in Chapter 8. These mitigation measures are expected to be adequate to manage potential impacts to Protected Matters for the life of The Plan.	Chapter 10 Chapter 8

Clause	Details	Response	Reference in The Report
	c) Demonstrate the anticipated effectiveness of implementation frameworks (including other permitting and future licencing requirements), funding arrangements and administrative processes to deliver the environmental outcomes and commitments proposed in the Plan.	A description of the Implementation Plans to be developed for the delivery of The Plan, is provided in Chapter 10. Implementation Plans are to be developed following the endorsement of The Plan. The effectiveness of the mitigation measures outlined in Chapter 8 has been well-established. The implementation of these measures is subject to other permitting and future licensing requirements. To provide certainty these measures are to be incorporated into the outcomes and commitments for the life of The Plan.	Chapter 10 Chapter 8
	d) Outline how the proposed environmental outcomes and commitments will be tracked and managed to improve their implementation, especially in situations where monitoring demonstrates the delivery of the outcomes and commitments is not leading to the effective management and conservation of Protected Matters.	A description of the Implementation Plans to be developed for the delivery of The Plan, including a monitoring and evaluation framework, is provided in Chapter 10. Implementation Plans are to be developed following the endorsement of The Plan.	Chapter 10
	e) Identify how new information relating to Protected Matters, including legislative changes, will be assessed and accounted for in the implementation of The Plan.	A description of the Implementation Plans to be developed for the delivery of The Plan, including adaptive management processes, is provided in Chapter 10.	Chapter 10
	f) Provide evidence to demonstrate how the proposed outcomes and commitments will be enforced and administered to third-parties to ensure Protected Matters are managed and protected over the life of The Plan.	A description of the Implementation Plans to be developed for the delivery of The Plan, is provided in Chapter 10. Implementation Plans are to be developed following the endorsement of The Plan. Formal agreements including contracts and leases will include requirements of outcomes and commitments including environmental management requirements (Section 10.2). These requirements would be monitored by the Approval Holders as part of the enforcement of the formal agreements.	Chapter 10, Section 10.2
5.6.	The Report must detail the plausible future climatic conditions of the Strategic Assessment Area in the assessment of impacts on Protected Matters of implementing The Plan (where such data exists). This should include, but not be limited to:		
	a) How changes in climate would affect the impacts of implementing The Plan on Protected Matters over time, and what (if any) effect this would have on the outcome for Protected Matters.	A summary of projected climate change is provided in Section 7.2.5, with further detail provided in the **Climate Review Report** (Appendix I).	Chapter 7, Section 7.2.5 Appendix I
	b) Discussion of loss, fragmentation, or drying of potential climate refugia for threatened species or communities as a result of the proposed Plan – consider the potential impacts of removing or otherwise impacting this climate refugia for the long-term survival of the species in the region.	Potential climate change outcomes as they relate to climate refugia are described in the **Climate Review Report** (Appendix I).	Appendix I

Clause	Details	Response	Reference in The Report
	c) Discussion of increased risk of fire as a result of The Plan under drier conditions and periods of extreme heat.	A discussion of fire risk as it relates to potential climate change outcomes is included in Chapter 7, with further detail provided in the **Climate Review Report** (Appendix I).	Chapter 7, Section 7.2.5 Appendix I
	d) Discussion of changes in the frequency and intensity of extreme weather events that may exacerbate impacts to Protected Matters within and downstream of the Strategic Assessment Area.	A summary description of potential future climate scenarios is provided in Chapter 7, with further detail provided in the **Climate Review Report** (Appendix I).	Chapter 7, Section 7.2.5 Appendix I
	e) Inclusion of different climate scenarios in any site water management modelling, including flooding, storm surge events and sea level rise.	Climate risks identified from detailed climate risk assessments are to be considered and managed through design. Climate projections have been included in the **Climate Review Report** in Appendix I. A detailed climate risk assessment is to be conducted separately to inform the design and to prepare a site for a controlled activity (site licence).	Appendix I
5.7	The Report must consider the extent to which the impacts from actions proposed under the Plan on Protected Matters would be consistent with the requirements and objectives of the EPBC Act (in accordance with Part 10, Division 1, Subdivision C), including but not limited to:		
	a) To the extent The Plan relates to a declared World Heritage property, an assessment of how approving an action or class of actions to be taken in accordance with The Plan, if endorsed, would not be inconsistent with: • Australia's obligations under the World Heritage Convention, or • The Australian World Heritage management principles, or • A plan that has been prepared for the management of the declared World Heritage property under section 316 or as described in section 321 (see section 146G of the EPBC Act).	This Protected Matter is not relevant to the Strategic Assessment as there are no World Heritage properties within, or in the region of, the Strategic Assessment Area that are likely to be directly or indirectly impacted as a result of implementing The Plan.	N/A
	b) To the extent The Plan relates to a National Heritage place, an assessment of how approving an action or class of actions to be taken in accordance with The Plan, if endorsed, would not be inconsistent with: • The National Heritage management principles, or • An agreement to which the Commonwealth is a party in relation to the National Heritage place, or • A plan that has been prepared for the management of the National Heritage place under section 324S or as described in 324X (see section 146H of the EPBC Act).	This Protected Matter is not relevant to the Strategic Assessment as there are no National Heritage places within, or in the region of, the Submarine Construction Yard that are likely to be directly or indirectly impacted as a result of implementing The Plan.	N/A

Clause	Details	Response	Reference in The Report
	c) To the extent The Plan relates to a declared Ramsar wetland, an assessment of how approving an action or class of actions to be taken in accordance with The Plan, if endorsed, would not be inconsistent with Australia's obligations under the Ramsar Convention (see section 146J of the EPBC Act).	This Protected Matter is not relevant to the Strategic Assessment as there are no Ramsar wetlands of international importance within, or in the region of, the Submarine Construction Yard that are likely to be directly or indirectly impacted as a result of implementing The Plan.	N/A
	d) To the extent The Plan relates to a listed threatened species or ecological community: 1. an assessment of how approving an action or class of actions to be taken in accordance with The Plan, if endorsed, would not be inconsistent with: a. Australia's obligations under: • The Biodiversity Convention, or • The Apia Convention, or • The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), or b. A recovery plan for the species or community or a threat abatement plan, and 2. How regard has been given to any relevant approved conservation advice for the species or community (see section 146K of the EPBC Act).	A assessment of international agreements and assessment is included in Chapter 4. Recovery plans, threat abatement plans and conservation advice for relevant threatened species were reviewed in the **Significance of Impact Assessments** (Appendix H).	Chapter 4 Appendix H
	e) To the extent The Plan relates to a listed migratory species, an assessment of how approving an action or class of actions to be taken in accordance with The Plan, if endorsed, would not be inconsistent with whichever of the following conventions or agreements because of which the species is listed: • The Bonn Convention; • The China–Australia Migratory Bird Agreement (CAMBA), • The Japan–Australia Migratory Bird Agreement (JAMBA), • An international agreement approved under Subsection 209(4) of the EPBC Act (see section 146L of the EPBC Act).	A description of international agreements and assessment is included in Chapter 4.	Chapter 4
	f) To the extent The Plan relates to approving an action or class of actions listed in section 146M of the EPBC Act, an assessment of how approving such an action or class of actions to be taken in accordance with The Plan, if endorsed, would not be inconsistent with section 146M.	The extent to which The Plan relates to an Action or Class of Action listed in section 146M of the EPBC Act is provided in Chapter 4. It is understood that the construction of the storage facility for the nuclear module. An assessment of the potential impacts associated with approving such an action is included in Chapter 7.	Chapter 4, Section 4.2 Chapter 7, Section 7.2

Clause	Details	Response	Reference in The Report
6. Implementation and assurance framework			
6.1.	As established in the Agreement, The Plan must include:		
	a) An implementation framework (Endorsement Criteria 4a) that describes how The Plan will be efficiently and effectively implemented (including how outcomes and commitments for the conservation of Protected Matters set out in The Plan will be achieved), and	Chapter 10 provides a description of the implementation framework to be included in The Plan, as required by the Strategic Assessment Agreement.	Chapter 10
	b) An assurance framework (Endorsement Criteria 4b) that describes how the Approval Holder will address and adaptively manage the effectiveness of proposed regulatory, administrative and Protected Matter outcomes.	Chapter 10 provides a description of the assurance framework, as required by the Strategic Assessment Agreement.	Chapter 10
6.2.	The Report must assess the effectiveness and efficiency of the proposed implementation framework and assurance framework to explain how:		
	a) If applicable, the administrative process that will be used to track the use of the Commonwealth Minister's Part 10 Approval by persons who are undertaking an action in accordance with The Plan.	The Part 10 Approval applies to a well-defined area and all Actions proposed to be undertaken relate to the two Classes of Actions, for construction and operations. Administrative processes to track the progress of The Plan, are to be included in Implementation Plans. As outlined in Chapter 10, Implementation Plans will be developed by the Approval Holders.	Chapter 10
	b) Third parties undertaking actions under the Commonwealth Minister's Part 10 Approval are informed of, and understand, their obligations under The Plan and approval.	Obligations for third parties acting under the approval are to be captured as part of formal agreements including contracts and leases and incorporated into the Implementation Plans prepared by the Approval Holders (Chapter 10).	Chapter 10
	c) Outcomes and commitments for Protected Matters will be monitored, documented, delivered, and adequately resourced throughout the life of The Plan	A description of the Implementation Plans to be developed to deliver The Plan, including a monitoring and evaluation framework is provided in Chapter 10. The Implementation Plans are to include detail on how outcomes and commitments will be adequately resourced for the life of The Plan. Implementation Plans are to be prepared by the Approval Holders.	Chapter 10
	d) Governance arrangements will be developed to implement the Commonwealth Minister's Part 10 Approval, including the roles and responsibilities of the Parties and the named Approval Holder throughout the life of The Plan.	A description of the Implementation Plans to be developed to deliver The Plan, including governance frameworks, roles and responsibilities is provided in Chapter 10. Implementation Plans are to be prepared by the Approval Holders.	Chapter 10

Clause	Details	Response	Reference in The Report
	e) The named Approval Holder will monitor, evaluate, review and manage the effectiveness of proposed regulatory, administrative and Protected Matter outcomes, commitments and approval conditions, this must include a process for auditing and reporting to provide transparency for stakeholders.	A description of the Implementation Plans to be developed to deliver The Plan, including a monitoring and evaluation framework is provided in Chapter 10. Implementation Plans are to be prepared by the Approval Holders. The frequency of monitoring, evaluation, reporting and improvement will vary depending on numerous factors including but not limited to the phase of the project, the Actions and Classes of Actions, and the environmental values.	Chapter 10
7. Evaluation of the overall outcomes of The Plan			
7.1.	The Report must evaluate the overall conservation commitments and environmental outcomes for Protected Matters, taking into account likely impacts to Protected Matters from implementing The Plan. The evaluation must include:		
	a) The extent to which Protected Matters are represented in the Strategic Assessment Area.	The following Protected Matters have been identified as being of relevance to the Strategic Assessment Area: – Listed threated species – Listed migratory species – The environment (as it relates to the undertaking of a nuclear action and actions undertaken by a Commonwealth agency). Further information regarding plant and animal related Protected Matters can be found in the **Biodiversity Values Report** (Appendix G). The outcomes and commitments outlined in Chapter 9, and to be presented in The Plan, will appropriately manage potential impacts on matters protected under Part 3 of the EPBC Act. An evaluation of how The Plan is being developed to address the endorsement criteria, including overall outcomes, is provided in Chapter 11.	Appendix G Chapter 9 Chapter 11

Clause	Details	Response	Reference in The Report
	b) The extent to which Protected Matters are represented in areas to be protected or managed under The Plan.	The Strategic Assessment Area is partially within, and adjacent to, an extensive coastal reserve system of protected areas to the north. Over 14,860 ha of the region is protected as part of the Adelaide International Bird Sanctuary. Due to the extent of high-quality protected areas, the function of key ecosystem services within the region is anticipated to remain viable, regardless of whether The Plan were implemented or not. Whilst there are no specific areas within the Strategic Assessment Area to be protected under The Plan, mitigation measures will manage the potential impacts to the marine area. The intent of outcomes and commitments summarised in Chapter 9, and the mitigation measures included in Chapter 8, form a basis for how potential impacts to Protected Matters within and in areas around the Strategic Assessment Area will be managed under The Plan. An evaluation of how The Plan is being developed to address the endorsement criteria, including overall outcomes, is provided in Chapter 11.	Chapter 9 Chapter 8 Chapter 11
	c) The extent to which any areas to be protected or managed under The Plan will provide for the long-term protection of each Protected Matter within the Strategic Assessment Area, including maintaining the function of key ecosystem services needed for the viability of Protected Matters.	The Strategic Assessment Area is partially within, and adjacent to, an extensive coastal reserve system of protected areas to the north. Over 14,860 ha of the region is protected as part of the Adelaide International Bird Sanctuary. Due to the extent of high-quality protected areas, the function of key ecosystem services within the region is anticipated to remain viable, regardless of whether The Plan were implemented or not. Whilst there are no specific areas within the Strategic Assessment Area to be protected under The Plan, mitigation measures will manage the potential impacts to the marine area. The intent of outcomes and commitments summarised in Chapter 9, and the mitigation measures included in Chapter 8, form a basis for how potential impacts to Protected Matters within and in areas around the Strategic Assessment Area will be managed under The Plan. An evaluation of how The Plan is being developed to address the endorsement criteria, including overall outcomes, is provided in Chapter 11.	Chapter 9 Chapter 8 Chapter 11

Clause	Details	Response	Reference in The Report
	d) Whether there will be serious and irreversible impacts to any Protected Matters.	No serious or irreversible impacts to Protected Matters are anticipated as a result of The Plan. The Actions and Classes of Actions that are to be undertaken for the construction and operation of the Submarine Construction Yard, are generally consistent with those that have occurred on the Lefevre Peninsula—alongside the extensive areas designated for the conservation of migratory and threatened species—over the past 50 years. As a result of this, and the suite of well-established mitigation measures that are to be implemented throughout the course of construction and operation, The Plan has been assessed to be unlikely to have a significant impact on the environment. An evaluation of how The Plan is being developed to address the endorsement criteria, including overall outcomes, is provided in Chapter 11.	Chapter 11
	e) The extent to which the outcomes and commitments proposed under The Plan address vulnerabilities of Protected Matters including climate change projections modelled under plausible climate change scenarios.	An evaluation of how The Plan is being developed to address the endorsement criteria, including overall outcomes, is provided in Chapter 11.	Chapter 11
	f) The likely effectiveness of the outcomes and commitments of The Plan in protecting and managing Protected Matters and any risks and uncertainties.	An evaluation of how The Plan is being developed to address the endorsement criteria, including overall outcomes, is provided in Chapter 11.	Chapter 11
	g) An assessment of how The Plan meets the endorsement criteria, as set out in Attachment 2 of the Agreement.	An evaluation of how The Plan is being developed to address the endorsement criteria, including overall outcomes, is provided in Chapter 11.	Chapter 11
	h) An analysis and justification, with regards to matters the Commonwealth Minister must consider, as to why the ASA considers that the impacts to Protected Matters of implementing The Plan are acceptable.	An evaluation of how The Plan is being developed to address the endorsement criteria, including overall outcomes, is provided in Chapter 11.	Chapter 11
7.2.	The Report must evaluate how The Plan meets the objectives of the EPBC Act.	An evaluation of how The Plan is being developed to be consistent with the objects of the EPBC Act, is provided in Chapter 11.	Chapter 11, Section 11.2
8. Addressing uncertainty and risk			
8.1.	The Report must identify key uncertainties and risks associated with implementing The Plan, responses to these and proposed adaptations to changing circumstances. Key uncertainties may include:	Uncertainties and risks have been addressed as relevant throughout The Report (this document).	Chapter 2, Section 2.8 Chapter 3, Section 3.6 Chapter 5, Section 5.13
	i. Knowledge gaps in scientific understanding and responding to new knowledge.	Knowledge gaps are addressed in Chapter 5.	Chapter 5, Section 5.13

Clause	Details	Response	Reference in The Report
	ii. Assumptions made in assessing potential impacts and benefits.	Assumptions made in the assessment of potential impacts and benefits are included in Chapter 2.	Chapter 2, Section 2.6
	iii. How changes to Commonwealth, South Australian State and relevant local government legislation, policies, plans and advice are to be accounted for in the management of the Strategic Assessment Area.	The incorporation of legislative changes—including policies, plans and advice—is addressed in Chapter 4.	Chapter 4, Section 4.9
	iv. The capability and capacity of the Approval Holder to make sure that The Plan is implemented.	The capability and capacity of the Approval Holders to implement the plan is included in Chapter 10. As outlined in Chapter 1 and Section 3.4, the Plan forms part of the AUKUS agreement which has bipartisan support within Australia and is part of a trilateral agreement with the United Kingdom and the United States of America.	Chapter 10 Chapter 1 Chapter 3, Section 3.4
9. Information sources			
9.1.	The Report must identify: a. the sources of information and data relied upon including the reliability and currency of the data. b. Any other relevant supporting information	A full list of information sources used for The Report, and supporting documents (including an assessment of the source's liability and currency), is included in Appendix E.	Appendix E
9.2.	If sources of information, data, or other relevant supporting information are publicly available, the Report will provide details of where they are publicly available.	Links to where information is publicly available is included within the Reference list (Chapter 12) and Appendix E. A full list of information sources used for The Report, and supporting documents (including an assessment of the source's liability and currency), is included in Appendix E.	Chapter 12 Appendix E

Appendix D

EPBC Act Protected Matters provisions – relevance assessment

Table D.1 EPBC Act section 34 provisions for matters protected and their relevance to the Strategic Assessment

Section 34 Provisions table			Protected Matter group	Relevance reason		
Item	**Provision**	**Matter protected**	**Subdivision title (explanation if clarification required)**	**Desktop presence (PMST Report)**	**Justification (Non-PMST Report matters)**	**Is the Protected Matter relevant? (To be assessed in The Report)**
1	Section 12	The world heritage values of a declared World Heritage property	World Heritage	No	N/A	No
1A	Section 15A	The world heritage values of a declared World Heritage property	World Heritage	No	N/A	No
1B	Section 15B	The National Heritage values of a National Heritage place	National Heritage	No	N/A	No
1C	Section 15C	The National Heritage values of a National Heritage place	National Heritage	No	N/A	No
2	Section 16	The ecological character of a declared Ramsar wetland	Wetlands of international importance	No	N/A	No
2A	Section 17B	The ecological character of a declared Ramsar wetland	Wetlands of international importance	No	N/A	No
3	Subsection 18(1)	A listed threatened species in the extinct in the wild category	Listed threatened species and communities	No	N/A	No
4	Subsection 18(2)	A listed threatened species in the critically endangered category	Listed threatened species and communities	Yes	N/A	Yes
5	Subsection 18(3)	A listed threatened species in the endangered category	Listed threatened species and communities	Yes	N/A	Yes
6	Subsection 18(4)	A listed threatened species in the vulnerable category	Listed threatened species and communities	Yes	N/A	Yes
7	Subsection 18(5)	A listed threatened ecological community in the critically endangered category	Listed threatened species and communities	Yes	N/A	Yes
8	Subsection 18(6)	A listed threatened ecological community in the endangered category	Listed threatened species and communities	Yes	N/A	Yes

Section 34 Provisions table			Protected Matter group	Relevance reason		
Item	Provision	Matter protected	Subdivision title (explanation if clarification required)	Desktop presence (PMST Report)	Justification (Non-PMST Report matters)	Is the Protected Matter relevant? (To be assessed in The Report)
8A	Subsection 18A(1) or (2)	A listed threatened species (except a species included in the extinct category of the list referred to in section 178 or a conservation dependent species) and a listed threatened ecological community (except an ecological community included in the vulnerable category of the list referred to in section 181)	Listed threatened species and communities	Yes	N/A	Yes
9	Section 20	A listed migratory species	Listed migratory species	Yes	N/A	Yes
9A	Section 20A	A listed migratory species	Listed migratory species	Yes	N/A	Yes
10	Section 21	The environment	Protection of the environment from nuclear actions (Requirement for approval of nuclear actions)	N/A	A person must not take a nuclear action that has, will have or is likely to have a significant impact on the environment.	No
10A	Section 22A	The environment	Protection of the environment from nuclear actions (Offences relating to nuclear actions)	N/A	A person must not take a nuclear action that has, will have or is likely to have a significant impact on the environment.	No
11	Subsection 23(1)	The environment	Marine environment (Relates to Commonwealth marine areas)	N/A	Subsection 23(4) indicates that Subsection 23(1) does not apply to an action if the person taking the action is the Commonwealth or a Commonwealth agency.	No
12	Subsection 23(2)	The environment	Marine environment (Relates to Commonwealth marine areas)	N/A	Subsection 23(4) indicates that Subsection 23(2) does not apply to an action if the person taking the action is the Commonwealth or a Commonwealth agency.	No
13	Subsection 23(3)	The environment in the coastal waters (as defined in the *Fisheries Management Act 1991*) in which the action is taken of the State or Territory	Marine environment (Relates to Commonwealth marine areas)	N/A	Subsection 23(4) indicates that subsection 23(3) does not apply to an action if the person taking the action is the Commonwealth or a Commonwealth agency.	No

Section 34 Provisions table			Protected Matter group	Relevance reason		
Item	**Provision**	**Matter protected**	**Subdivision title (explanation if clarification required)**	**Desktop presence (PMST Report)**	**Justification (Non-PMST Report matters)**	**Is the Protected Matter relevant? (To be assessed in The Report)**
13A	Subsection 24A(1) or (2)	The environment	Marine environment (Relates to Commonwealth marine areas: Actions in Commonwealth marine areas)	N/A	The Commonwealth marine area is over 90 km from the Strategic Assessment Area	No
13B	Subsection 24A(3) or (4)	The environment	Marine environment (actions outside Commonwealth marine areas affecting those areas)	N/A	The Commonwealth marine area is over 90 km from the Strategic Assessment Area	No
13C	Subsection 24A(5) or (6)	The environment in the coastal waters (as defined in the *Fisheries Management Act 1991*) in which the action is taken of the State or Territory	Marine environment *(Relates to fishing)*	N/A	The action does not relate to fishing	No
13D	Subsection 24B(1)	The environment	Great Barrier Reef Marine Park	No	Not relevant to the Strategic Assessment Area	No
13E	Subsection 24B(2)	The environment in the Great Barrier Reef Marine Park	Great Barrier Reef Marine Park	No	Not relevant to the Strategic Assessment Area	No
13F	Subsections 24C(1) and (3)	The environment	Great Barrier Reef Marine Park	No	Not relevant to the Strategic Assessment Area	No
13G	Subsections 24C(5) and (7)	The environment in the Great Barrier Reef Marine Park	Great Barrier Reef Marine Park	No	Not relevant to the Strategic Assessment Area	No
13H	Section 24D	A water resource	Protection of water resources from unconventional gas development and large coal mining development	No	This is not relevant to the Strategic Assessment	No
13J	Section 24E	A water resource	Protection of water resources from unconventional gas development and large coal mining development	No	This is not relevant to the Strategic Assessment	No

Section 34 Provisions table			Protected Matter group	Relevance reason		
Item	**Provision**	**Matter protected**	**Subdivision title (explanation if clarification required)**	**Desktop presence (PMST Report)**	**Justification (Non-PMST Report matters)**	**Is the Protected Matter relevant? (To be assessed in The Report)**
14	Section 25	A thing prescribed by the regulations for the purposes of this item in relation to an action to which section 25 applies	Additional matters of national environmental significance *(Relates to approval of prescribed actions – that are actions prescribed by the regulations)*	N/A	No additional prescribed matters identified in the EPBC Regulation	No
15	Subsection 26(1)	The environment	Protection of the environment from proposals involving the Commonwealth (*Protection of environment from actions involving Commonwealth land*)	N/A	Subsection 26(3) indicates that subsection 26(1) does not apply to an action if the person taking the action is the Commonwealth or a Commonwealth agency.	No
16	Subsection 26(2)	The environment on Commonwealth land	Protection of the environment from proposals involving the Commonwealth (*Protection of environment from actions involving Commonwealth land*)	N/A	Subsection 26(3) indicates that subsection 26(2) does not apply to an action if the person taking the action is the Commonwealth or a Commonwealth agency.	No
16A	Subsections 27A(1) or (2)	The environment	Protection of the environment from proposals involving the Commonwealth (*Protection of environment from actions involving Commonwealth land*)	N/A	Section 27A subsection (6) indicates that subsection 27A(1) and (2) do not apply if he person taking the action is a Commonwealth agency.	No

Section 34 Provisions table			Protected Matter group	Relevance reason		
Item	**Provision**	**Matter protected**	**Subdivision title (explanation if clarification required)**	**Desktop presence (PMST Report)**	**Justification (Non-PMST Report matters)**	**Is the Protected Matter relevant? (To be assessed in The Report)**
16B	Subsections 27A(3) or (4)	The environment on Commonwealth land	Protection of the environment from proposals involving the Commonwealth (*Protection of environment from actions involving Commonwealth land*)	N/A	This provision applies to actions undertaken outside of Commonwealth land but would, or would be likely to, impact Commonwealth land.	No
16C	Section 27B	The environment in a Commonwealth Heritage place outside the Australian jurisdiction	Protection of Commonwealth Heritage places outside the Australian jurisdiction (Commonwealth Heritage places overseas)	N/A	This is not relevant to the Strategic Assessment	No
16D	Subsection 27C(1) and (2)	The environment in a Commonwealth Heritage place outside the Australian jurisdiction	Protection of Commonwealth Heritage places outside the Australian jurisdiction (Commonwealth Heritage places overseas)	N/A	This is not relevant to the Strategic Assessment	No
17	Section 28	The environment	Protection of the environment from Commonwealth actions	Yes	The action would be undertaken by a Commonwealth agency and could potentially impact on the environment	Yes

Appendix E

Information sources and reliability

Sources	Source Type	Reliability	Currency
Title, date, retrived from	*Government whitepaper, Legislation, peer reviewed journal article, report, Commonwealth approved database, technical advice*	*High, Medium, Low*	*High, Medium, Low*
The Report			
Adelaide Metro (2024). Adelaide network map [Online]. Available from: https://www.adelaidemetro.com.au/__data/assets/pdf_file/0009/824247/22908_AM_network_map_v2.pdf (Accessed: July 2024)	Government website	High	High
Australia ICOMOS Incorporated (2013). The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013 [Online]. Available from: https://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf (Accessed: April 2024)	Report	High	Low
Australian Defence Magazine (ADM) (2016). The submarine problem - deeper than meets the eye [Online]. Available from: https://australiandefence.com.au/news/the-submarine-problem-deeper-than-meets-the-eye (Accessed: April 2024)	Technical advice	Medium	Low
Australian Defence Magazine (ADM) (2021). Future Frigate in Focus [Online]. Available from: https://www.australiandefence.com.au/defence/sea/future-frigate-in-focus/1000 (Accessed: April 2024)	Technical advice	Medium	Medium
Australian Institute of Landscape Architects (AILA) (2018). Guidance Note for Landscape and Visual Assessment [Online]. Available from: https://www.aila.org.au/common/Uploaded%20files/_AILA/Resource%20library/Guidance%20Note%20for%20LA%20-2018.pdf (Accesed: April 2024)	Report	Low	High
Australian Naval Infrastructure (ANI) (2018). Annual Report 2017-2018 [Online]. Available from: https://www.ani.com.au/wp-content/uploads/2021/09/ANI-AnnualReport-2017-18.pdf (Accessed: April 2024)	Report	Low	High
Australian Naval Infrastructure (ANI) (2020). The Morse Osborne Naval Shipyard Project Newsletter [Online]. Available from: https://www.ani.com.au/wp-content/uploads/2021/11/200521-The-Morse_Web.pdf (Accessed: April 2024)	Industry newsletter	High	High
Australian Naval Infrastructure (ANI) (2021). The Morse Osborne Naval Shipyard March 2021 Project Newsletter [Online]. Available from: https://www.ani.com.au/wp-content/uploads/2021/11/21Mar_The-Morse_Web.pdf (Accessed: April 2024)	Industry newsletter	Medium	High
Australian Naval Infrastructure (ANI) (2023). Facilities [Online]. Available from: https://www.ani.com.au/osborne-naval-shipyard/ (Accessed: April 2024)	Technical Advice	High	High
Australian Naval Infrastructure (ANI) (2024a). Osborne North Development Project Slide pack. Not publicly available.	Technical Advice	High	High
Australian Naval Infrastructure (ANI) (2024b). Environmentally Sustainable Practices [Online]. Available from: https://www.ani.com.au/2021/08/17/hello-world/ (Accessed: April 2024)	Technical Advice	High	High
Australian National Soil Information System (ANSIS) (2024). *Data Viewer: National Acid Suphate Soils* [Online]. Available from: https://portal.ansis.net/ (Accessed: April 2024)	Database	High	High
Australian Radiation Protection and Nuclear Safety Agency (Australian Radiation Protection and Nuclear Safety Agency). (2008). Safety Guide for Predisposal Management of Radioactive Waste, Radiation Protection Series G-16. Victoria: Australian Radiation Protection and Nuclear Safety Agency. Retrieved from https://www.arpansa.gov.au/sites/default/files/legacy/pubs/rps/rps16.pdf	Technical advice	High	Low
Australian Radiation Protection and Nuclear Safety Agency (2014a). Regualtory Guide - Siting of controlled facilities, GDE-1756. Retrieved from Australian Radiation Protection and Nuclear Safety Agency: https://www.arpansa.gov.au/regulation-and-licensing/licensing/information-for-licence-holders/regulatory-guides/regulatory-guide-siting-controlled-facilities	Technical advice	High	Low
Australian Radiation Protection and Nuclear Safety Agency (2014b). Fundamentals for Protection Against Ionising Radiation, Radiation Protection Series F-1. Victoria: Australian Radiation Protection and Nuclear Safety Agency. Retrieved from https://www.arpansa.gov.au/sites/default/files/legacy/pubs/rps/rpsF-1.pdf	Technical advice	High	Low
Australian Radiation Protection and Nuclear Safety Agency (2015). Guide for Radiation Protection of the Environment. Available from: https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications/radiation-protection-series/guides-and-recommendations/rpsg-1 (Accessed November 2024).	Technical advice	High	Low
Australian Radiation Protection and Nuclear Safety Agency (2019a). Guide for Radiation Protection in Emergency Exposure Situations, Radiation Protection Series G-3. Victoria: Australian Radiation Protection and Nuclear Safety Agency. Retrieved from https://www.arpansa.gov.au/sites/default/files/rps-g-3-part-1-2019.pdf	Technical advice	High	Medium
Australian Radiation Protection and Nuclear Safety Agency (2019b). Code for the Safe Transport of Radioactive Material, Radiation Protection Series C-2. Victoria: Australian Radiation Protection and Nuclear Safety Agency. Retrieved from https://www.arpansa.gov.au/sites/default/files/rps_c-2-2019.pdf	Technical advice	High	Medium
Australian Radiation Protection and Nuclear Safety Agency (2018). Code for Disposal of Radioactive Waste by the User, Radiation Protection Series C-6. Victoria: Australian Radiation Protection and Nuclear Safety Agency.	Technical advice	High	Low
Australian Radiation Protection and Nuclear Safety Agency (2020a). Radiation Protection Series G-4. Available from: rps_g-4_-_guide_for_classification_of_radioactive_waste.pdf (Accessed November 2024).	Technical advice	High	Medium
Australian Radiation Protection and Nuclear Safety Agency (2020b). Code for Radiation Protection in Planned Exposure Situations, Radiation Protection Series C-1. Victoria: ARPANSA. Retrieved from https://www.arpansa.gov.au/sites/default/files/20220404-rps_c-1_rev_1.pdf	Technical advice	High	Medium
Australian Radiation Protection and Nuclear Safety Agency (2021, January 01). Regulatory Guide - Construction of an item important for safety, GDE-1760. Retrieved from Australian Radiation Protection and Nuclear Safety Agency: https://www.arpansa.gov.au/regulation-and-licensing/licensing/information-for-licence-holders/regulatory-guides/regulatory-guide-construction-item-important	Technical advice	High	Medium
Australian Radiation Protection and Nuclear Safety Agency (2024). Ionising radiation and health Available from: https://www.arpansa.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/ionising-radiation-and-health (Accessed November 2024).	Technical advice	High	High
Australian Submarine Corporation (ASC) (2022). Australia's Sovereign Submarine Capability [Online]. Available from: https://www.asc.com.au/wp-content/uploads/2022/05/Australias-Sovereign-Submarine-Capability.pdf (Accessed: April 2024)	Technical advice	High	High
BAE Systems (2023a). Audacious launch [Online]. Available from: https://www.baesystems.com/en/multimedia/audacious-launch (Accessed: April 2024)	Technical advice	High	High
BAE Systems (2023b). HMS Audacious [Online]. Available from: https://www.baesystems.com/sites/Satellite?c=BAEMedia_C&childpagename=Global%2FBAELayout&cid=1434595865064&pagename=GlobalWrapper (Accessed: April 2024)	Technical advice	High	High
BAE Systems (2024). Multimedia [Online]. Available from: https://www.baesystems.com/en/multimedia/-h5-the-accommodation-unit-from-the-first-of-class-dreadnought-submarine---h5- (Accessed: April 2024)	Technical advice	High	High
BirdsSA (2024). Mutton Cover Conservation Reserve [Online]. Available from: https://birdssa.asn.au/location/mutton-cove-conservation-reserve/ (Accessed: April 2024)	Technical advice	Medium	High
Boskalis Australia Pty Ltd (2020). Ports Dredging Adelaide, Australia. Outer Harbor Channel Widening [Online]. Available from: https://boskalis.com/media/dsae0uea/adelaide.pdf (Accessed: April 2024)	Technical advice	High	Medium
Bureau of Meteorology (BOM) (2019). Wind speed and direction rose [Online]. Available from: http://www.bom.gov.au/cgi-bin/climate/cgi_bin_scripts/windrose_selector.cgi?period=Annual&type=9&location=23034. (Accessed April 2024).	Commonwealth approved database	High	Medium
Bureau of Meteorology (BOM) (2024a). Monthly rainfall: Adelaide (Torrens Island) Station 23018 [Online]. Available from: http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=023018 (Accessed: April 2024)	Commonwealth approved database	High	High
Bureau of Meteorology (BOM) (2024b). Monthly rainfall: Kilburn, Station 23134 [Online]. Available from: http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=023134 (Accessed: April 2024)	Commonwealth approved database	High	High
Central Dredging Association (CEDA) (2011). CEDA Position Paper: Underwater Sound in Relation to Dredging, CEDA Environment Commission Working Group [Online]. Avaiable from: https://www.iadc-dredging.com/wp-content/uploads/2017/02/article-ceda-position-paper-underwater-sound-in-relation-to-dredging-125-4.pdf (Accessed: April 2024)	Report	High	Low
City of Port Adelaide Enfield (2018). Lefevre Peninsula Stormwater Management Plan [Online]. Available from: https://www.cityofpae.sa.gov.au/__data/assets/pdf_file/0015/411504/Stormwater-Management-Plan-Lefevre-Peninsula.pdf (Accessed: April 2024)	Report	High	Low
City of Port Adelaide Enfield (2021). Integrated Transport Strategy 2021-2031 [Online]. https://www.cityofpae.sa.gov.au/__data/assets/pdf_file/0036/1158867/Integrated-Transport-Strategy-2021-31.pdf (Accessed: April 2024)	Government report	High	High
City of Port Adelaide Enfield (2024a). Playgrounds, Parks and Gardens. Accessed April 2024 [Online]. https://www.cityofpae.sa.gov.au/explore/sport-and-recreation/playgrounds-parks-and-gardens (Accessed: April 2024)	Government report	High	High
City of Port Adelaide Enfield (2024b). LED Light Upgrades [Online]. Available from: https://www.cityofpae.sa.gov.au/development/projects/led-lighting-upgrades (Accessed: April 2024)	Government report	High	High
COAG Standing Council on Environment and Water (2012). Australia's Native Vegetation Framework [Online]. Available from: https://www.agriculture.gov.au/sites/default/files/documents/native-vegetation-framework.pdf (Accessed: April 2024)	Report	High	Low
Coffey (2017). ANI Due Diligence – Outer Dock – Environmental Site Assessment. Prepared for Australian naval Infrastructure Ptd Ltd.	Report	High	Low
Commonwealth of Australia (2002). Australian Natural Heritage Charter: for the conservation of places of natural heritage significance, 2nd ed. [Online]. Australian Heritage Commission. Available from: https://vgls.sdp.sirsidynix.net.au/client/search/asset/1292682. (Accessed April 2024).	Commonwealth guidelines	High	Low
Commonwealth of Australia (2012). Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy [Online]. Available from: Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (dcceew.gov.au)	Legislation	High	Low
Commonwealth of Australia (2013a). National Environment Protection (Assessment of Site Contamination) Measure 1999 [Online]. Available from: https://www.legislation.gov.au/F2008B00713/latest/text. (Accessed April 2024).	Legislation	High	Low
Commonwealth of Australia (2013b). Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies - Significant Impact Guidelines 1.2. Department of Sustainability, Environment, Water, Population and Communities [Online]. Available from: https://www.dcceew.gov.au/sites/default/files/documents/commonwealth-guidelines_1.pdf (Accessed: April 2024)	Commonwealth guidelines	High	Low
Commonwealth of Australia (2013c). Significant Impact Guidelines 1.1 – Matters of National Environmental Significance [Online]. Available from: https://www.dcceew.gov.au/sites/default/files/documents/nes-guidelines_1.pdf. (Accessed April 2024).	Commonwealth guidelines	High	Low
Commonwealth of Australia (2017). EPBC Policy Statement 3.21. 'Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species [Online]. Available from: https://www.dcceew.gov.au/sites/default/files/documents/bio4190517-shorebirds-guidelines.pdf (Accessed: April 2024)	Commonwealth guidelines	High	Low
Commonwealth of Australia (2018a). MarinePestPlan 2018-2023 – National Strategic Plan for Marine Pest Biosecurity [Online]. Available from: https://www.marinepests.gov.au/sites/default/files/Documents/marine-pest-plan-2018-2023.pdf (Accessed: April 2024)	Commonwealth report	High	Low
Commonwealth of Australia (2018b). Australian Radioactive Waste Management Framework, Department of Industry, Innovation and Science [Online]. Available from: https://www.industry.gov.au/sites/default/files/2019-04/australian_radioactive_waste_management_framework.pdf (Accessed: April 2024)	Government framework	High	Low
Commonwealth of Australia (2019). Working Together Managing Commonwealth Heritage Places, A guide for Commonwealth Agencies [Online]. Available from: https://www.dcceew.gov.au/sites/default/files/documents/working-together-2019.pdf (Accessed: April 2024)	Commonwealth guidelines	High	Medium
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (2024). List of Contracting Parties [Online]. Available from: https://cites.org/eng/disc/parties/chronolo.php?order=field_official_name&sort=asc (Accessed: July 2024)	Technical Advice	Medium	High
Department for Infrastructure and Transport (DIT) (2021a). Environment and Heritage Technical Manual – Attachment 7D: Guideline for the Management of Noise and Vibration: Construction and Maintenance Activities [Online]. Available from: https://www.dit.sa.gov.au/__data/assets/pdf_file/0020/921206/EHTM_-_Part_7_-_Noise_-_Attachment_7D_-_Management_of_Noise_and_Vibration_Construction_and_Maintenance_Activities.pdf. (Accessed April 2024).	Government guidelines	High	Medium
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Appendix F

Community and Stakeholder Engagement Report

Australian Government
Australian Submarine Agency

ASA

COMMUNITY AND STAKEHOLDER ENGAGEMENT REPORT

SUBMARINE CONSTRUCTION YARD STRATEGIC ASSESSMENT

OSBORNE, SOUTH AUSTRALIA

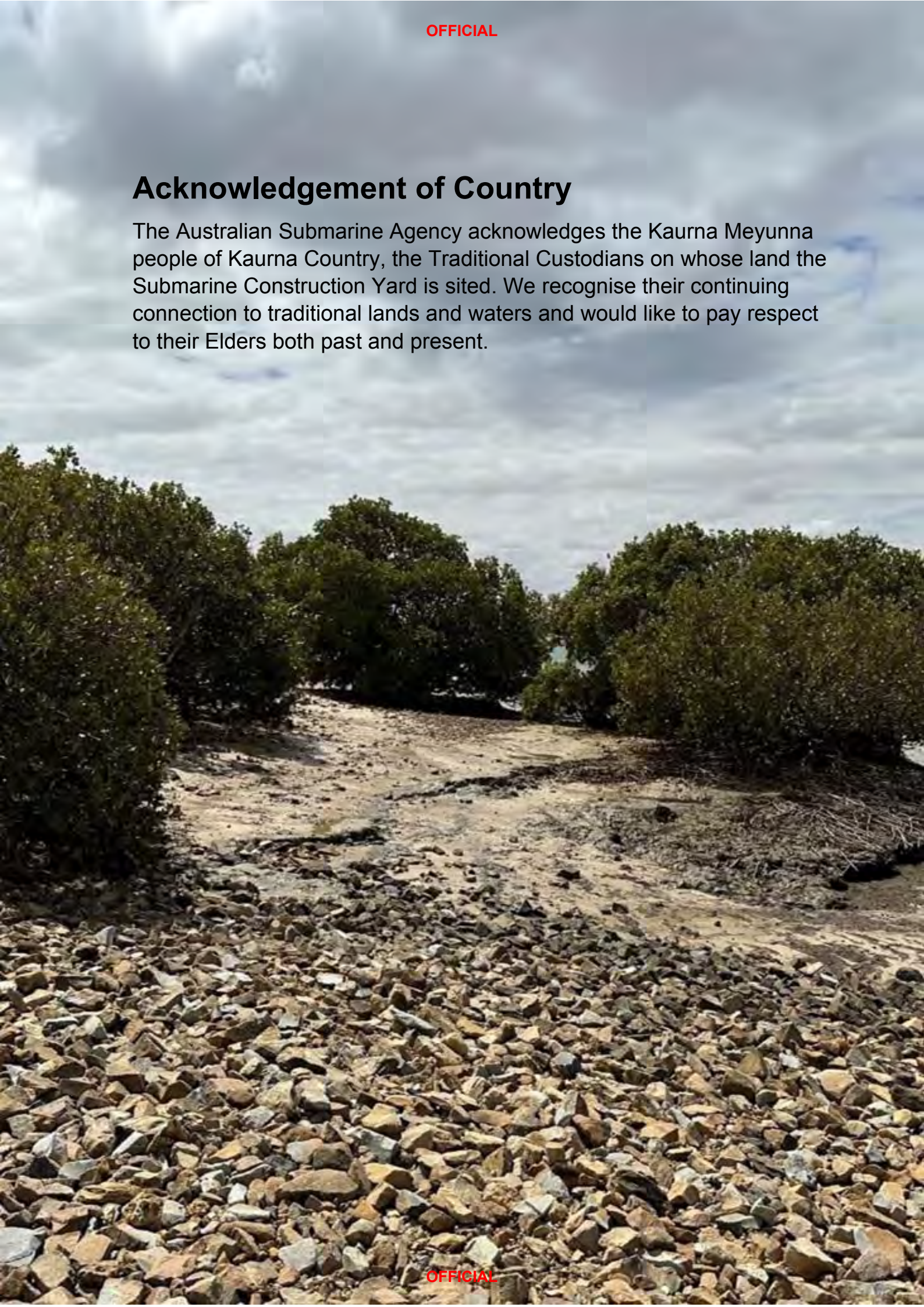
29 November 2024

www.asa.gov.au

Project name	Submarine Construction Yard Strategic Assessment
Document title	Community and Stakeholder Engagement Report
This document has been prepared by GHD Pty Ltd for the Australian Submarine Agency	

Acknowledgement of Country

The Australian Submarine Agency acknowledges the Kaurna Meyunna people of Kaurna Country, the Traditional Custodians on whose land the Submarine Construction Yard is sited. We recognise their continuing connection to traditional lands and waters and would like to pay respect to their Elders both past and present.



Document navigation

This report is an Appendix to the Submarine Construction Yard Strategic Assessment Impact Assessment Report ('The Report'), which provides details of the engagement strategy and activities undertaken for the Submarine Construction Yard Strategic Assessment process.

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Acronyms and abbreviations

Acronym / abbreviation	Definition
ACST	Australian Central Standard Time
DCCEEW	The Department of Climate Change, Energy, the Environment and Water
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
IAP2	International Association for Public Participation
KYAC	Kaurna Yerta Aboriginal Corporation
LGA	Local Government Area
PAREPG	Port Adelaide Residents Environment Action Group

Glossary

Term	Definition
AUKUS	Trilateral security partnership between Australia, the United Kingdom, and the United States of America.
The Plan	The Strategic Assessment Plan which describes: – The Actions and Classes of Actions that are to be undertaken to construct and operate the Submarine Construction Yard in the Strategic Assessment Area. – The outcomes that will be achieved for Protected Matters, to which Actions proposed under The Plan relate, in accordance with the requirements of the EPBC Act.
The Report	The Impact Assessment Report assesses the potential environmental impacts associated with the development of the Submarine Construction Yard, and includes: – A description of the environment to which Actions proposed under The Plan relate – An assessment of the potential impacts of implementing The Plan on Protected Matters – Details of how likely or potential impacts will be avoided, mitigated and offset (where necessary or appropriate) to make sure that Protected Matters are protected and managed in the long-term.
Strategic Assessment	A process where The Minister may approve taking an Action or Class of Actions in accordance with an endorsed policy, plan or program. A Strategic Assessment Agreement provides for this kind of assessment. It's often used for landscape-scale assessments of developments and programs.
Terms of Reference	Means the Terms of Reference finalised on 25 March 2024, which details how the impacts from the proposed Actions and activities are to be assessed.

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1. Introduction

1.1 Purpose of this chapter

This chapter outlines the engagement approach for the Submarine Construction Yard alongside for the Strategic Assessment. Engagement are important elements of the Strategic Assessment process.

1.2 Engagement objectives

Our strategy has been built upon a set of engagement objectives and aims to demonstrate a considered engagement program to support the Strategic Assessment process.

Objectives of the community engagement program for the Submarine Construction Yard Project are to:

- **Establish mutual understanding and agreement** with project partners to achieve project alignment. Early engagement with First Nations stakeholders and community interest groups.
- **Build community awareness and project legitimacy** through targeted communication and engagement.
- **Maintain awareness and understanding** of the Submarine Construction Yard Project within stakeholder groups and the community.
- **Encourage community participation** to inform the final Report through regular communication and engagement.
- **Maintain established relationships** with the community and key stakeholders to promote lasting stakeholder and community trust and goodwill (capture feedback / address concerns).

1.3 Strategic assessment guidelines

This engagement summary and community engagement completed to date, considered requirements listed within the Strategic Assessment Agreement Guidelines, which are stipulated under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It also meets the Department of Climate Change, Energy, the Environment and Water's (DCCEEW) community engagement expectations to satisfy the Strategic Assessment Terms of Reference. The Strategic Assessment Agreement stipulates two formal public comment periods must be completed as part of the Strategic Assessment. These are outlined in Sections 1.3.1, 1.3.2 and 1.3.3.

1.3.1 Terms of Reference

The Strategic Assessment Guidelines state that the Australian Submarine Agency must publish the draft Terms of Reference for public comment for a period of 28 days. The draft Terms of Reference was made available on the Australian Submarine Agency website for public comment between 4 December 2023 to 28 January 2024. Advertisements were placed in print media (Appendix A), web media and on social media platforms to raise public awareness of the notification period and highlighting the opportunity for stakeholders and the community to respond.

The draft Terms of Reference was revised following public review before being finalised and submitted for approval by the Australian Minister for the Environment on 25 March 2024. The finalised Terms of Reference have been published on the Australian Submarine Agency's website.

1.3.2 Strategic Assessment Impact Assessment Report

The draft Strategic Assessment Impact Assessment Report ('The Report') will be made available for public comment. The Australian Submarine Agency will publish The Report on their website for a period of 28 days. A notification will also be published in a national daily newspaper at the start of the Public Comment Period. The ad will include details about where stakeholders and community can send feedback and where to access further information.

At the close of the Public Comment Period, and following consideration of any public comments received, the Australian Submarine Agency will prepare a response to these comments and address how they have been considered through revisions to the draft Strategic Assessment Impact Assessment Report or Strategic Assessment Plan ('The Plan') (if required).

This Public Comment Period has been built into the engagement approach for the Strategic Assessment.

1.3.3 Engagement with First Nations people under the EPBC Act

In addition to statutory requirements, there are expectations from DCCEEW in relation to the level of engagement with First Nations stakeholders and how this is incorporated into wider engagement activities for the Strategic Assessment. These expectations are outlined in the *Interim Engaging with First Nations People and Communities on Assessments and Approvals under Environment Protection and Biodiversity Conservation Act 1999* (interim guidance). Early and respectful engagement is expected by proponents working under the EPBC Act.

The *interim guidance* promotes partnering with First Nations people to:

– Seek First Nations knowledge of country and environmental management
– Protect and manage the environment
– Conserve and use Australia's biodiversity in a sustainable way
– Engage with First Nations stakeholders early and throughout the project

To meet the expectations in the interim guidance, an Indigenous Engagement Specialist was engaged to support the First Nations engagement activities. This specialist assisted in navigating cultural sensitivities and created opportunities for the team to meet and discuss the Submarine Construction Yard, with First Nation stakeholders, in an appropriate manner. This facilitation also assisted in breaking down barriers and building relationships with First Nations stakeholders.

2. Engagement approach

The engagement program for the Submarine Construction Yard has been phased to align with key project milestones that align to the Strategic Assessment process. It provides clarity around the relevant activities required at each stage. These phases are:

- **Phase 0:** Project establishment period
- **Phase 1:** Foundation engagement period
- **Phase 2:** Project introduction engagement period
- **Phase 3:** Pre-public comment engagement period
- **Phase 4:** Public comment engagement period
- **Phase 5:** Post public comment engagement period

Activities in each phase were completed at end of June 2024[1].

2.1 Implementation Plan

Prior to engagement commencing, a detailed Implementation Plan was developed to set out the overall approach and actions to support the required engagement efforts under the Strategic Assessment for the Submarine Construction Yard. The Implementation Plan included:

- Engagement objectives and principles to guide the Implementation Plan
- Stakeholder identification and analysis
- Engagement tools and methods to use
- The proposed engagement activities to be deployed throughout the Strategic Assessment process
- Evaluation measures

This plan was used to guide engagement activities. The plan took guidance from the International Association for Public Participation (IAP2) principles and the South Australia 'Better Together' engagement framework. First Nations engagement planning was undertaken in line with the plan and expectations outlined in the *Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act 1999* guideline (DCCEEW 2023).

2.2 Social licence

Social licence represents community trust and confidence in an organisation's actions, beyond legal or legislative requirements. For the Australian Submarine Agency, it is both an aspiration and long-term engagement objective to build a social licence for this project. It requires ongoing effort and commitment to working in partnership with the local community; to maintain the community's trust and confidence.

The Implementation Plan has identified steps to building a social licence to operate (Figure 1). Each phase of engagement for the Strategic Assessment works towards building relationships, creating awareness, opportunities for community benefit, and ultimately trust to achieve this goal.

[1] *Updates may be made to this chapter following the completion of future activities.*

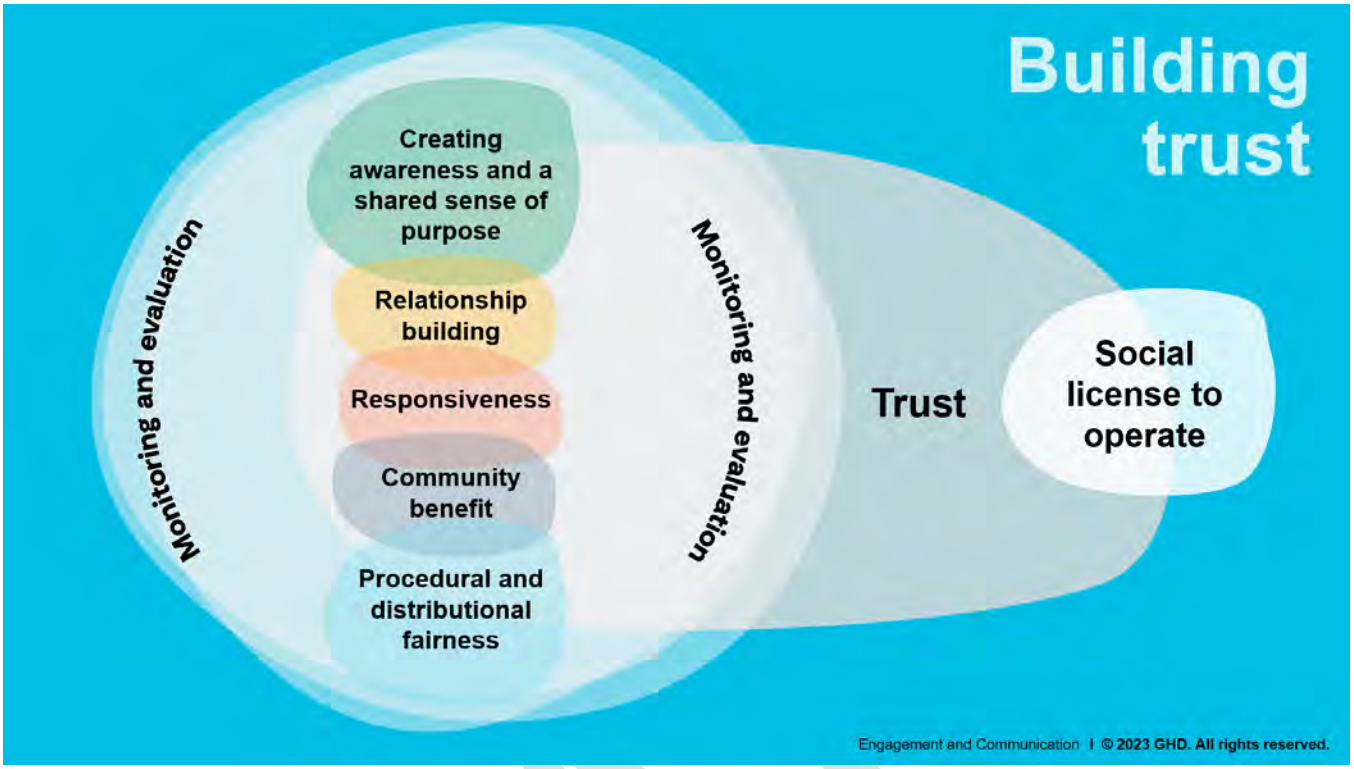

Figure 1 Building trust to achieve social licence

2.3 Social context

To gain a better understanding of the population breakdown, a demographic data analysis for the Port Adelaide Enfield Local Government Area (LGA) was completed in Phase 0.

Port Adelaide Enfield has a population of 134,134 people[2]. The medium and high population projection by 2041 for Port Adelaide Enfield Local Government Area (LGA) and South Australia, is provided in Table 1. The annual population growth is slightly lower for Port Adelaide Enfield LGA than for South Australia.

Table 1 South Australian population projection

Area	2021 census	2041 medium growth		2041 high growth	
		Persons	Annual growth (%)	Persons	Annual growth (%)
Port Adelaide Enfield LGA	134,134	159,866	0.96	167,232	1.23
South Australia	1,820,530	2,174,497	0.97	2,299,354	1.32

The 2021 Census data for the three closest suburbs to the Strategic Assessment area is provided in Table 2, and includes:

– North Haven (ABS 2021a), south of Victoria Road within 0.3 km of the southern boundary of the onshore Strategic Assessment Area
– Osborne (ABS 2021b), within 1 km south of the southern boundary of the onshore Strategic Assessment Area
– Taperoo (ABS 2021c), within 1.9 km south of the southern boundary of the onshore Strategic Assessment Area

[2] PlanSA 2021

Table 2 Local suburbs census data (2021)

Item		North Haven	Osborne	Taperoo	South Australia
Population (persons)		5585	1951	3250	**1,820,530**
Aboriginal and/or Torres Strait Islander (% of population)		1.5	5.1	6.5	**2.4**
Median age (years)		51	41	39	**41**
Housing (% of population)	Owned outright	43.8	26.8	23.2	**32.8**
	Owned mortgage	36.2	39.2	32.2	**35.6**
	Rented	16	31.7	41.6	**27.6**
Work (% of population)	In labour force	58.2	58.3	51.6	**60**
	Full-time work	59.2	57.1	52.8	**54.1**
	Part time work	32.2	30.7	32.6	**35**
	Person working in shipbuilding and repair	2.9	2.1	–	**0.4**
Travel to work (% of population)	By car (as driver or passenger)	75.1	74.8	70.5	**69.7**
	By public transport	4.8	5	5.6	**5.3**

2.4 Key stakeholders

Table 3 outlines high-level stakeholder categories relevant to the Submarine Construction Yard.

Table 3 Stakeholder identification and planned engagement methodology

Stakeholder group	Interest in project	Reason to engage	Recommended method of engagement
First Nations people	– General interest in the Submarine Construction Yard – Impacts to potential items of Aboriginal heritage – Landscape impacts / views of 'Country'	– Provide general project awareness – Provide visibility of planned engagement activities	– Phone and email invitations – In-person briefings – Project fact sheets – Newspaper advertising – Social media posts – Website
Local residents	– General interest in the Submarine Construction Yard – Potential impacts during construction and operation – Safety concerns	– Provide general project awareness – Proximity to the Submarine Construction Yard site – Indirectly impacted stakeholders – Living and/or working in the vicinity of the Submarine Construction Yard	– Community webinars – Community information sessions – Letterbox drops – Newspaper advertising – Social media posts – Website
Local businesses	– General interest in the Submarine Construction Yard – Potential impacts during construction and operation	– Proximity to the Submarine Construction Yard site – Indirectly impacted stakeholders – Located in the vicinity of the Submarine Construction Yard	– Community webinars – Community information sessions – Letterbox drops – Newspaper advertising – Social media posts – Website

Stakeholder group	Interest in project	Reason to engage	Recommended method of engagement
Local government	– General interest in the Submarine Construction Yard – Common touchpoints between Australian Submarine Agency and government – Potential impacts during construction and operation – Community concerns and feedback	– Provide general project awareness – Provide visibility of planned engagement activities	– Government briefings (in-person / virtual) with local members – Regular discussions as part of Project management – PowerPoint presentation project introduction
State government agencies	– General interest in the Submarine Construction Yard – Potential impacts during construction and operation – Common touchpoints with Australian Submarine Agency	– Provide general project awareness – Provide visibility of planned engagement activities	– Government briefings (in-person / virtual) with relevant agencies – Regular discussions as part of Project management
Community and environment groups	– General interest in the Submarine Construction Yard – Potential impacts on local environment during construction and operation	– Provide general project awareness – Indirectly impacted stakeholders – Operating / vested interest in the vicinity of the Submarine Construction Yard	– Community webinars – Community information Sessions – Briefings (in-person / virtual) – Newspaper advertising – Social media posts – Website
Recreational / tourism groups	– General interest in the Submarine Construction Yard – Potential impacts on local tourism and recreational activities related to the Port Adelaide River during construction and operation	– Provide general project awareness – Indirectly impacted stakeholders – Operating / vested interest in the vicinity of the Submarine Construction Yard	– Community webinars – Community information sessions – Newspaper advertising – Social media posts – Website

2.5 Australian Naval Infrastructure liaison

In addition to the Commonwealth Strategic Assessment, the Submarine Construction Yard is also required to seek State Government approvals to proceed. This process is being managed by Australian Naval Infrastructure.

The team has identified potential overlaps in engagement activities with stakeholders. The Australian Submarine Agency has maintained a regular forum with Australian Naval Infrastructure to ensure alignment on such matters and, where possible; collaborate to avoid engagement fatigue, misinformation or confusion about the Submarine Construction Yard. Notably, the First Nations engagement approach has been designed in with the Australian Naval Infrastructure team, to maximise opportunities.

2.6 Interactions record management

To assist in managing engagement activities, an interactions register was established to capture these details. The information captured in this register includes:

- Contact details
- Stakeholder group
- Type of interaction
- Actions taken and due dates
- Sentiment
- Follow up tracker, to ensure all actions are closed out.

3. Implementation

This section provides details of all implemented engagement activities, categorised by the relevant phase as represented in Figure 2. The engagement program to-date was phased to align with key milestones for the Strategic Assessment process and provide clarity around the relevant activities required at each stage.

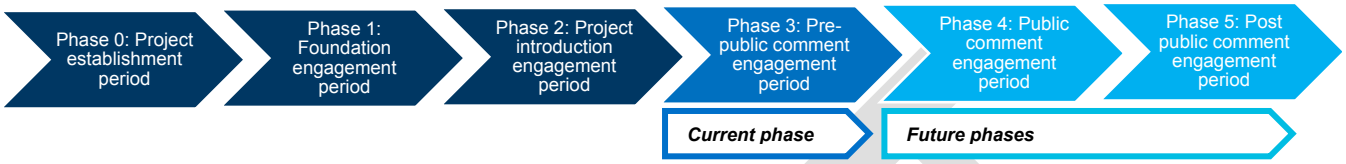

Figure 2 The various engagement phases to support the Strategic Assessment.

3.1 Phase 0: Project establishment period

A number of activities were undertaken during Phase 0, to satisfy the requirements of the Strategic Assessment process. The draft Terms of Reference was open for public comment from 4 December 2023 to 28 January 2024. This was the first official public notification about the Submarine Construction Yard. As required, under the Strategic Assessment agreement, a public notification advertisement was placed in the Adelaide Advertiser, on 4 December 2023 to alert the public that the draft Terms of Reference was open for public comment. A second advertisement was placed, on 16 January 2024 (Appendix A). The draft Terms of Reference was also published on the Australian Submarine Agency's website.

During the Public Comment Period, one submission was received from the Port Adelaide Residents Environment Action Group (PAREPG). A response was prepared by the Australian Submarine Agency and provided to PAREPG. The response offered an opportunity for the group to meet and discuss the Submarine Construction Yard Project. This meeting took place on 3 December 2023, where attendees discussed the consultation approach, questions about the project, and next steps for the strategic assessment.

3.2 Phase 1: Foundation engagement period

Phase 1 centred around early foundation activities to publicly introduce the Submarine Construction Yard and the Strategic Assessment process. Preparatory activities during this phase included developing materials and planning for future engagement activities. First Nations engagement also commenced in Phase 1.

3.2.1 Social listening

A social listening tool, GHD Pulse (Figure 3), was implemented in this phase. This tool was employed not only to establish the baseline sentiment across media outlets, social media, and online discussions; but also to initiate regular monitoring to inform the engagement approach. The reports generated from this process highlight key words and associated sentiment; and identify emerging trends and spikes in mentions related to the Project.

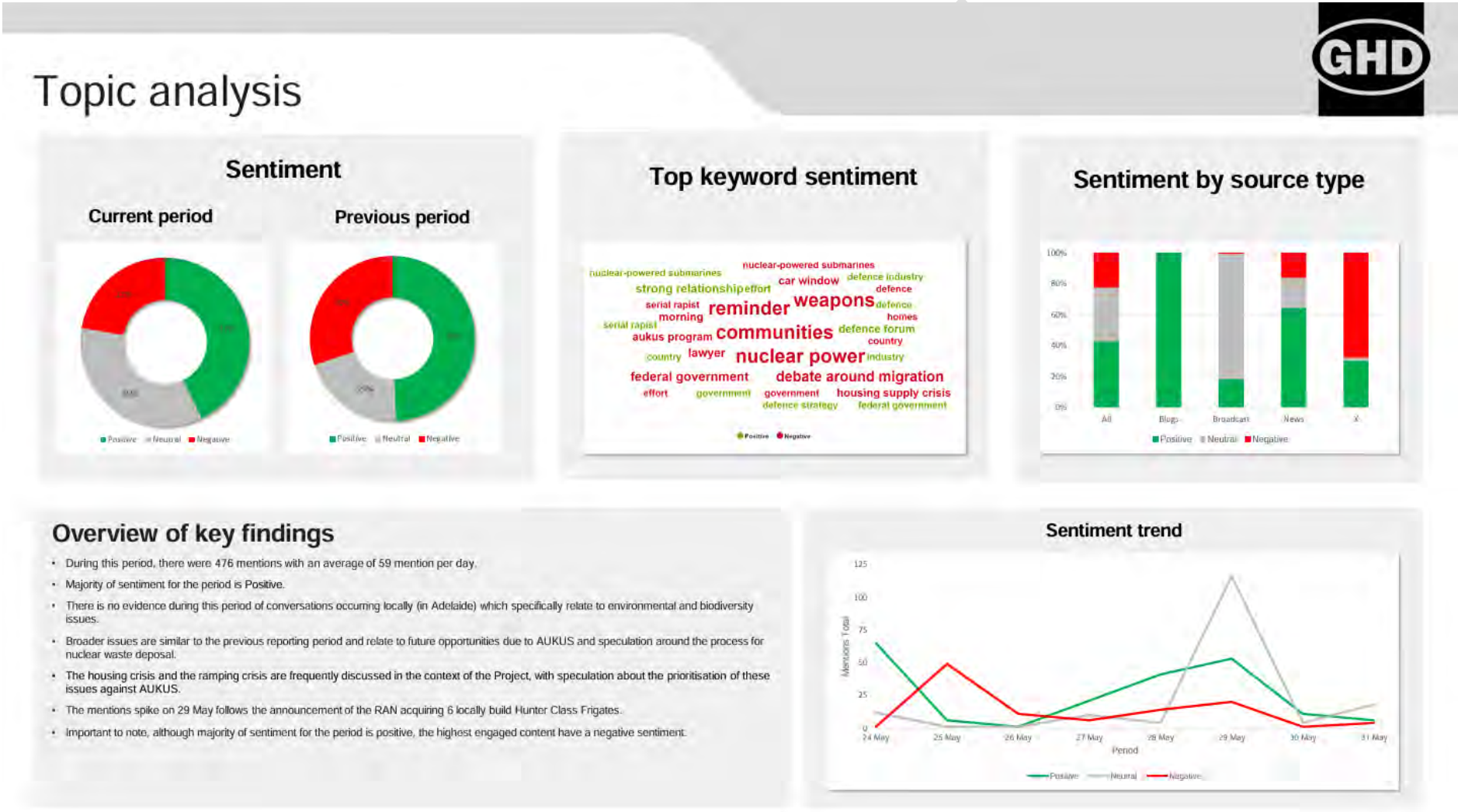

Figure 3 *An example of a GHD Pulse social listening report*

From 19 February 2024, weekly social listening reports were prepared; providing insights into public sentiment on related topics such as AUKUS, nuclear-powered submarines, and the Department of Defence. Although these themes sit outside of the Project's scope, it provides a wholistic view. Figure 4 illustrates this favourable increase in sentiment, reflecting greater project acceptance.

Insights from these reports will continue to inform the team in designing and tailoring engagement activities in future phases. Figure 4 shows the sentiment trends for the Submarine Construction Yard, between February and July of 2024. The figure shows a decrease in community sentiment during Phase 2, between March and April 2024; which could be due to misinformation. Consequently, the engagement approach was reviewed by the team to mitigate these risks; informing necessary adjustments for the next phase to meet engagement objectives and enhance project acceptance and social licence.

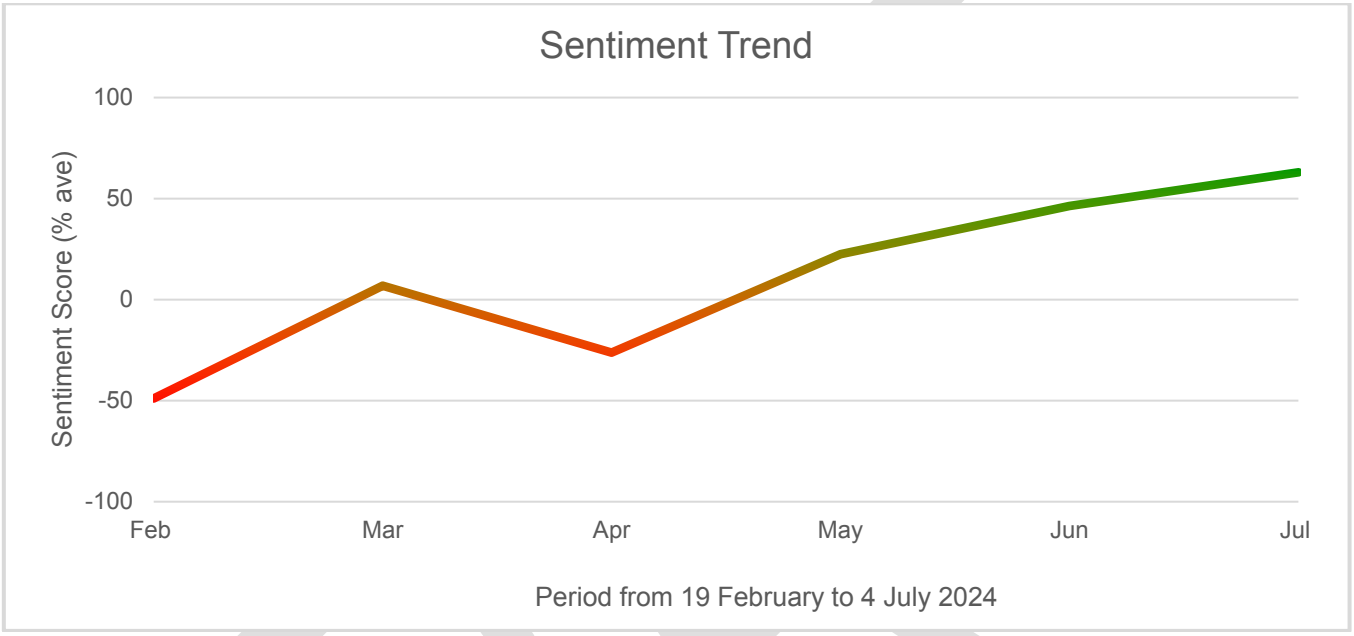

Figure 4 *Sentiment trend: 19 February 2024 to 4 July 2024*

3.2.2 First Nations engagement

A round of introductory meetings with First Nations stakeholders was held in February 2024. These stakeholders were identified during the initial stakeholder analysis process. Respecting cultural sensitivities, GHD involved an Indigenous Engagement Specialist to lead stakeholder activities and navigate discussions with First Nations people.

Meetings took place in Adelaide between Monday 26 February 2024 and Thursday 29 February 2024. Objectives of engagement were to introduce the engagement team, introduce the project team at a high level; to gain an understanding of the role the stakeholders play in the Adelaide community, and to understand respective expectations, organisational aspirations and protocols regarding ongoing project engagement. The engagement team included:

– Australia Submarine Agency, Assistant Director, Social Licence and Stakeholder Engagement
– Australian Naval Infrastructure, Development and Environmental Approvals Manager
– GHD Pty Ltd Senior Consultant – Indigenous Engagement Specialist

The engagement team met with the following First Nation stakeholder organisations:

– Kaurna Yerta Aboriginal Corporation (KYAC), Registered Native Title Bodies Corporate
– Southern Cultural Immersion
– RAW Group
– The City of Port Adelaide Enfield Aboriginal Advisory Panel.

Key engagement outcomes and themes

Based on the conversations with these stakeholders, five key engagement outcomes were identified. The main themes from the initial round of First Nations engagement were:

- **Relationships:** Establish and maintain a transparent, meaningful and respectful relationship throughout the whole of the Submarine Construction Yard (considering it is a long-term project).
- **Training and employment:** Identify opportunities to leverage training and employment.
- **Economic opportunities:** Identify procurement/economic opportunities for the Submarine Construction Yard.
- **Self-determination:** Opportunities for the Submarine Construction Yard to maximise potential for self-determination for each organisation, and in particular KYAC.
- **Legacy:** Ensure that First Nations opportunities leveraged through the Submarine Construction Yard has a lasting legacy for the Kaurna and broader community.

These outcomes are intended to inform subsequent conversations with these stakeholders in future phases of the Submarine Construction Yard development.

3.3 Phase 2: Project introduction engagement period

During Phase 2, formal community-wide engagement commenced; designed to introduce the Submarine Construction Yard, and provide details about the Strategic Assessment process. Multiple tactics were employed, including a combination of community-wide and targeted activities to expand reach and access to Project information.

3.3.1 Community Update letterbox drop

The first community-wide communication was a two-page A4 ‘Community Update’ that was circulated to 65,000 addresses across the Port Adelaide Enfield LGA. This was sent out on the week commencing 1 April 2024 (Appendix B).

The Community Update provided a general overview of the Submarine Construction Yard, the Strategic Assessment process and timeline as well as answers to some common questions about Project. It also introduced the first Community Webinar session and provided details on how to register.

3.3.2 Community webinar

The second engagement activity undertaken was a 30-minute community webinar, scheduled for 17 April 2024, at 6 pm (ACST); designed to provide a brief presentation about the Submarine Construction Yard, and provide additional details that were not included in the ‘Community Update’ flyer.

Interested attendees were encouraged to register their interest in attending via an online booking platform (TryBooking). They were then sent an email confirmation from TryBooking with the Microsoft Teams meeting link.

The session was promoted across multiple Australian Submarine Agency channels and platforms, including:

- Community Update
- Australian Submarine Agency website
- Australian Submarine Agency social media channels (Facebook, Instagram, LinkedIn, X)
- Email invitations sent to First Nations stakeholders
- Email invitations sent to the Port Adelaide Enfield Council.

A total of 131 registrations were received for the community update session, with 64 attendees on the day.

These registrations captured important stakeholder information, including their interest in the Project and locality, as shown in Figure 5. The majority of interested stakeholders in attendance (38 percent), were not from the area; while 31 percent represented those who either live or work in the Port Adelaide Enfield Council Area.

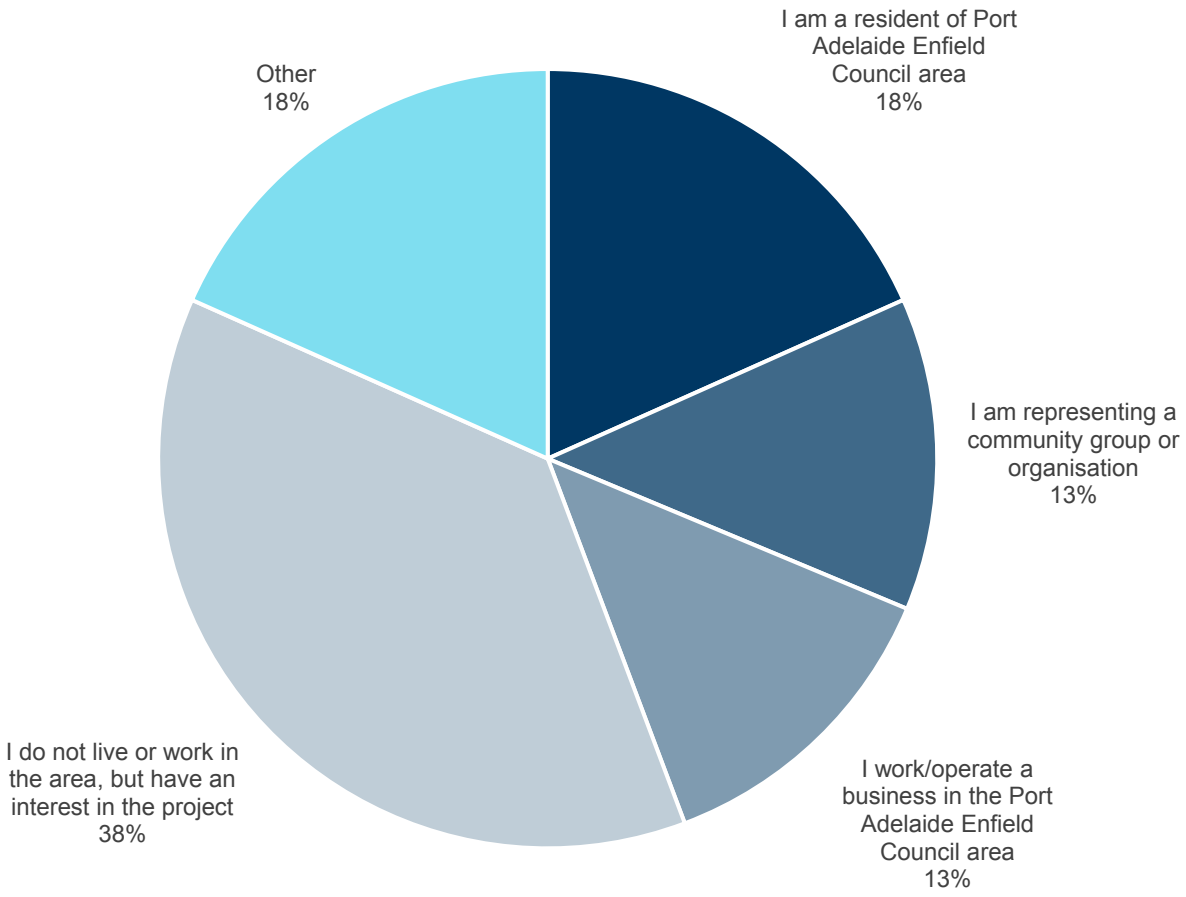

Figure 5 ***Attendees were asked: 'What category applies to you?' in regard to their interest in the project***

Following the session, a recording was uploaded to the Australian Submarine Agency website to provide additional access to the information presented. All of those who registered to attend were also sent a thank you email, and provided with contact information should they have any further questions.

A number of emails were received in response to the webinar; one asking about traffic impacts, and others related to industry procurement opportunities and employment opportunities. No other issues were raised following the webinar.

3.3.3 Targeted stakeholder engagement

Throughout this phase the Australian Submarine Agency maintained and established new relationships with a number of key stakeholders who had an interest in the Project. These stakeholders included:

- City of Port Adelaide Enfield Council
- Australian Naval Infrastructure
- Port Adelaide Residents Environment Action Group (PAREPG)
- Estuary Care Foundation (Friends of Port River)

Proactive discussions and regular scheduled meetings, provide stakeholders with information about the Project, while introducing them to their point of contact from the Australian Submarine Agency.

Additional targeted stakeholder engagement will be undertaken during Phase 4; being the Public Comment Period. The proposed activities during this phase include Project briefings, and the provision of additional information about the Strategic Assessment. The engagement footprint will also be expanded to include the neighbouring City of Charles Sturt and City of Salisbury. This decision to expand the engagement footprint was based upon feedback received by the team from the City of Port Adelaide Enfield Council.

3.3.4 Incoming enquiries via the Australian Submarine Agency mailbox

The Australian Submarine Agency email address is the primary contact point for the Project; with all correspondence directed to this address. Since November 2023, seven emails have been received via the Australian Submarine Agency inbox. The nature of this correspondence was mainly administrative or enquiry-based, rather than providing any feedback on the Project. The emails included requests for copies of the slides from the Community Webinar, and enquiries regarding employment and procurement opportunities with the Australian Submarine Agency.

The emails received to-date include:

– One submission to the Terms of Reference
– Five in response to the Community Webinar; requesting a recording, expressing interest in employment and procurement opportunities, and signing up to the Project's mailing list
– One general enquiry about the Submarine Construction Yard.

3.3.5 Website engagement

The Australian Submarine Agency website provides a collated repository of information about the Submarine Construction Yard. All stakeholder communications from the Australian Submarine Agency point towards this page if seeking further information, with regular updates provided there. As indicated in Figure 6, the website attracts a consistent daily audience; including from users new to the site, indicating a strong interest in the Australian Submarine Agency and their projects.

Webpage 'views' provide an indication of the number of clicks per page on the Australian Submarine Agency website; with 'sessions' defined by a person staying on the website, and viewing multiple pages. Information on the Project page of the website was viewed 439 times in the month of May 2024; showing continued interest in activities associated with the Submarine Construction Yard.

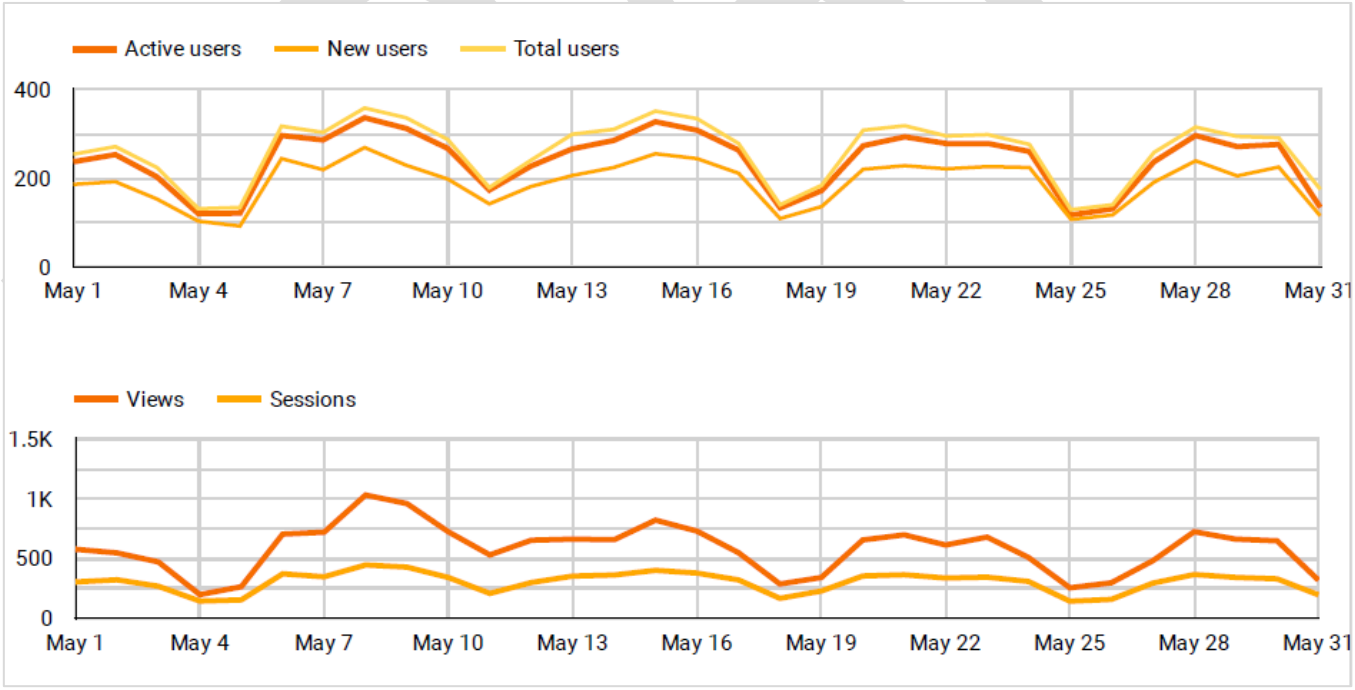

Figure 6 ***Australian Submarine Agency website traffic data showing a breakdown of user types and the differences between 'views' and 'sessions'***

3.3.6 Australian Submarine Agency social licence activities

Concurrently with the Strategic Assessment, the Australian Submarine Agency Social Licence team has developed relationships and a regular schedule of meetings with the following stakeholders, groups and organisations; to ensure the program's social licence objectives:

- Port Adelaide Enfield Council
  - Major Projects team
  - Community Engagement teams
- Environmental Groups – Port Adelaide Residents Environment Protection Group (PAREPG), Friends of Port River (Estuary Care Foundation)
- State Government – Social Licence and Communications Working Group
- Australian Naval Infrastructure.

The Australian Submarine Agency Social Licence Team has also developed relationships containing needs-based engagement with:

- Barker Inlet Port River Workshops and Forums
- City of Charles Sturt
- City of Salisbury
- Elected Members – State and Federal
- Flinders Port Holdings Environmental team
- BAE Systems Environmental team
- ASC Pty Ltd.

Community engagement activities

The Australian Submarine Agency Social Licence team has also undertaken a number of community engagement activities as part of the wider community engagement program. Details of these activities have been included below to highlight their concurrent presence in the community, whilst the Strategic Assessment process has been underway.

Navy and Shipbuilding Career Expo November 2023

This event was developed hosted by the South Australian Government, in partnership with Australian Defence Force Careers. It was an opportunity for approximately 5,000 visitors to learn more about life in the Royal Australian Navy; and to discover career opportunities within the naval shipbuilding industry. The event also included tours on HMAS *Warramunga* and HMAS *Dechaineux*. The Australian Submarine Agency Social Licence team led the Project team's participation. Attendees from the Australian Submarine Agency included members of the recruitment team.

Kiosk events

The Australian Submarine Agency Social Licence team has also set up Kiosks on separate occasions in the local Port Adelaide Plaza Shopping Centre. The purpose of these events was to inform the community about the Project. Staffed by Australian Submarine Agency staff and a Submariner from the Royal Australian Navy; the kiosks provided an opportunity for community engagement to build trust, and increase the public's understanding of the nuclear-powered submarine program. Kiosks were open over consecutive weekdays, around midday. Table 4 outlines the dates, number of attendees, and topics raised during these sessions.

Table 4 Kiosk events held by the Australian Submarine Agency Social Licence team

Date	Number of attendees	Topics of enquiry
October 2023	Approximately 150 engagements	– Positive sentiment regarding jobs and employment opportunities – General project interest – Project implications for residents of the Lefevre Peninsula – Some scepticism regarding the continuation of the program as a result of previous submarine program cancellations on the Peninsula
April 2024	30–40 people, across two days	– Positive sentiment regarding nuclear power – Local industry – Employment opportunities – General project interest
June 2024	Approximately 130 engagements, over four days	– Positive sentiment regarding jobs and opportunities – Residents were encouraged to engage via various mechanisms through the public engagement process for the Strategic Assessment under the *Environmental Protection and Biodiversity Act 1999*

3.4 Phase 3: Pre-public comment engagement period

In the lead up to the Public Comment Period, a number of preparatory activities were undertaken; to ensure that the community and key stakeholders were aware of the upcoming comment period, and understood what to expect. This phase included a Community Information Session, a Council briefing and another round of First Nations engagement.

3.4.1 Community Drop-In Information Session

A Community Drop-In Information Session was held on 22 June 2024.

The session aimed to re-communicate details shared in the webinar; and provide the community with an opportunity to raise questions in-person about the Submarine Construction Yard, potential impacts, or other project-related enquiries.

The session was promoted via newspaper advertisement, in the Adelaide Advertiser. It was also promoted via the Australian Submarine Agency website, social media channels (Figure 7) and invitations sent out via email to existing stakeholders.

The details of this session are as follows:

– **Date & Time:** Saturday 22 June 2024, from 10:00am to 2:00pm
– **Location:** Port Adelaide Public Library; located at 2-4 Church Street, Port Adelaide, South Australia, 5015

Static displays of key project information, including large-scale maps of the Submarine Construction Yard site, and details about the Strategic Assessment process were displayed during the session. The session was also an opportunity to talk about the upcoming Public Comment Period, and how community can be involved in the process.

Figure 7 An information session promotional post from the Australian Submarine Agency's Facebook page

Prior to the event, there were 23 registered attendees, with a total of 40 attendees on the day. This included 34 local residents, three local businesses, two community and environment groups, and one government agency.

Stakeholders that attended the session showed a medium to high interest in the project. This interest was displayed through positive interactions and questions eagerly asked by stakeholders. Many stakeholders were also eager to take the information packs available at the session.

Social media and website data

To support the promotion of the Community Drop-In Information Session, the Australian Submarine Agency posted invitations on their social media channels. This included social media posts via Facebook, Instagram, X and LinkedIn. Traffic was directed to the TryBooking link to register their interest in attending the session.

Further detail on metrics related to these posts is included in Appendix C.

Stakeholder feedback

There were six themes identified during the Community Drop-In Information Session. Table 5 provides an overview of these key themes.

Table 5 Key conversation themes from the Community Drop-In Information Session

Key themes	Details
Theme 1: “Industry and job opportunities””	– The attendance of industry stakeholders indicates an interest in industry and job opportunities. These job interest enquiries were directly and indirectly related to the project. – Stakeholder comments included enquiries about future job opportunities following the completion of the Strategic Assessment.
Theme 2: “General project interests””	– General project interests included requests from the community and Council for the Australian Submarine Agency to provide more information regarding the approvals process and planning and design of the Submarine Construction Yard. – Other enquiries included questions about the purpose of the project; with requests to clarify why and how the project is being funded, as the “biggest Defence spend for issues that are unknown to the community”. – Stakeholders also asked about the current size of the workforce in the Australian Submarine Agency. – There was requests made for models of the Submarine Construction Yard to be provided, to understand the bigger picture of the project. There were mentions of a model that had already been provided by a separate agency.
Theme 3: “The indirect/direct impacts on local communities”	Comments raised included concerns around: – Noise pollution caused by the construction of the Submarine Construction Yard – Access to shops – Access in and out of the suburb – The traffic impacts when construction starts – Car parking, and whether there will be sufficient parking available for workers – Whether light pollution impacts have been considered
Theme 4: “Nuclear waste management”	– There were general enquiries regarding how nuclear waste will be managed and maintained.
Theme 5: “General opposition towards the project and AUKUS-associated activities”	– A protest held by a group from the Medical Association for Prevention of War (Australia) at the session indicated the group’s general opposition to the project. – Although not specifically relevant to the project, this is important to consider for future planning in risk mitigation and management.
Theme 6: “General enquiries relating to future engagement can communication opportunities” (the need for more in-person and early engagement)	– There were multiple requests from the community at the information session to have a presentation delivered to them about the project. – Members of the community mentioned that they only heard about the project either through a work email or by chance as they were walking past the venue. The community was expecting a letterbox drop for project updates. – There was enquiries from the Port Adelaide Enfield Council and community members regarding details of future engagement activities.

3.4.2 City of Port Adelaide Enfield Council briefing

Prior to the June 2024 information session, the Australian Submarine Agency provided an in-person briefing to Port Adelaide Enfield Council officers on the Submarine Construction Yard, as well as an update on the Strategic Assessment process; including details of the upcoming Public Comment engagement period.

There were 15 people in attendance at the briefing. This included, three GHD staff members, two Australian Submarine Agency staff members, and 10 attendees from the Council. Council attendees displayed a general interest in the Project. This was evident through active participation in the discussion with the team.

The discussion was an opportunity to further clarify the Strategic Assessment process; and share details of previous engagement with the local community and other key stakeholders.

3.4.3 First Nations engagement

Site Walk

To build upon the positive discussions from the first round of engagement, a second briefing and site walk was arranged for the KYAC Board and its members on 5 August 2024. The presentation was held at the Tauondi Aboriginal College in Port Adelaide. It was co-hosted by the Australian Submarine Agency and Australian Naval Infrastructure, and led by an Indigenous Engagement Specialist from GHD.

The objectives of this briefing were to:

- Provide KYAC Board members with the opportunity to meet the Project team
- Provide a more detailed Project overview (i.e. background, process, timeline, progress, next steps)
- Answer any questions about the Project
- Uphold the principle of free, prior and informed consent.

There were 18 attendees at the session, including five KYAC Board Members. An overview of attendees is included below in Table 6. Following the formal briefing, the group was taken by bus to complete a walk of the site.

Table 6 Attendees at the KYAC briefing and site walk

Stakeholder group	Attendees
Kaurna Aboriginal Corporation (KYAC)	Seven KYAC Directors were invited. Five of the invited KYAC Directors were able to attend
GHD	– Indigenous Engagement Lead – Environment Technical Director – Defence Collaboration Leader
Australian Submarine Agency	– Assistant Director General Sovereign Submarine Program Delivery – Submarine Construction Yard Infrastructure Project Manager (Consultant), Department of Defence – Social Licence and Engagement
Australian Nuclear Powered Submarine Regulatory Design	– Rear Admiral, Head of Nuclear-Powered Submarine Regulatory Design – Director General Engagement and Culture – Communications Director
Australian Naval Infrastructure	– Chief Operating Officer – Development and Environmental Approvals Manager – Stakeholder Engagement Manager
South Australian Native Title Services	– Project Officer

The briefing and site walk were well-received, and the group was appreciative of the opportunity to view the site. The discussion included general interest in relation to the community sentiment towards the Project, interest in understanding what the Australian Submarine Agency wanted from KYAC, and concerns related to previous experiences with the Royal Australian Navy where they were involved in naming a base but that not proceed as planned.

It was also revealed during this engagement activity that KYAC are already being engaged on 17 other projects; an awareness of the impacts of 'consultation fatigue' must be factored into any future engagement plans. This includes leveraging existing KYAC forums where possible; allowing adequate lead time for meetings and avoiding over-engagement.

Additional feedback from the KYAC Board indicated that the content presented was very technical and not easily understood by the audience. This feedback will be used to inform the communication materials developed for the Public Comment Period.

Briefing on public consultation

The Australian Submarine Agency presented to the KYAC Board on the 8 October 2024, to provide an overview of the Strategic Impact Assessment Report, the upcoming public consultation period and how to make a submission. The board provided feedback around how the ASA could align with community leaders to encourage wider First nations Community members to participate in the Public Comment Period.

4. Next steps

4.1 Phase 4: Public comment engagement period

Phase 4 includes a program of engagement activities to encourage participation and awareness of the Public Comment Period for the Draft Report. A combination of in-person and online events are planned to support a direct approach of engaging key stakeholders, including First Nations people and the wider community.

The proposed activities are as follows:

- **Combined local government briefing:** A joint briefing would be offered to the City of Port Adelaide Enfield, City of Charles Sturt, City of Salisbury and City of Playford prior to the Public Comment Period; to ensure that all relevant Councils are properly briefed on the public comment process and the contents of the Draft Report.
- **State government representatives briefing:** A briefing with State government representatives (prior to the Public Comment Period), to provide details on the Public Comment Period process for the Draft Report.
- **First Nations briefings:** In-person meetings scheduled in the lead-up to, and during, the Public Comment Period with KYAC and other First Nations stakeholders; to run through the Draft Report, provide information on making a submission, and to answer questions. These briefings intend to provide information about the public comment process and an opportunity to provide input.
- **State and Federal member briefings:** Targeted briefings to be offered to State and Federal Members of Parliament to brief them on the Project, the public comment process and the contents of the Draft Report.
- **Port Adelaide Residents Environment Protection Group briefing:** To ensure this key stakeholder is aware of the Public Comment Period, a briefing is to be offered to run through the draft Report, provide information on making a submission and to answer any questions. This briefing is intended to provide information about the public comment process and an opportunity to provide input.
- **General community engagement:**
  - We will issue a DL-sized flyer via a letterbox drop to residents of the City of Port Adelaide and the City of Charles Sturt; to promote the Public Comment Period and encourage residents to find out more about upcoming engagement events.
  - We will hold four (4) community drop-in sessions across various times and days, during a concentrated week of in-person engagement within the Public Comment Period; to offer the community a chance to learn about the Draft Report, interact with the Submarine Construction Yard team, raise questions and learn how to submit feedback.
  - We will also provide an assortment of materials including guidelines for making submissions, a breakdown of the approvals process, and a summary document that simplifies complex aspects of the Draft Strategic Assessment Report into terms that the public can easily understand.

4.2 Phase 5: Post public comment engagement period

Following the conclusion of the Public Comment Period, this phase includes engagement activities designed to close-out the formal engagement period for the Strategic Assessment, and provide details about the finalisation of The Report.

The Australian Submarine Agency will issue a Community Update via its social media channels and distribution lists to provide post-comment period information, and the next steps for the Strategic Assessment. Any queries or feedback raised by the community and stakeholders regarding the Strategic Assessment can be addressed in this update.

This will be the final formalised engagement activity related to the Strategic Assessment process; however works would continue to strengthen and maintain stakeholder relationships throughout approvals and construction.

5. Summary and conclusion

This document details the engagement strategy and activities undertaken for the Submarine Construction Yard Strategic Assessment process.

The engagement program is aligned with the key milestones of the Strategic Assessment process; which include the Public Comment Periods for the draft Terms of Reference and The Report, as well as the engagement with First Nations stakeholders under the EPBC Act. The objectives of engagement were to establish mutual understanding and agreement with project partners, build community awareness and project legitimacy, maintain awareness and understanding of the Project, encourage community participation and feedback, and promote lasting stakeholder and community trust and goodwill.

Engagement activities to-date have included social listening to track community sentiment, First Nations briefings, Community Update letterbox drop, community webinar, targeted stakeholder engagement activities, community drop-in information session, and City of Port Adelaide Enfield Council briefing. The engagement outcomes and themes indicate a low-level interest in the Submarine Construction Yard project from majority of stakeholders; with some general enquiries and positive sentiment regarding jobs and opportunities. Some concerns were raised about potential impacts on the local environment, community, and heritage values.

During the Public Comment Period of the Draft Strategic Assessment Report, the Australian Submarine Agency will deliver a range of communication and engagement activities aimed to inform and encourage stakeholder participation and submissions. This will include First Nations meetings, stakeholder briefings and community drop-in sessions.

Engagement activities during the Public Comment Period will aim to build and maintain a social licence for the Submarine Construction Yard; by demonstrating continued transparent, respectful and meaningful engagement with stakeholders and the community.

6. References

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Appendices

Appendix A

Terms of Reference notice

Beach trend is fair play

Shireen Khalil

Aussies have discovered an "awesome" and "clever" new trend at beaches across the country.

If you're a fan of street libraries where locals can swap, donate and borrow used books from shelves on residential streets, then you're going to love this beachside trend.

"Toy libraries" have begun popping up along Australia's coastline, proving particularly popular for families who forget to bring buckets, shovels and spades for their little ones.

South Australian MP Stephen Mullighan shared a snap of two popular beaches embracing the trend – Henley Beach, 15 minutes from the city, and Semaphore Beach, in the northwest.

"Have you spotted these community beach toy libraries popping up along the coast? Take a toy down to the shore for the little ones to play with, and then return it to the library upon leaving," he wrote. "What an excellent community initiative".

Mr Mullighan's post has been 'liked' almost 3000 times with hundreds of people flooding the comments section with ideas.

"There was a dog toy box at Largs too with tennis balls," one person added.

Sofie, 6, at Semaphore South, enjoys borrowing some beach gear. Picture: Kerye Stevens

Towering ambition

Freemasons' plan backlash

George Yankovich

A 37-storey building set to be Adelaide's first skyscraper has divided heritage advocates because of its location and "glass box" shape, as public consultation on the controversial project nears its end.

The $400m Keystone Tower is a venture by the Freemasons with developer Peilligra and is currently before the state planning panel.

If approved, it would be built behind the fraternity's heritage-listed hall on North Tce, measuring 183m tall and featuring a 236-room hotel, office space and a state history museum.

Debbie Williams runs the Facebook page "Help save South Australia's history from demolition" and has been inundated with comments blasting the development.

"To allow the Freemasons to make such a monumental statement on our cultural boulevard is a distinct slap in the face to our prestigious terrace," Mrs Williams said.

Keystone Tower design.

"It's slowly being destroyed by unimaginative boxes, all claiming 'architectural advancement, and innovative design. It is staggering that this build seems to be the best they can do."

The developers have also been criticised for seeking to demolish the heritage-listed great hall as the building's rear to pave the way for the tower.

In 2020, the Freemasons said repairing the great hall would cost around $8.5m.

Mrs Williams blamed "poor past management" and lack of maintenance for its condition.

Greens MLC Robert Simms said North Tce was the wrong spot for the build.

Public consultation through PlanSA closes on January 17.

Appendix B

Community Update

COMMUNITY UPDATE

April 2024

Osborne Submarine Construction Yard Project

Project Overview

The Australian Submarine Agency (ASA) is the single point of accountability for Australia's conventionally-armed, nuclear-powered submarine program. Known as the SSN-AUKUS, these submarines will be built in Adelaide, South Australia. The delivery of this historic capability will be a transformative and inter-generational program for South Australian industry, with the first Australian SSN-AUKUS build beginning before the end of this decade.

The SSN-AUKUS construction will be supported by an expansion of the existing Osborne Naval Shipyard to accommodate a new Submarine Construction Yard (SCY). The preferred site for the SCY, is located on the Lefevre Peninsula approximately 19km north of Adelaide.

Over the next few years it is estimated at least $2 billion will be invested in South Australian infrastructure. At its peak, the design and build of the infrastructure for the SCY is expected to employ up to 4,000 workers – almost double the workforce forecast for the Attack Class program.

Strategic Assessment Process

Under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the Project is required to undertake environmental assessments to understand the potential impacts on protected matters related to the construction and operation of the SCY.

Figure 1 – Strategic Assessment area.

The Strategic Assessment Agreement includes the development of:

- Terms of Reference (TOR) – describes the assessment requirements of the Strategic Impact Assessment Report (the Report).
- Plan – describes the kinds of activities that will be undertaken as a part of the construction and operation of the SCY.
- Report – assesses the impact of the activities against the assessment requirements described in the TOR.

The draft TOR was made available for public comment from 4 December 2023 until 28 January 2024. The finalised TOR will be published on the DCCEEW and ASA websites.

The ASA is now preparing the Plan and draft Report to detail the proposed construction and operation of the SCY and provide an assessment of the potential environmental impacts.

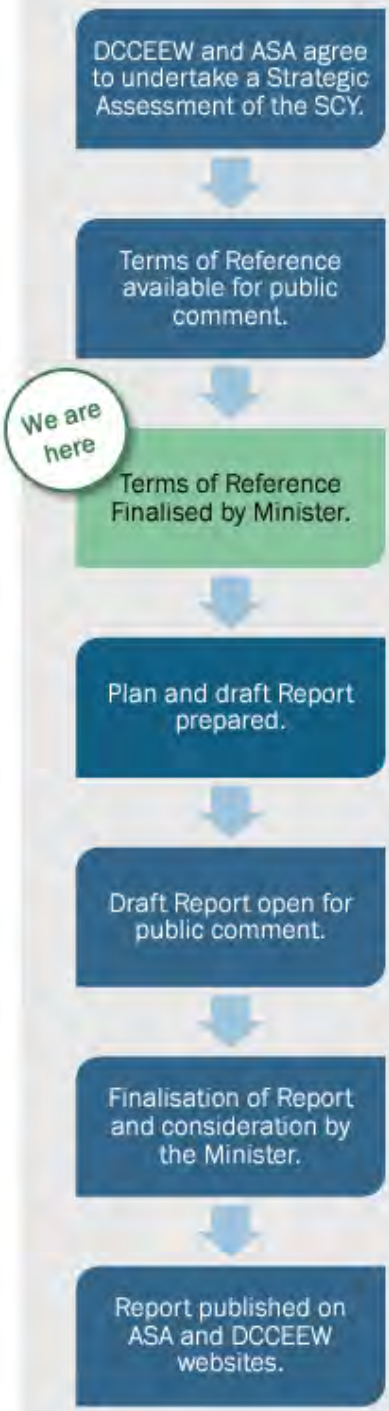
Once complete, the Report will be made available for public review and comment. During this time, there will be many opportunities for the community and key stakeholders to learn more about the Project and ask questions.

Feedback will be reviewed at the end of the comment period, and amendments made to the Report where relevant. The revised document will then be submitted to the Federal Minister for the Environment and Water for consideration.

Australian Government
Australian Submarine Agency

COMMUNITY UPDATE

Strategic Assessment Timeline



Commonly asked questions

What is the Australian Submarine Agency?

The ASA was established on 1 July 2023 to safely and securely acquire, construct, deliver, technically govern, sustain and dispose of Australia's conventionally-armed nuclear-powered submarine capability, via the AUKUS partnership.

What will the site be used for?

The Osborne SCY will transform Osborne into one of the most advanced technological hubs in the world. Once constructed Australian workers will begin manufacturing components for use on the UK and US production lines, before starting construction of the first Australian-built nuclear-powered submarine, the SSN-AUKUS.

When will construction begin on submarines?

The build for the first Australian nuclear-powered submarine will start by the end of this decade at Osborne.

Will there be any environmental impacts on the surrounding waterways or land?

The Report will provide a thorough assessment of any impacts that may occur during construction and operation of the Osborne SCY. The Report will also include proposed mitigation methods and offset measures for identified impacts

What happens now?

Following finalisation of the Terms of Reference, the draft Report will be prepared and published for public review and comment later this year.

During this time, there will be opportunities to read the Report, contact the ASA and submit feedback. The ASA is committed to keeping the community informed about the Project and values community contributions.

Where can I get updated information?

Updates can be found on the ASA website and we will also publish notifications about upcoming engagement events you can attend.

What if I have other questions?

We encourage you to send any questions or other enquiries about the SCY to asa.Osborne.enquiries@defence.gov.au

Join our upcoming **Community Webinar** to learn more: 6pm Wednesday 17 April 2024
Register via the QR

Osborne Submarine Construction Yard Project

www.asa.gov.au **asa.osborne.enquiries@defence.gov.au**

Appendix C

Social media and website report – June Information Session

Social Media Insights Report

Osborne Construction Yard - Drop In Info Session
Saturday 22 June

facebook

418 Followers

Original Post
263 Reach
11 Engagements
2 Shares

Australian Submarine Agency
4 June ·

Attention South Australians!

The Australian Submarine Agency are preparing to release the Osborne Submarine Construction Yard draft Strategic Impact Assessment Report (Report) to share with the community in coming months as part of a comment period.

In the lead up to this release, join us at the Osborne Submarine Construction Yard Project Community Drop-in Information Session and learn more about the Project:

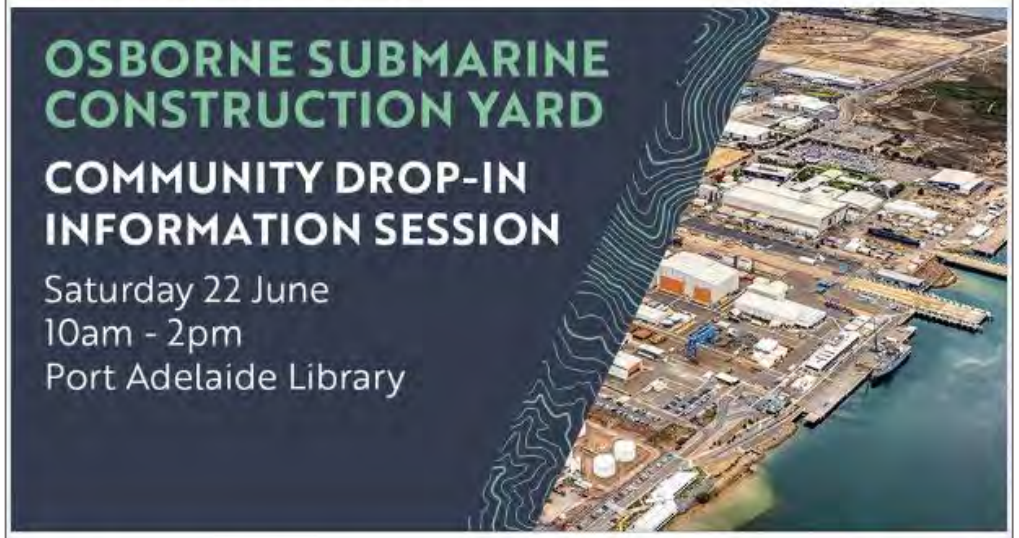
Saturday 22 June 10am – 2pm
Port Adelaide Library

This Community Drop-in Information Session is one opportunity where you can engage with the project team and explore the depths of the Osborne Submarine Construction Yard draft Report.

Attendees can expect to gain first-hand information from project specialists, ask questions, and dive into topics about the Project and Strategic Assessment process.

Register here: www.trybooking.com/CRXYK

For all enquiries related to the Osborne Submarine Construction Yard Project and Strategic Assessment process, email the Australian Submarine Agency at asa.osborne.enquiries@defence.gov.au



Boost this post to reach up to 2795 more people if you spend AU$35.

Boost post

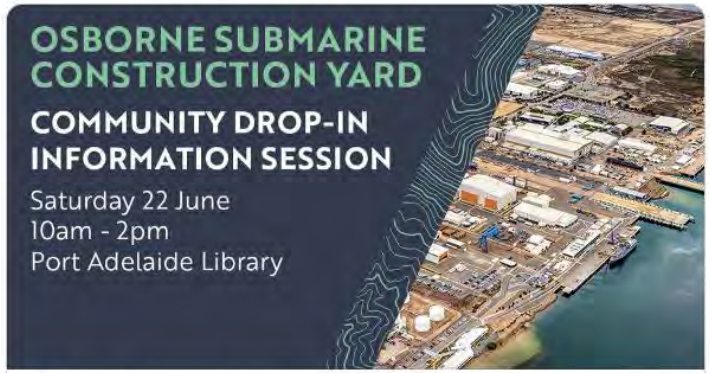
11

1 comment 2 shares

facebook

Australian Submarine Agency
14 June at 10:05 ·

There is still time to register your interest for one of our Community Drop-in Information Sessions! Please see details below.



Australian Submarine Agency
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Register here: www.trybooking.com/CRXYK

For all enquiries related to the Osborne Submarine Construction
Assessment process, email the Australian Submarine Agenc
asa.osborne.enquiries@defence.gov.au

1

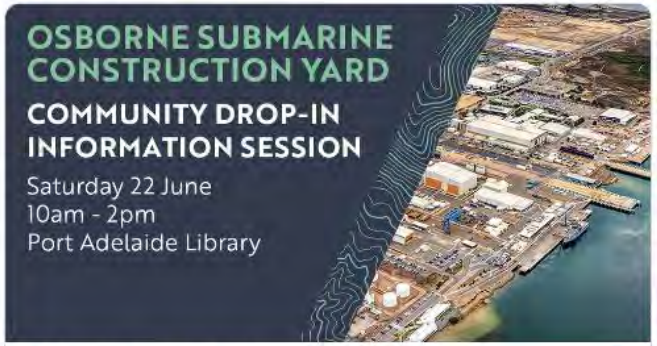
Shared Post
166 Reach
1 Reaction

Australian Submarine Agency
20 June at 10:35 ·

The Osborne Submarine Construction Yard Project Community Drop-in Information Session is on Saturday!

It's not too late to register your interest or drop-by the Port Adelaide Library between 10 am – 2 pm to meet the ASA and project team.

More details here www.trybooking.com/CRXYK



Australian Submarine Agency
4 June ·

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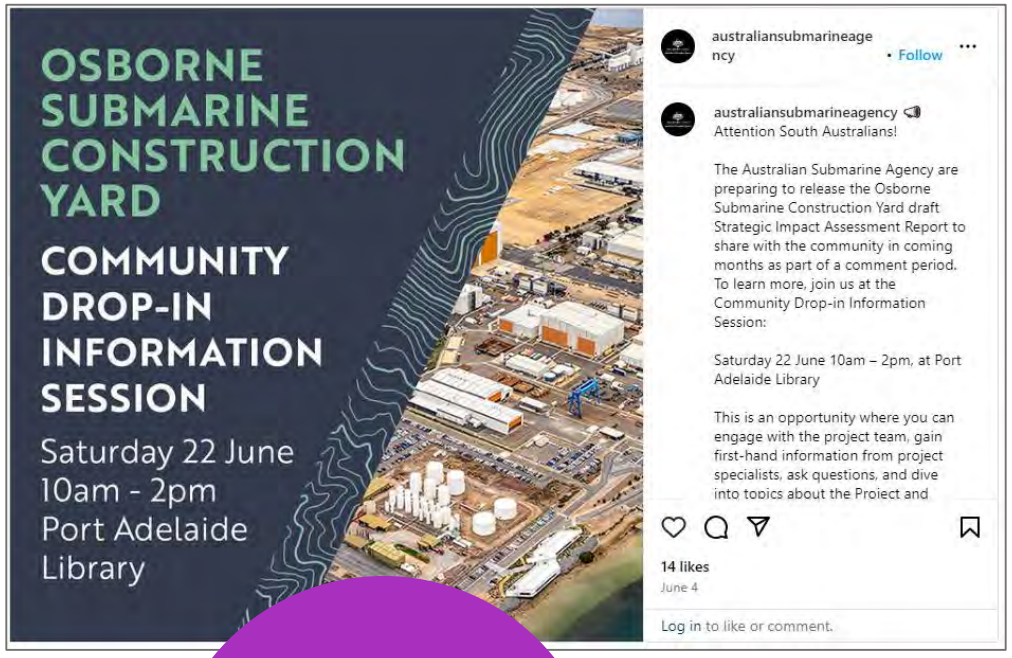
For all enquiries related to the Osborne Submarine Construction Yard Proj
Assessment process, email the Australian Submarine Agency at
asa.osborne.enquiries@defence.gov.au

9

Shared Post
174 Reach
9 Reactions

Instagram

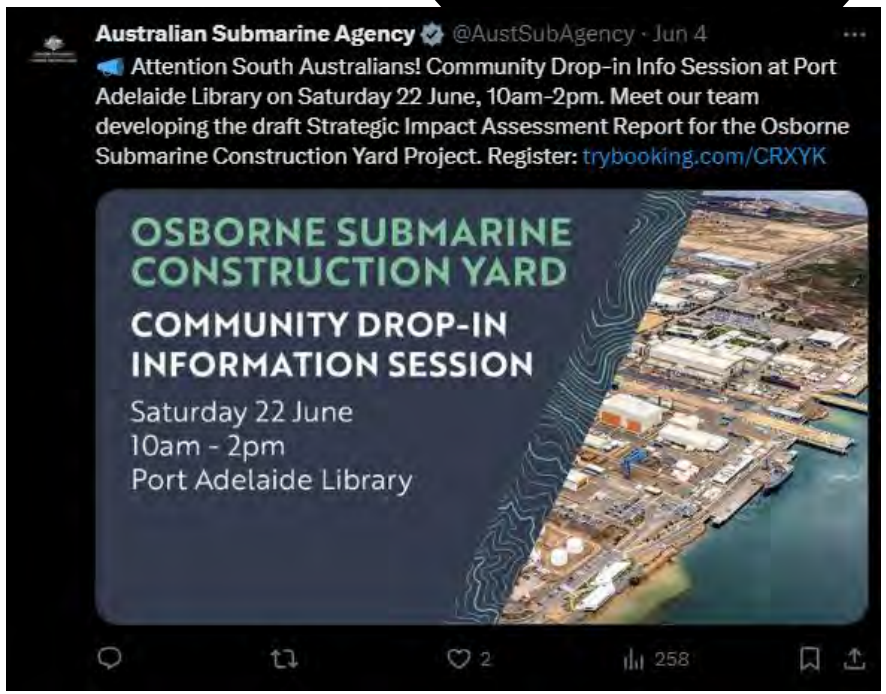


Post
126 Reach
14 Reactions

Story
91 Reach
2 Link Clicks

181 Followers

Original Post
258 Reach
2 Engagements



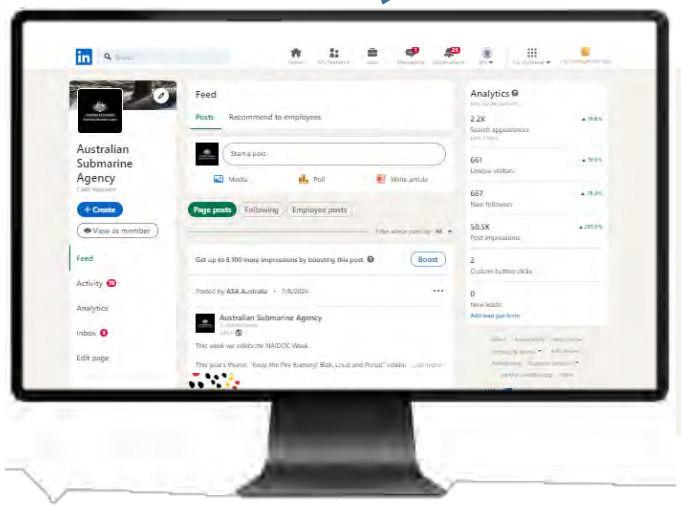
1.1k Followers

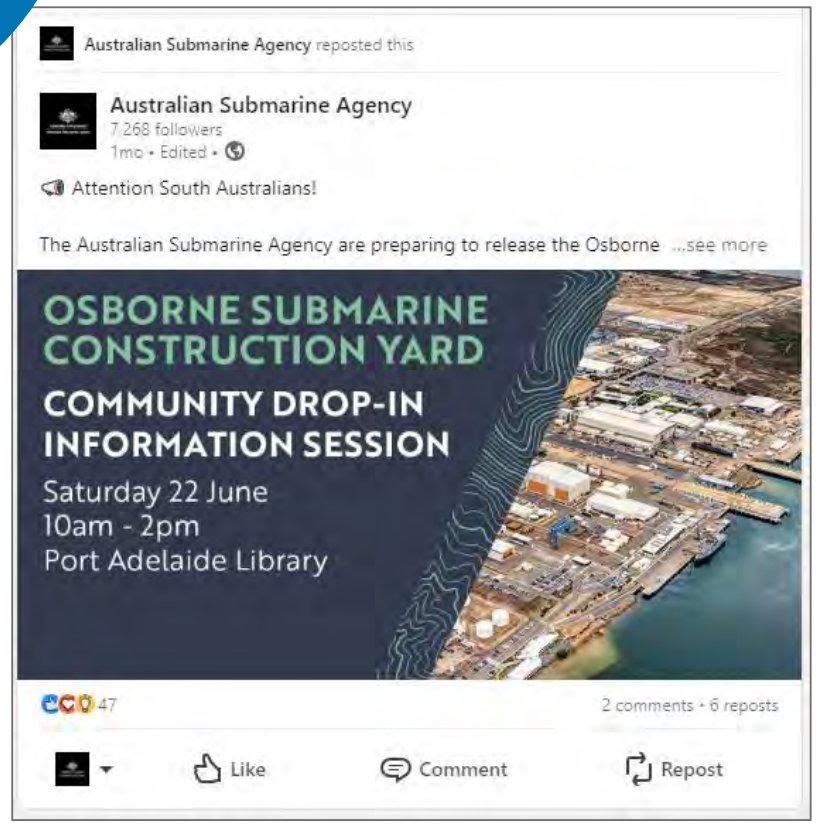
Shared Post
207 Reach
3 Engagements

LinkedIn

5,451 Reach
195 Clicks
47 Reactions
6 Reposts

7.2k Followers





Australian Government

Australian Submarine Agency

ASA

www.asa.gov.au

OFFICIAL

Appendix G

Biodiversity Values Report

Australian Government
Australian Submarine Agency

ASA

BIODIVERSITY VALUES REPORT

SUBMARINE CONSTRUCTION YARD STRATEGIC ASSESSMENT

OSBORNE, SOUTH AUSTRALIA

29 November 2024

www.asa.gov.au

Project name	Osborne Submarine Construction Yard Strategic Assessment
Document title	Biodiversity Values Report
This document has been prepared by GHD Pty Ltd for the Australian Submarine Agency	

Acknowledgement of Country

The Australian Submarine Agency acknowledges the Kaurna Meyunna people of Kaurna Country, the Traditional Custodians on whose land the Submarine Construction Yard is sited. We recognise their continuing connection to traditional lands and waters and would like to pay respect to their Elders both past and present.

Executive summary

Overview

The Australian Submarine Agency and the Commonwealth Minister for the Environment and Water ('the Minister') entered into a Strategic Assessment Agreement in November 2023. The pathway for assessment and approvals, agreed upon under the Strategic Assessment Agreement, for the construction and operation of a Submarine Construction Yard, is under Part 10 of the *Environment Protection and Biodiversity Conservation Act 1999*.

The Submarine Construction Yard will be located on the Lefevre Peninsula, approximately 19 km north of Adelaide in South Australia to enable the building of nuclear-powered, conventionally armed submarine SSN-AUKUS. The Lefevre Peninsula has undergone alteration and industrial development since 1881. The Strategic Assessment Area includes an area that has been filled historically to depths of approximately 3.3 m below the ground level. Additionally, the Port Adelaide River has been subject to dredging operations since the onset of industrialisation in the region.

This Biodiversity Values Report provides details of the biodiversity values of the Submarine Construction Yard and surrounding region based upon desktop review and field investigations undertaken in 2023 and 2024. Biodiversity values of interest include ecological communities, flora and fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and species listed under the *National Parks and Wildlife Act 1972* (NP&W Act), as well as habitat that supports these species.

This report has been prepared as a supporting technical document to the Strategic Impact Assessment Report. It provides information in relation to biodiversity matters within the Submarine Construction Yard 'Strategic Assessment Area' required by the Terms of Reference of the Strategic Assessment Agreement between the Department of Climate Change, Energy, the Environment, and the Australian Submarine Agency.

Strategic Assessment Area context

The onshore area of the Strategic Assessment Area was historically cleared and filled. Vegetation has re-established on areas where hardstand is not present or planted along open stormwater basins and within landscaped gardens. Scattered mangroves occur along parts of the shoreline, and a sandy tidal flat is located at the interface between the onshore area and the marine area in the Port Adelaide River.

Several conservation areas are present in vicinity of the Strategic Assessment Area from Port Adelaide River, through Barker Inlet north along the eastern shore of Gulf St Vincent. These include Mutton Cove, Torrens Island Conservation Park, and Adelaide International Bird Sanctuary National Park Winaityinaityi Pangkara. In addition to these conservation areas, Adelaide Dolphin Sanctuary encompasses Port Adelaide River, Barker Inlet, Outer Harbor, North Haven and extends north to Port Gawler.

Flora

No EPBC Act listed, or state-listed flora species were recorded in the Strategic Assessment Area despite targeted surveys.

The EPBC Act listed threatened ecological community, subtropical and temperate coastal saltmarsh, is known to occur in tidal areas around the coastal margins in the region of the Strategic Assessment Area. Vegetation within the Strategic Assessment Area did not have the characteristics or meet the condition requirements described in the Conservation Advice for the threatened ecological community which has a status of vulnerable under the EPBC Act. No other listed threatened ecological communities occur within the Strategic Assessment Area.

Vegetated areas within the onshore area primarily contain species known as samphires (*Tecticornia pergranulata, T. indica, T. halocnemoides)* and saltbushes (*Nitraria billardierei* and *Enchylaena tomentosa* subsp. *tomentosa*), while the marine area within Port Adelaide River supports seagrass meadows along its banks. Six vegetation associations were mapped within the Strategic Assessment Area.

Fauna

Observations from surveys conducted in the Strategic Assessment Area (Table E1) included:

– Three (3) EPBC Act listed threatened species
– Six (6) EPBC Act listed migratory species
– Eight (8) NP&W Act listed species

Habitat types include constructed wetlands, low open shrubland, tidal flats, seagrass meadows and mangrove shrubland.

Table E1 EPBC and NP&W listed species observed from surveys conducted in the Strategic Assessment Area

Common name	Scientific name	EPBC Act		NP&W Act threatened status
		Threatened status	Migratory	
Australian fairy tern	*Sternula nereis nereis*	Vulnerable	–	–
Banded stilt	*Cladorhynchus leucocephalus*	–	–	Vulnerable
Bush stone-curlew	*Burhinus grallarius*	–	–	Rare
Caspian tern	*Hydroprogne caspia*	–	Yes	–
Common greenshank*	*Tringa nebularia*	Endangered	Yes	–
Common sandpiper*	*Actitis hypoleucos*	–	Yes	Rare
Elegant parrot	*Neophema elegans*	–	–	Rare
Greater crested tern	*Thalasseus bergii*	–	Yes	–
Plumed egret	*Ardea intermedia*	–	–	Rare
Pied oystercatcher	*Haematopus longirostris*	–	–	Rare
Red-necked stint*	*Calidris ruficollis*	–	Yes	–
Sharp-tailed sandpiper*	*Calidris acuminata*	Vulnerable	Yes	–
Sooty oystercatcher	*Haematopus fuliginosus*	–	–	Rare

**migratory shorebird*

Document navigation

This report is an Appendix to the Submarine Construction Yard Strategic Impact Assessment Report, which provides a consolidated description of the ecological values for the Strategic Assessment Area and surrounding region. An assessment of the impact of the construction and operation of the Submarine Construction Yard on matters protected under the EPBC Act, including migratory species, is provided in the Strategic Impact Assessment Report.

Acronyms and abbreviations

Acronym / abbreviation	Definition
BIA	Biologically Important Area
CAMBA	China–Australia Migratory Bird Agreement
Cth	Commonwealth
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
JAMBA	Japan–Australia Migratory Bird Agreement
NP&W Act	*National Parks and Wildlife Act 1972* (South Australia)
PMST	Protected Matters Search Tool
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SSN	Submersible Ship Nuclear
SA	South Australia
sp	Unspecified species
spp	Indicates several species of the same genus
ssp	Subspecies
var	Variant
WoNS	Weed of National Significance

Glossary

Term / phrase	Definition
Actions	An activity or series of activities, proposed to be undertaken during the construction and operation of the Submarine Construction Yard, that are subject to approval by the Federal Minister for the Environment and Water.
Activities	Discrete activities or works undertaken during the construction or operation of the Submarine Construction Yard, that may form part of a broader 'Action' or 'Class of Actions'. For example, site clearing is an activity.
Assembly and testing area	The area within the onshore area of the Strategic Assessment Area north of Pelican Point Road and east of Mersey Road North.
AUKUS	Trilateral security partnership between Australia, the United Kingdom, and the United States of America.
Biodiversity	The variety of life on earth, including within and between groups of plants, animals, microorganisms and their ecosystems.
Bonn Convention	The Convention on the Conservation of Migratory Species of Wild Animals.
Class of Actions	A 'Class of Actions' is a grouping of similar 'Actions' subject to approval by the Federal Minister for the Environment and Water.
Clearing	The cutting down, felling, thinning, logging, removing, killing, destroying, ringbarking, uprooting of vegetation.
Commissioning	The process of testing to check that equipment and systems is per the design and can run safely.
Construction	Construction means: – The erection of a building or structure that is, or is to be, fixed to the ground and wholly or partially fabricated on-site. – The alteration, maintenance, repair or demolition of any building or structure. – Any work which involves breaking of the ground (including pile driving) or bulk earthworks. – The laying of pipes and other prefabricated materials in the ground. – Any associated excavation work.
Conventionally-armed	Submarines (or other defence force vessels / vehicles) that are armed with common weaponry and excludes nuclear weaponry.
the Department	The Commonwealth Department of Climate Change, Energy, the Environment and Water.
Ecological communities	A group of native plants, animals and other organisms that naturally occur together and interact in a unique habitat. The structure of an ecological community, composition and distribution are determined by environmental factors such as soil type, position within the landscape / seascape (for example, altitude / depth), climate, and water availability, chemistry and movement (for example, oceanic currents). Species within each ecological community interact with and depend on each other—for example, for food or shelter.
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
the Environment	Means 'environment' as defined in Section 528 of the EPBC Act. It includes: a. Ecosystems and their constituent parts including people and communities ('ecosystem' is defined in the EPBC Act as 'a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functioning unit'), and b. Natural and physical resources, and c. The qualities and characteristics of locations, places and areas, and d. Heritage values of places ('heritage value' is defined in the EPBC Act as including 'the place's natural and cultural environment having aesthetic, historic, scientific or social significance, or other significance, for current and future generations of Australians.' 'Indigenous heritage value' is defined as meaning 'a heritage value of the place that is of significance to Indigenous persons in accordance with their practices, observances, customs, traditions, beliefs or history'), and e. The social, economic and cultural aspects of a thing mentioned in paragraph a), b), c) or d).

Term / phrase	Definition
Manufacturing and fabricating area	The area within the onshore area of the Strategic Assessment Area south of Pelican Point Road and west of Mersey Road North.
Marine area	A portion of the Strategic Assessment Area located within the Port Adelaide River.
the Minister	The Commonwealth Minister for the Environment and Water, who is responsible for the administration of the EPBC Act. As per the Terms of Reference, this may include a person to whom that Minister's power, under Section 146(1) of the EPBC Act, has been delegated.
Onshore area	Any area of land within the shore area that is not included in the territorial sea or within the Port Adelaide River.
Osborne Naval Shipyard	Refers to the Osborne Naval Shipyard facilities currently under operation and in construction on property administered by Australian Naval Infrastructure.
The Plan	The Strategic Assessment Plan which describes: – The Actions and Classes of Actions that are to be undertaken to construct and operate the Submarine Construction Yard in the Strategic Assessment Area. – The outcomes that will be achieved for Protected Matters, to which Actions proposed under The Plan relate, in accordance with the requirements of the EPBC Act.
Protected Matter	Means a matter protected by a provision of Part 3 of the EPBC Act. The specific matter protected by each provision is set out in Section 34 of the EPBC Act.
Ramsar Convention	The Convention on Wetlands of International Importance.
The Report	The Impact Assessment Report assesses the potential environmental impacts associated with the development of the Submarine Construction Yard, and includes: – A description of the environment to which Actions proposed under The Plan relate – An assessment of the potential impacts of implementing The Plan on Protected Matters – Details of how likely or potential impacts will be avoided, mitigated and offset (where necessary or appropriate) to make sure that Protected Matters are protected and managed in the long-term.
SSN-AUKUS	A planned class of nuclear-powered fleet submarine intended to enter service with the United Kingdom's Royal Navy in the late 2030s and Royal Australian Navy in the 2040s.
Strategic Assessment	A process where the Minister may approve taking an Action or Class of Actions in accordance with an endorsed policy, plan or program. A Strategic Assessment Agreement provides for this kind of assessment. It's often used for landscape-scale assessments of developments and programs.
Strategic Assessment Area	Means the area displayed within the Strategic Assessment Area in Attachment 1 of the Agreement.
Surrounding region	The Strategic Assessment Area is surrounded by a variety of natural and manmade infrastructure. It sits in the greater context of the Lefevre Peninsula in Adelaide, South Australia. For the purposes of this report, the 'surrounding region' is inclusive of the following: – North: natural reserves and ecosystems line the coast. This includes the Adelaide International Bird Sanctuary National Park, and Torrens Island – South: The Osborne Naval Shipyard and residential areas – East: Torrens Island, Barker Inlet and St Kilda – West: industrial zoning, and Gulf St Vincent
Terms of Reference	Means the Terms of Reference finalised on 25 March 2024, which details how the impacts from the proposed Actions and activities are to be assessed.

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Appendices

1. Introduction

1.1 Background

Australia, the United Kingdom, and the United States announced the AUKUS trilateral security partnership in September 2021. The AUKUS partners agreed to support Australia to construct conventionally-armed nuclear-powered submarines (known as 'submersible ship nuclear', or SSN) in South Australia. The conventionally-armed nuclear-powered submarines built under AUKUS will meet Australia's defence requirements in future decades.

The approach for Australia to develop a conventionally-armed nuclear-submarine capability (the 'Optimal Pathway') was announced on 13 March 2023. Under AUKUS it is planned to build up to five conventionally-armed nuclear-powered submarines in Australia, to be known as SSN-AUKUS, by the early 2040s.

The preferred site for construction of Australia's SSN-AUKUS submarines is at Osborne on the Lefevre Peninsula, approximately 19 km north of Adelaide in South Australia. The Submarine Construction Yard would be developed to contain a range of facilities in which fabrication and manufacture of submarine parts and components and testing and commissioning of submarines would occur (Figure 1 and Figure 2).

The Australian Submarine Agency and the Commonwealth Minister for the Environment and Water ('the Minister') entered into a Strategic Assessment Agreement in November 2023. This Section 146 agreement, made under Part 10 of the EPBC Act, sets out the content that is required for inclusion within the Strategic Assessment Plan for the construction and operation of the Submarine Construction Yard ('The Plan'), as well as the requirement to develop relevant Terms of Reference for a Strategic Impact Assessment Report ('The Report'). The area agreed to be designated as the 'Strategic Assessment Area' in which Actions or Classes of Actions proposed under the Plan, can be endorsed and approved by the Minister, is shown in Figure 1.

1.2 Purpose of this report

The purpose of this report is to provide details of the biodiversity values of the Strategic Assessment Area to support the EPBC Act Strategic Assessment process. This report has been prepared to support the assessment in The Report and address the relevant Terms of Reference included in Table 1-1.

Table 1-1 Relevant Terms of Reference

Terms of Reference clause	Section
4.2. The Report must identify and describe Protected Matters to which actions under The Plan relate. This must include:	
c) A description of, and spatial information for EPBC Act listed ecological communities found within or relevant to the Strategic Assessment Area outlining their known and potential extents (in hectares), condition, listing status, threatening processes, habitat quality and landscape context (Part 3, Division 1, Subdivision C). The Report must also consider matters that are potentially eligible for listing as a result of inclusion in a final priority assessment listing held by the Commonwealth, or a recommendation to the Commonwealth Minister for listing by the Threatened Species Scientific Committee, prior to The Report being submitted.	Section 3.1.2 Section 3.2.1 **Appendix F (Figure F1, Table F1)**
d) A description of, and spatial information for listed threatened and/or migratory species relevant to the Strategic Assessment Area. Details are to include listing status, documented habitat type and documented or surveyed estimates of population size or abundance and distribution, habitat presence quality and area (in hectares), landscape context and existing threatening processes (Part 3, Division 1, Subdivision C and D). The Report must also consider matters that are potentially eligible for listing as a result of inclusion in a final priority assessment listing held by the Commonwealth, or a recommendation to the Commonwealth Minister for listing by the Threatened Species Scientific Committee, prior to The Report being submitted.	Section 3.1.2 Appendix B Appendix C **Appendix F (Table F1, Table F2, Table F3, Table F4)**
e) The identification of critical or important areas for Protected Matters, including consideration of the importance of areas of habitat, habitat connectivity, position in the landscape and areas likely to be important for maintaining ecological processes.	Section 4.2 Figure 6
f) Maps detailing habitat type and extent for the listed threatened species, migratory species and ecological communities that are known, likely or may occur within the Strategic Assessment Area.	Appendix B Figure 6

1.3 Strategic Assessment Area context

1.3.1 Onshore area

The onshore area of the Strategic Assessment Area is largely flat apart from stormwater management infrastructure. These include drainage detention basins and swales constructed from around 2011 including within Falie Reserve and in between the southern boundary of the assembly and testing area and the access road to Snapper Point car park lookout. Mutton Cove is also bordered by earth berms on its northern, western and southern extents.

Prior to historical filling and levelling of much of the Lefevre Peninsula, the Strategic Assessment Area was part of the Port River estuary. Soils underlying the fill layer comprise historic estuarine muds and sands (Cook & Coleman 2003). Figure 3 shows the change of the Lefevre Peninsula in 1959 to present day.

Due to the changed landscape, there are no natural surface waterbodies within the onshore area. Water within stormwater basins in Falie Reserve is fresh water that is not tidally influenced because it is part of the stormwater management infrastructure. Water from the Falie Reserve detention basin is captured and periodically pumped to the swale drain north of Mutton Cove. Water within the swale drain is subject to daily tides.

Some areas are planted and actively maintained such as Falie Reserve, while other areas have been utilised for the purposes of dredge spoil management or prior construction, and comprise either bare earth, or areas where low scattered vegetation has established. Landscape plantings are present around existing buildings and along roads.

1.3.2 Marine area

Port Adelaide River is a tidal inlet from Gulf St Vincent that has two high and low tides daily (semidiurnal tides). The river includes a dredged shipping channel and is characterised by tidal mud flats and mangroves, with intertidal and subtidal eelgrass (*Zostera marina*) beds present on the northern side of the channel.

The shoreline interface between the onshore area and the marine area of the Strategic Assessment Area is an tidal flat with scattered mangroves in some areas, largely in the area adjacent to the swale drain discharge point to the Port Adelaide River.

The Port Adelaide River contains the Adelaide Dolphin Sanctuary. Established in 2005, the sanctuary aims to protect and enhance the environment and in turn protect the population of dolphins that utilise the habitat.

Gulf St Vincent has been recognised as an internationally significant area for migratory shorebirds and is listed as an internationally significant site within the *Australian national directory of important migratory shorebird habitat* (Weller *et al.* 2020). Gulf St Vincent is a destination site for the East Asian-Australasian Flyway and regularly hosts an average of over 29,000 shorebirds each year including 14,000 migrants of 13 species (Lees *et al.* 2020).

1.3.3 Surrounding region

The northern portion of the Lefevre Peninsula supports industry and logistics, including Flinders Container Port, a cruise ship terminal, industrial premises including Viterra Outer Harbor, Pelican Point Power, and Snapper Point Power Station. The banks of the Port Adelaide River along the eastern flank of the Lefevre Peninsula have been hardened for industrial purposes, including ship building within the Osborne Naval Shipyard. An existing seawall along the boundary of Mutton Cove with Port Adelaide River was breached in 2016, and the reserve is now subject to tidal influence.

The nearest open space and recreation areas outside of the Strategic Assessment Area are:

- Biodiversity Park, west of the onshore area
- Kardi Yarta Playground, a small playground and park area between Biodiversity Park and the south onshore area
- Mutton Cove, east of the onshore area

Biodiversity Park and Kardi Yarta Playground were developed in 2010 by Renewal SA as a part of an open space project to introduce conservation areas and recreational facilities on the northern Lefevre Peninsula.

Mutton Cove is the last remaining area of remnant vegetation on the Lefevre Peninsula. It has been degraded since European settlement with vegetation changing over time, from being dominated by mangrove species to saltmarsh species depending on connection to the tidal regime. Mutton Cove is also used as a recreational area by nearby local residents who walk the boundary path.

The periphery of Gulf St Vincent, including areas along Port Adelaide River, contain coastal and marine habitats, including saltmarsh, sandflats, mudflats, mangroves and tidal creeks (DEW 2012). Eelgrass (*Zostera marina*) beds extend around Barker Inlet (located approximately 3 km north north-east of Lefevre Peninsula, on the eastern edge of Torrens Island).

Adjacent to the Strategic Assessment Area, across the Port Adelaide River is Torrens Island (east) and Bird Island (north). These areas provide remnant habitat for Protected Matters and other migratory shorebirds (Section 4.2).

Torrens Island contains multiple power stations, a cardon dioxide plant and the historical Torrens Island Quarantine Station along the western extent, with the rest of the island designated as a conservation park. It contains remnant mangroves, samphire and coastal dunes which provide valuable habitat for international migratory and resident native species (Section 4.2). The conservation park is not open for public access.

Bird Island was formed along the northern breakwater (originally completed in 1913) of the Outer Harbor entry, approximately 2.5 km northwest of the onshore area and adjacent to the northeast boundary of the marine area. Bird Island was formed from dredged clay and sand spoil placed in 1976, and extended in 1997. It is known to provide habitat to a range of migratory and shorebird species. The island is slowly growing to the north-east as sand and sediment from Adelaide's southern beaches moves north and accumulates. Initially the island was planted with nitre bush *(Nitraria billardierei)* to stabilise against erosion, and since then has been colonised by coastal saltbush, samphire and mangroves. Multiple bird species are known to use the island as breeding grounds, particularly the Australian fairy tern *(Sternula nereis nereis)*, with a substantial proportion of the known breeding population of birds in South Australia inhabiting Bird Island (Section 4.2).

The Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara and the broader Adelaide International Bird Sanctuary, is located along the eastern coastline of Gulf St Vincent. It spans 60 km from St Kilda to Port Parham. The National Park protects 14,633 ha of critical migratory bird habitat on the southern extent of international migratory flyways, including the East Asian-Australasian Flyway.

STRATEGIC ASSESSMENT AREA

Legend

- Railway
- Strategic assessment area
- Marine area
- Onshore area

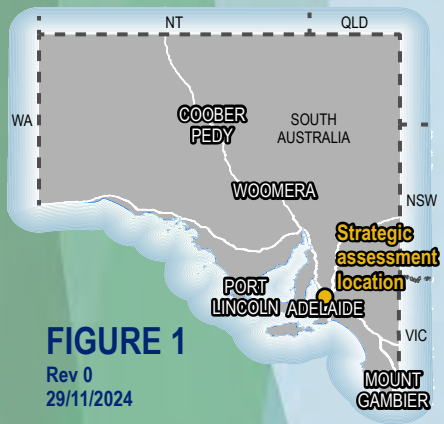


FIGURE 1
Rev 0
29/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_031_AssessmentAreasAgreement

Australian Government
Australian Submarine Agency

GHD

Torrens Island Conservation Park
Port Adelaide River
Pelican Point
Power Stations
Container Terminal
Grain Terminal
Snapper Point
Lefevre Peninsula
Pelican Point Road
Mutton Cove
Falie Reserve
Oliver Rogers Road
North Haven Golf Course
Biodiversity Park
Victoria Road
Power Station
Lady Ruthven Drive
Gulf St Vincent
Osborne Naval Shipyard
Port Adelaide
North Haven Marina
Osborne Road

STRATEGIC ASSESSMENT AREA OPERATIONAL AREAS

Legend

- Railway
- Strategic assessment area
- Marine area
- Manufacturing and fabricating area
- Assembly and testing area

Australian Government
Australian Submarine Agency

GHD

FIGURE 2
Rev 0
29/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_007_AssessmentArea

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment areas (2023). nearmap.com:

Figure 3 *Lefevre Peninsula in 1959 (left) and 2024 (right) (Source: Government of South Australia, Mapland and NearMap 2024)*

1.4 Legislative context

The Commonwealth and state legislative context for the environmental values present in the Strategic Assessment Area and surrounds are detailed in Table 1-2.

Table 1-2 Environmental legislative context of the Strategic Assessment Area

Legislation	Description
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999	The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as it relates to biodiversity values, includes listings of nationally protected animals including threatened and migratory animals, marine species, cetaceans, plants and ecological communities. Biodiversity values relevant to the Strategic Assessment Area include matters of national environmental significance, which are: – Vulnerable, endangered or critically endangered listed threatened plant and animal species. – Endangered or critically endangered threatened ecological communities. – Listed migratory species. Under section 146L of the EPBC Act, migratory species are also protected under international agreements, including: – The Bonn Convention – The China-Australia Migratory Bird Agreement (CAMBA) – The Japan-Australia Migratory Bird Agreement (JAMBA) – An international agreement approved under subsection 209(4) (this relates to other international agreements that are not listed above that relate to the conservation of migratory species, such as the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA). In addition to the matters of national environmental significance, the EPBC Act also includes lists of marine species, whales and other cetaceans that have protections under the EPBC Act, as well as places that have natural heritage values that relate to or support biodiversity. Threatened species are listed in the EPBC Act as endangered, vulnerable, critically endangered and conservation dependent.
State (South Australia)	
Fisheries Management Act 2007	Provides for conservation and management of aquatic resources including protection of aquatic habitats, aquatic mammals and aquatic resources as well as control of exotic aquatic organisms and diseases in aquatic resources.
National Parks and Wildlife Act 1972	The *National Parks and Wildlife Act 1972* (NP&W Act) establishes and manages reserves for public benefit and enjoyment and provides legal recognition for threatened plant and animal species in South Australia. Threatened species are listed in the NP&W Act as endangered, vulnerable or rare.
Native Vegetation Act 1991	The *Native Vegetation Act 1991* applies to public and private land and aims to prevent large scale clearance of native vegetation across South Australia for urban development and agriculture. As the Strategic Assessment Area is not mapped within the State Significant Vegetation Overlay, the *Native Vegetation Act 1991* does not apply to the Submarine Construction Yard.
Landscape South Australia Act 2019	A list of typically introduced plants and animals has been declared under the *Landscape South Australia Act 2019.* The list, which was included in the South Australian Government Gazette (see SA Government 2020, pp. 4002–4038), identifies typically introduced pest plants and animals, the provisions of the Act which apply to the class, and the area of the state in which the declaration applies. For certain classes of declared animals and plants, there is an obligation under the *Landscape South Australia Act 2019* to address specific controls. As relevant to actions, these include: – Movement of animals or plants (Section 186) – Requirement to notify of the presence of a class of plants or animals (Section 190) – Requirement to destroy or control a class of plants (Section 192)
Adelaide Dolphin Sanctuary Act 2005	The *Adelaide Dolphin Sanctuary Act 2005* establishes a sanctuary to protect the dolphin population of the Port Adelaide River estuary and Barker Inlet and its natural habitat. It provides protection and enhancement of the Port Adelaide River estuary and Barker Inlet and other purposes. The Port Adelaide River is home to around 20 Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) and the common bottlenose dolphin (*Tursiops truncatus*) also transits through the area. Neither species is considered to be threatened under the EPBC Act.
Environment Protection Act 1993	The *Environment Protection Act 1993* provides for the protection of the environment and provides for the economic, social and physical well-being of communities. It establishes the role of the Environment Protection Authority and defines its functions and powers.

2. Methods

2.1 Desktop assessment

A desktop assessment for biodiversity values known or predicted to be present within the Strategic Assessment Area was undertaken. A review of publicly available databases and websites, available reports and guidance, and spatial datasets is summarised in Table 2-1. A quality assessment based on relevant literature and assessment criteria was undertaken of the novel habitats identified within the Strategic Assessment Area (**Table F3** of **Appendix F**). A review of the DCCEEW website was conducted on 16 March 2014 for species and ecological communities nominated or potentially eligible for a threatened listing.

Table 2-1 Desktop assessment sources

Source	Detail / notes / reference
Database searches	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Search Tool (PMST)	10 km search area (Appendix A) Extracted 24 September 2024
NatureMaps, which provides GIS mapping, maintained by Department of Environment and Water South Australia, including modelled mapping of broad vegetation types, locations of threatened flora and fauna records from the Flora and Fauna Atlas	NatureMaps 2024 Extracted 31 May 2024
Threatened species and ecological communities nominations for listing	DCCEEW 2023a Reviewed 4 September 2024
Technical studies reviewed	
Osborne Preliminary Environmental and Heritage Impact Assessment Ecological Investigation Report	GHD 2023
Osborne Preliminary Environmental and Heritage Impact Assessment Planning Study Report	GHD 2023
Osborne North Car Park and Grade Separated Road Biodiversity Values Report	GHD 2023
Technical Memorandum – Targeted survey for Bead Glasswort (*Tecticornia flabelliformis*)	GHD 2023
Technical Memorandum – Targeted survey for slender billed thornbill (*Acanthiza iredalei rosinae*)	GHD 2023
Expansion of the Osborne Naval Shipyard Baseline Environmental Report	Succession Ecology 2023
Migratory Shorebird Survey Submarine Construction Yard	GHD 2024
Osborne Naval Shipyard Expansion Marine Ecological Assessment	J Diversity 2023
Outer Harbor LNG Project Development Application	Venice Energy 2020
Outer Harbor channel widening dredging seagrass condition assessment	EPA 2020
ANI Due Diligence – Outer Dock Environmental Site Assessment	Coffey 2017

2.2 Field surveys

2.2.1 Overview

Field surveys were conducted between March 2023 and February 2024 to inform baseline condition and planning associated with the Submarine Construction Yard. The coverage of previous field surveys is shown in Table 2-2.

Table 2-2 Field assessments

Survey dates	Field survey	Purpose	Completed by
15 May 2023 19 June 2023 11 and 18 July 2023	Environmental risks survey	Environmental risks survey	Succession Ecology
7 to 9 March 2023	Baseline ecological assessment	Baseline ecological assessment of the Strategic Assessment Area	GHD
20 to 21 April 2023	Targeted survey for the bead glasswort (*Tecticornia flabelliformis*)	Targeted survey for the bead glasswort within the Strategic Assessment Area and a reference site on Torrens Island	GHD
3 July 2023 17 to 21 July 2023	Targeted survey for the slender-billed thornbill (*Acanthiza iredalei rosinae*)	Targeted survey for the slender-billed thornbill (*Acanthiza iredalei rosinae*)	GHD
19 to 22 December 2023 15 to 19 January 2024 29 January to 2 February 2024 12 to 16 February 2024	Migratory bird survey	Targeted survey for migratory shorebirds within the Strategic Assessment Area and reference sites within the surrounding region	GHD
3 August 2023	Benthic survey	Benthic survey of the marine area	J Diversity

2.2.2 Flora

Survey techniques and effort during each flora and vegetation field survey previously undertaken within the Strategic Assessment Area are detailed in Table 2-3.

Table 2-3 Survey techniques and survey effort for flora during each field survey

Field survey	Survey type	Survey techniques	Survey effort and dates
Environmental risks survey	Environmental risks survey	– Identified, described, and mapped vegetation types. – Compiled list of flora identified in survey area. – Surveyed 'significant trees'.	– Four days: • 15 May 2023 • 19 June 2023 • 11 July 2023 • 18 July 2023
Baseline ecological assessment	Habitat / vegetation community assessment	– Identifying and mapping flora under the EPBC Act and/or NP&W Act (SA). – Identifying and mapping vegetation associations via vegetation plot assessments. – Documenting opportunistic flora observations on site. – Brief searches for threatened species in potentially suitable habitat. – Assessing habitat values.	– Three 10-hour days: • 7 to 9 March 2023 – 100 x 100 m (1 ha) vegetation plots were conducted in each of the three sections of the Strategic Assessment Area – Number of plots in each section depended on the variation of vegetation in that section – Three team members
Targeted survey for the bead glasswort (*Tecticornia flabelliformis*)	Targeted survey	– Surveys conducted in optimal flowering season. – Located reference site to confirm species was flowering at time of survey. – Walking parallel transect lines in suitable habitat, between one and two metres apart in smaller suitable habitat areas, up to 10 m apart in lower value potential habitat.	– Two days: • 20 to 21 April 2023 – Four qualified team members
Benthic survey of the marine area	Benthic survey	– Conducted by towing a camera from a boat along transects. – Confirming benthic vegetation data already accumulated.	– One day: • 3 August 2023

2.2.3 Fauna

Survey techniques and effort during each fauna field survey previously undertaken within the Strategic Assessment Area are detailed in Table 2-4.

The Migratory Bird Survey Report (Appendix B) was prepared following targeted surveys for migratory birds between December 2023 and February 2024. The report contains a detailed description of methods and results. The findings of these surveys, including habitat and population numbers, have been incorporated into this Biodiversity Values Report where relevant.

Table 2-4 Survey techniques and survey effort for fauna during each field survey

Field survey	Survey type	Survey techniques	Survey effort and dates
Environmental risks survey	Environmental risk survey	– Opportunistic fauna observations were noted during the survey. – Opportunistic signs of secondary wildlife traces (droppings, scratches, nests) were noted in the survey. – Assessed vegetation associations and trees (>2 m circumference) for habitat value.	– Four days: • 15 May 2023 • 19 June 2023 • 11 July 2023 • 18 July 2023
Baseline ecological assessment	Fauna species and habitat assessment	– Identifying and mapping the location of fauna listed under the EPBC Act and/or NP&W Act. – Shorebird and wetland bird surveys: • Walking multiple 200 m transects twice a day. • Recording all birds seen and heard in 20 minutes in a 1 ha area. – Active searches for reptiles and amphibians: • 20 minute search in suitable microhabitats. – Mammal surveys: • Four remote surveillance cameras deployed on shoreline locations with high resource availability for three nights. – Active searches for secondary wildlife traces including feathers, nests, eggs and footprints. – Assessing habitat values of each vegetation association. – Opportunistic observations of fauna seen and heard over survey period were recorded.	– Three days: • 7 to 9 March 2023 – Surveys undertaken at 10 sites across Strategic Assessment Area
Targeted survey for the slender-billed thornbill (*Acanthiza iredalei rosinae*)	Targeted survey	– Survey was undertaken in breeding season with a higher chance to detect species. – Area searches of suitable species habitat, recording birds seen or heard. – Transect surveys in suitable habitat, recording all birds seen or heard. – Broadcast surveys using call playback.	– Six days: • 3 July 2023 • 17 to 21 July 2023 – 10 hours per day with minimum two hours beginning at dawn

Field survey	Survey type	Survey techniques	Survey effort and dates
Migratory bird survey (Appendix B)	Targeted survey	– Conducted minimum six shoreline transect surveys per day in the Strategic Assessment Area. – Conducted minimum three shoreline transect surveys per day at reference sites when conditions were suitable. – Visual surveys for shorebirds by walking 200 m shoreline transects. – Recording all terrestrial birds seen and heard in 20 minutes in a 1 ha area. – Assessing habitat values of each vegetation association including foraging, nesting, breeding and roosting resources. – Identifying and mapping the location of migratory species or communities listed under the EPBC Act and/or NP&W Act. – Collection of general site data, including photographs of ecological values and threatening processes. – Cameras were deployed at four locations within the Strategic Assessment Area for approximately two months.	– Three ecologists – Three five-day survey periods, and one four-day survey period: • 19 to 22 December 2023 • 15 to 19 January 2024 • 29 January to 2 February 2024 • 12 to 16 February 2024 – Surveys conducted at a total of 12 sites. Eight of which were reference sites. – Surveys conducted at high and low tide periods, to account for roosting time requirements and morning and afternoon periods to compare utilisation levels and times of varying human disturbance levels. – Detailed analysis of camera footage to detect the presence of other species not detected in survey hours.
Benthic survey of marine area	Benthic survey	– Conducted by towing a camera from a boat along transects. – Surveying habitat and small marine species.	– One day: • 3 August 2023

2.3 Likelihood of occurrence assessment

To assess likelihood of occurrence, the criteria in Appendix C were applied to each of the threatened and migratory species listed in the PMST report. The full assessment is provided in Appendix A.

The likelihood of occurrence criteria is based on:

– Field survey results
– Species records for the Strategic Assessment Area and surrounding region
– A review of the species geographic distribution and habitat requirements, based upon available documentation (e.g. species recovery plans, conservation advice etc.)
– Consideration of habitats in the Strategic Assessment Area, habitat connectivity in the landscape, and species movement behaviour

A conservative likelihood category was applied where there was uncertainty related to:

– Survey limitations such as:
  • Survey timing (i.e. seasonality) for migratory or nomadic fauna species or cryptic flora species
  • Reduced detectability of species
  • Length of survey
  • Methods employed for survey
  • Weather conditions
– Strategic Assessment Area location (i.e. remote locations that may not have been surveyed previously with limited records)
– Strategic Assessment Area extent (i.e. areas not available at the time of survey)
– Strategic Assessment Area disturbance related to extreme weather events such as bushfire, flooding and cyclone within the previous five years
– Habitat conditions related to prolonged weather conditions (e.g. drought)

Table 2-5 Likelihood of occurrence criteria

Likelihood category	Criteria
Known	– The species was recorded in the Strategic Assessment Area during a field survey, or – The species has been recorded within the Strategic Assessment Area from field surveys conducted within five years of The Report.
Likely	– The species was not recorded within the Strategic Assessment Area during a field survey; however was recorded at a reference site, or – The Strategic Assessment Area is within the documented extent of the species' geographic distribution and there are species records from the previous five to ten years from the surrounding region (i.e. 10 km buffer), and: • Species known distribution would encompass the Strategic Assessment Area, • Habitat connectivity across landscape or species mobility such that species would be able to access the Strategic Assessment Area, or • Species habitat is present in the Strategic Assessment Area.
Potential	For fauna species: – Species record from greater than 10 years within the surrounding region, and: • Species home range could encompass the Strategic Assessment Area, or • Habitat connectivity across landscape or species mobility such that species would be able to access the Strategic Assessment Area. For flora species: – Species record from greater than ten years within the surrounding region, and: • Vegetation associations in which the species is known to occur are present within the Strategic Assessment Area, or • Underlying soil or landform conditions known to be suitable for the species occur within the Strategic Assessment Area.
Unlikely	– Strategic Assessment Area is outside of documented geographic distribution of the species, or – Historical records greater than 10 years within the surrounding region, and: • No, or highly limited connectivity across landscape or limited species mobility meaning that species would be unlikely to be able to access the Strategic Assessment Area, or • Preferred habitat is not present within the Strategic Assessment Area, or • Historical record most likely reflecting a transient occurrence or incorrectly transcribed data.
Highly unlikely	– Strategic Assessment Area is outside of documented geographic distribution extent of the species, and – Conditions for species survival are not present within the Strategic Assessment Area.

PREVIOUS SURVEY COVERAGE WITHIN THE STRATEGIC ASSESSMENT AREA

Legend

- Railway
- Strategic assessment area

Survey

- Baseline ecological assessment of the wider investigation area
- Benthic survey
- Environmental risks survey
- Targeted surveys for bead glasswort (*Tecticornia flabelliformis*)
- Targeted surveys for migratory shorebirds
- Torrens Island survey area
- Boat transect
- Walking transect

Australian Government
Australian Submarine Agency

GHD

FIGURE 4
Rev 0
29/11/2024

0 100 200 300 400
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_016_PreviousFieldSurveys

Torrens Island Conservation Park
Port Adelaide River
Pelican Point
Power Stations
Container Terminal
Grain Terminal
Snapper Point
Lefevre Peninsula
Fuel Terminal
Mutton Cove
Falie Reserve
Biodiversity Park
Oliver Rogers Road
North Haven Golf Course
Pelican Point Road
Power Station
Lady Ruthven Drive
Sir Keith Smith Drive
Gulf St Vincent
Osborne Naval Shipyard
North Haven Marina
Victoria Road

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). Succession Ecology - Environmental risks survey, Torrens Island survey (2023); J Diversity Pty Ltd - Benthic survey (2023). GHD - Strategic assessment area (2023) Previous fieldwork extents (2024). nearmap.com:

3. Flora

3.1 Vegetation

3.1.1 General

Historically, the Strategic Assessment Area has been extensively cleared and raised, resultantly disconnecting the landscape from the tidal regime. Native vegetation has regenerated where hardstand is not present and is dominated by saltmarsh species. Vegetation has been planted around infrastructure as well as on embankments of drainage features such as Falie Reserve. Subject to changes overtime, Mutton Cove has retained high ecological value supporting dense mangrove shrubland.

Due to human induced landscape alterations across the northern parts of the Lefevre Peninsula, the vegetation communities that have re-established on reclaimed land should be seen as novel ecosystems rather than natural. Novel ecosystems are described as ecosystems that differ to historical native ecosystems due to human influence (Hobbs *et al.* 2013).

The Port Adelaide River has been historically dredged to maintain a shipping channel but still retains sparse patches of seagrass in the shallow intertidal areas that border the river (J Diversity 2023).

3.1.2 Threatened ecological communities

Desktop results

Protected Matters Search Tool report

The PMST report identified three EPBC Act listed threatened ecological communities with potential to be present within the Strategic Assessment Area and surrounding region (Table 3-1).

Table 3-1 EPBC Act listed threatened ecological communities potentially present within the Strategic Assessment Area

Threatened ecological community	EPBC Act threatened status	PMST likelihood
Subtropical and temperate coastal saltmarsh	Vulnerable	Likely to occur
Grey box (*Eucalyptus macrocarpa*) grassy woodlands and derived native grasslands of south-eastern Australia	Endangered	May occur
Peppermint box (*Eucalyptus odorata*) grassy woodland of South Australia	Critically endangered	May occur

Matters potentially eligible for listing

A summary of the review for matters potentially eligible for listing is included in Table 3-2.

Table 3-2 Summary of review for potentially eligible ecological communities

List reviewed	Assessment
Listing Assessments open for public comment – ecological community nominations	There were no ecological community nominations open for comment.
Extensions to EPBC Act listing assessment and decision timeframes	Two listing assessments had been extended, both of which relate to oyster reefs or beds, neither of which is relevant to the Strategic Assessment Area as oyster reefs or beds do not occur within it.
Ecological communities assessed as ineligible for listing	No relevant communities identified, and communities ineligible.
Ecological communities nominations not prioritised for assessment	A review of the community names did not indicate any previous nominations that aligned with the communities mapped within the Strategic Assessment Area (DCCEEW 2023a).

Field survey results

The Strategic Assessment Area contained saltmarsh shrubland that did not have the characteristics of or meet the Conservation Advice (DCCEEW 2013a) condition requirements for the Subtropical and temperate coastal saltmarsh threatened ecological community. The threatened ecological community is present in areas surrounding the Strategic Assessment Area including Mutton Cove and Torrens Island. A summary description of the threatened ecological community in proximity to the Strategic Assessment Area is provided in **Table F1** and **Figure F1** of **Appendix F.**

No other listed threatened ecological communities occur within the Strategic Assessment Area.

3.1.3 Nationally Important Wetlands

The Strategic Assessment Area is located within or near to two Nationally Important Wetlands. These include:

– Barker Inlet and St Kilda
– Port Gawler and Buckland Park Lake

The wetlands were identified and compiled by the Directory of Important Wetlands in Australia under criteria determined by the Australian and New Zealand Environment and Conservation Council Wetlands Network in 1994. The wetlands are now classified using a modified system based on that used by the Ramsar Convention to describe Wetlands and International Importance (DCCEEW 2021a).

Barker Inlet and St Kilda is identified as nationally important wetland because it exemplifies an extensive mangrove and saltmarsh community, being the largest in Gulf St Vincent and in close proximity to a city. Port Gawler and Buckland Park Lake are located north of the Strategic Assessment Area and contain the only substantial freshwater habitat on the Adelaide Plains. The wetlands provide habitat for EPBC Act threatened species also observed in the Strategic Assessment Area, such as the pied oystercatcher (*Haematopus longirostris*), sharp-tailed sandpiper (*Calidris acuminata*) and common greenshank (*Actitis hypoleucos*) (DCCEEW 2019).

3.1.4 Vegetation associations

Six vegetation associations were observed within the Strategic Assessment Area (Table 3-3) (Figure 5).

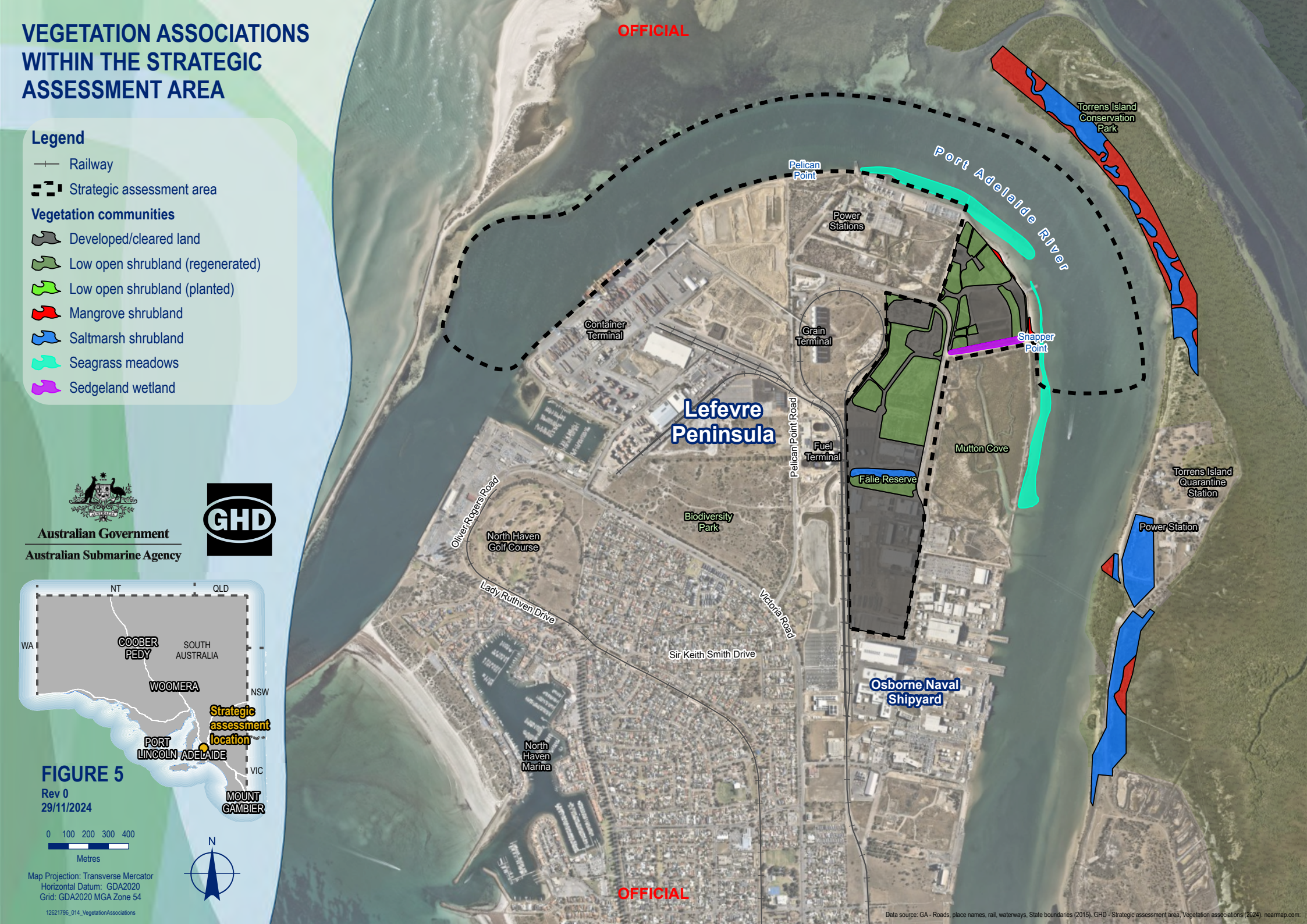
Table 3-3 Vegetation associations within the Strategic Assessment Area

Description		
Low shrubland (regenerated)		
A novel ecosystem that was previously cleared and has regenerated with saltmarsh, small shrubs and freshwater rushland species.		
Dominant flora species	Shrubby samphire *(Tecticornia halocnemoides*), blackseed samphire (*Tecticornia pergranulata*), brown-headed samphire (*Tecticornia indica*), austral seablite (*Suaeda australis*). Small wetland area that is characterised by *Typha spp.*	 Photo showing low shrubland in the manufacturing and fabricating area, facing west.
Weeds	Moderate to high weed cover (10%–30%). Dominated by barley grasses (*Hordeum spp.*), wild oats (*Avena spp.*), sea lavender (*Limonium hyblaeum*) and terracina spurge (*Euphorbia terracina*).	
EPBC Act (Cth) status	Not listed	
NP&W Act (SA) status	Not listed	
Threatened flora species	Unlikely to occur due to previous disturbance.	
Connectivity	Different sections of the vegetation community disconnected by roads and buildings.	

Description		
Low shrubland (planted)		
Planted native and non-native shrubland present on road edges and on the outer boundaries of Falie Reserve and around buildings.		
Dominant flora species	Saltbushes (*Atriplex spp.*) and she oak (*Allocasuarina spp.*).	 Photo of planted low shrubland vegetation on the roadside.
Weeds	Not recorded	
EPBC Act (Cth) status	Not listed	
NP&W Act (SA) status	Not listed	
Threatened flora species	Unlikely to occur due to previous disturbance.	
Connectivity	Disconnected from other vegetation associations by fences, roads and buildings.	
Saltmarsh shrubland		
Planted native saltmarsh species along Falie Reserve drainage line.		
Dominant flora species	Shrubby samphire (*Tecticornia halocnemoides*), blackseed samphire (*Tecticornia pergranulata*), brown-headed samphire (*Tecticornia indica*), austral seablite (*Suaeda australis*).	 Photo of Falie Reserve facing southwest.
Weeds	Low presence	
EPBC Act (Cth) status	Not listed	
NP&W Act (SA) status	Not listed	
Threatened flora species	Possible occurrence of bead glasswort (*Tecticornia flabelliformis*), listed as vulnerable under the EPBC Act and NP&W Act (SA), although targeted surveys found no individuals present.	
Connectivity	Disconnected from tidal regime. Connected to planted low shrubland vegetation on the upper banks of Falie Reserve and surrounding reserve parkland.	
Mangrove shrubland		
Small patches of monospecific mangrove shrubland present on the foreshore of the assembly and testing area, with some saltmarsh species present.		
Dominant flora species	Grey mangrove (*Avicennia marina*)	 Photo of mangrove shrubland facing north to the Port Adelaide River.
Weeds	Not recorded	
EPBC Act (Cth) status	Not listed	
NP&W Act (SA) status	Not listed	
Threatened flora species	Unlikely to occur	
Connectivity	Connected to tidal regime of Port Adelaide River and to regenerated low shrubland in the assembly and testing area.	

Description		
Sedgeland wetland		
Sedgeland wetland present along lagoon in assembly and testing area.		
Dominant flora species	Salt club-rush (*Bolboschoenus caldwellii*) and spiny flatsedge (*Cyperus gymnocaulos*). Other native species included sea rush (*Juncus kraussii*).	 Photo of tidal drain to the north of Mutton Cove Conservation Reserve, looking north.
Weeds	Dominant weeds included spiny rush (*Juncus acutus*), barley grasses (*Hordeum spp.*), oats (*Avena spp.*), sea lavender (*Limonium hyblaeum*) and terracina spurge (*Euphorbia terracina*).	
EPBC Act (Cth) status	Not listed	
NP&W Act (SA) status	Not listed	
Threatened flora species	Potential habitat for hoary rush (*Juncus radula*), albeit low likelihood based on previous disturbance.	
Connectivity	Present in the assembly and testing area only. Connected to austral sea blite (*Tecticornia halocnemoides, T. pergranulata, T. indica* and *Suaeda australis*) open samphire shrubland.	
Seagrass meadow		
Seagrass meadows present in the shallow intertidal area of the Port Adelaide River.		
Dominant flora species	At least two species of eelgrass (*Zostera spp.*): *Z. nigricaulis* (previously *Heterozostera tasmanica*) and *Z. muelleri.*	 Photo of the shallow tidal area of the Port Adelaide River, facing north.
Weeds	*Caulerpa taxifolia* and *Caulerpa cylindracea* present (declared noxious under the *Fisheries Management Act 2007* (SA)).	
EPBC Act (Cth) status	Not listed	
NP&W Act (SA) status	Not listed	
Threatened flora species	Unlikely to occur	
Connectivity	Tidal area connected to mangrove shrubland.	

VEGETATION ASSOCIATIONS WITHIN THE STRATEGIC ASSESSMENT AREA



3.2 Plant species

3.2.1 Desktop results

Overview

The EPBC Act Protected Matters Search Tool report identified seven (7) EPBC Act listed threatened flora species that may be relevant to the Strategic Assessment Area and surrounding region. In addition, the NatureMaps mapping tool identified 26 NP&W Act (SA) listed flora species previously recorded within the Strategic Assessment Area and surrounding region.

Matters potentially eligible for listing

A summary of the review for matters potentially eligible for listing under the EPBC Act is included in Table 3-4.

Table 3-4 Summary of review for flora potentially eligible for listing

List reviewed	Assessment
Listing Assessments open for public comment – species	At the time of review there were five plant species listed. Only one of the plant species was relevant to South Australia: rough logania (*Logania scabrella*) (open for public comment until 8 April 2024). This species is endemic to western Kangaroo Island and is not relevant to the Strategic Assessment Area.

3.2.2 Field survey results

Listed species

No EPBC Act or NP&W Act (SA) listed flora species were recorded in the Strategic Assessment Area despite targeted surveys.

A total of 97 flora species were recorded during field surveys within the Strategic Assessment Area, including 57 native (including planted native species) and 40 introduced species. A full list of flora species recorded across the Strategic Assessment Area is presented in Appendix D.

Following completion of field surveys, the listed flora species assessed to have potential to occur (Table 3-5) were concluded to be unlikely to occur in the Strategic Assessment Area as they were not detected, and suitable habitat was not present.

A targeted survey was conducted for the bead glasswort (*Tecticornia flabelliformis*), as it was assessed in the desktop assessment as having the potential to occur within the Strategic Assessment Area. The targeted survey located the species outside of the Strategic Assessment Area, in mudflats on Torrens Island. The species was not observed within the Strategic Assessment Area and was therefore concluded as being unlikely to occur.

3.2.3 Likelihood of occurrence – flora species

The likelihood of occurrence assessment is included in Appendix C. Three species were assessed to have the potential to occur within the Strategic Assessment Area based on historical records and habitat presence. A summary of species assessed to have a known, likely or possible likelihood of occurrence is included in Table 3-5.

Table 3-5 Flora species with known, likely or potential likelihood of occurrence in the Strategic Assessment Area

Scientific name	Common name	EPBC Act threatened status	NP&W Act threatened status	Likelihood of occurrence
Acacia dodonaeifolia	Hop-leaved wattle	–	Rare	Potential
Juncus radula	Hoary rush	–	Vulnerable	Potential
Triglochin minutissima	Tiny arrowgrass	–	Rare	Potential

3.2.4 Weeds

Terrestrial

Twelve nationally and/or state-listed (South Australian) terrestrial weed species (non-native species) were recorded within the Strategic Assessment Area (Table 3-6), including:

– Four Weeds of National Significance (WoNS)
– Twelve declared noxious weeds (inclusive of the four WoNS) under the *Landscape South Australia Act 2019* (SA).

Table 3-6 Listed weed species recorded within the Strategic Assessment Area

Scientific name	Common name	WoNS	State listing (declared noxious)
Asparagus asparagoides	Bridal creeper	Yes	Yes
Casuarina glauca	Swamp oak	–	Yes
Chondrilla juncea	Skeleton weed	–	Yes
Chrysanthemoides monilifera ssp. monilifera	Boneseed	Yes	Yes
Cynara cardunculus ssp. flavescens	Artichoke thistle	–	Yes
Euphorbia terracina	False caper	–	Yes
Gazania linearis	Gazania	–	Yes
Juncus acutus	Sharp rush	–	Yes
Lycium ferocissimum	African boxthorn	Yes	Yes
Olea europaea ssp. europaea	European olive	–	Yes
Retama raetam	White weeping broom	–	Yes
Ulex europaeus	Gorse	Yes	Yes

Marine

Two species of green macroalgae that are present within the marine area of the Strategic Assessment Area are listed as introduced species under the *Fisheries Management Act 2007* (SA) (Table 3-7).

Table 3-7 Listed marine weed species recorded within the Strategic Assessment Area

Scientific name	Common name	State listing
Caulerpa taxifolia	Aquarium caulerpa	Noxious
Caulerpa cylindracea	Sonder	Exotic

4. Fauna

4.1 Strategic Assessment Area habitats

4.1.1 Habitat types

Six distinct habitat types were observed within the Strategic Assessment Area during surveys, four of which broadly correspond to the vegetation associations outlined in Section 3.1.4:

- Low open shrubland
- Mangrove shrubland
- Constructed wetland
- Seagrass meadow
- Tidal flat
- Estuarine river

As discussed in Section 3.1.1, habitats within the onshore portion of the Strategic Assessment Area are novel due to being subject to human disturbance (filling and clearing). The habitats that are present have either been planted in small patches, for example Falie Reserve, or regrown over time. This has resulted in lower quality habitats (**Table F3** of **Appendix F**) which provide limited attributes for resting, foraging and sheltering by substantial species populations.

Although habitats are present within the Strategic Assessment Area, they are generally of lower quality and restricted in extent compared to those in a remnant environment. Where novel ecosystems do not replicate remnant ecosystems, they may provide less suitable habitat for many species (Kennedy *et al.* 2018).

A summary of habitat types is included in Table 4-1 and their distribution is displayed in Figure 6.

Table 4-1 Potential fauna habitat types in the Strategic Assessment Area

Description		
Low open shrubland (26.51 ha)		
Sandy substrate with low saltmarsh ground cover vegetation.		
Ecological values	Habitat for rodents. Foraging habitat for snakes and lizards. Habitat for birds.	 Photo of low shrubland in the manufacturing and fabricating area, facing west.
Listed threatened and migratory species	Foraging habitat for elegant parrot (*Neophema elegans elegans*). Potential habitat for slender-billed thornbill (Gulf St Vincent) (*Acanthiza iredalei rosinae*).	
Other	Corresponds with low shrubland (regenerated and planted) and saltmarsh shrubland vegetation associations.	

Description		
Constructed wetland (2.54 ha)		
Constructed drainage wetlands located in the manufacturing and fabricating and testing and assembly area, including Falie Reserve.		
Ecological values	Supports high food and shelter availability for fauna species. Foraging habitat for migratory shorebirds. Habitat for snakes and lizards.	 Photo of Falie Reserve facing southwest.
Listed threatened and migratory species	Foraging habitat for EPBC Act migratory birds. Foraging habitat for elegant parrot. Potential habitat for slender-billed thornbill (Gulf St Vincent).	
Other	Corresponds to wetland and sedgeland vegetation associations.	
Mangrove shrubland (0.35 ha)		
Tidally inundated patch of mangrove vegetation.		
Ecological values	Foraging habitat for honeyeaters. Foraging and denning habitat for water rats.	 Photo of mangrove shrubland on tidal flats facing west.
Listed threatened and migratory species	Foraging habitat for EPBC Act migratory shorebirds. Potential habitat for sooty oystercatcher (*Haematopus fuliginosus*) and pied oystercatcher (*Haematopus longirostris*).	
Other	Corresponds to mangrove shrubland vegetation association.	
Tidal flat (2.58 ha)		
Tidally inundated and sparsely vegetated mudflats, inclusive of the mangrove shrubland.		
Ecological values	Foraging habitat for migratory shorebirds.	 Photo of tidal flats in the Port Adelaide River facing east.
Listed threatened and migratory species	EPBC Act migratory species observed, including common sandpiper (*Actitis hypoleucos*). Foraging habitat for EPBC Act migratory shorebirds, including great knot (*Calidris tenuirostris*), far eastern curlew (*Numenius madagascariensis*) and curlew sandpiper (*Calidris ferruginea*). Potential habitat for sooty oystercatcher (*Haematopus fuliginosus*) and pied oystercatcher (*Haematopus longirostris*).	
Other	Tidal environment. Foraging habitat for foxes.	

Description		
Seagrass meadow (6.23 ha)		
Located in the subtidal and intertidal areas of the Port Adelaide River.		
Ecological values	Habitat for a range of fish turtles, sharks, rays, crustaceans and marine mammal species.	 Photo showing seagrass meadows in shallow water of the Port Adelaide River.
Listed threatened and migratory species	Potential foraging habitat for loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*) and leatherback turtle (*Dermochelys coriacea*).	
Other	Corresponds with seagrass meadows vegetation association.	
Estuarine river (186 ha)		
Industrialised river encompassing the marine area of the Strategic Assessment Area (186 ha), inclusive of the seagrass meadows.		
Ecological values	Marine environment for fishes, sharks, rays, crustaceans and marine mammal species.	 Photo facing north towards Port Adelaide River.
Listed threatened and migratory species	Potential habitat for Australian sea lion (*Neophoca cinerea*).	
Other	Marine tidal environment.	

4.2 Important habitat outside of the Strategic Assessment Area

In addition to the potential habitat in the boundary of the Strategic Assessment Area (Figure 6), the Lefevre Peninsula is surrounded by valuable habitat for many international and national migratory bird species, as well as other resident fauna species. This habitat is present in the following areas:

– Mutton Cove
– Bird Island
– Torrens Island

Together these intertidal areas encompass a mosaic of different environments including sandflats, seagrass meadows, mangrove forests and saltmarsh, including the Subtropical and Temperate Coastal Saltmarsh threatened ecological community (**Figure F1** of **Appendix F**). These habitats provide foraging, roosting and sheltering habitat for a range of bird species, including migratory birds. The significance of these areas as important habitat is recognised through inclusion in the Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, an extension of the Adelaide International Bird Sanctuary. The national park protects 14,633 ha of habitat, located at the southern extent of the East Asian-Australasian Flyway, with the sanctuary extending along 60 km of coastline from St Kilda to Port Parham. The sanctuary contains important habitat for at least 52 shorebird species, including 37 migratory species. A number of these species are also recognised under international agreements (JAMBA, CAMBA, the Bonn Convention, ROKAMBA). This is inclusive of two EPBC Act threatened species: the curlew sandpiper (*Calidris ferruginea*) and the far eastern curlew (*Numenius*

madagascariensis), which were assessed as being 'likely' and having 'potential' to occur in the Strategic Assessment Area, respectively.

Mutton Cove, located immediately adjacent to the Strategic Assessment Area, is connected to the tidal regime of the Port Adelaide River. Despite being surrounded by development and cleared land, it supports a mangrove forest as well as the 'Subtropical and Temperate Coastal Saltmarsh' threatened ecological community which provides a small patch of potential roosting, sheltering and foraging habitat for migratory species. This is likely used as a transient habitat for species moving between more substantial habitats, such as Torrens Island.

Torrens Island, adjacent to Mutton Cove but separated by the Port Adelaide River, contains 44 ha of vegetation protected as a Conservation Park. It comprises patches of mangrove forest and saltmarsh, inclusive of the 'Subtropical and Temperate Coastal Saltmarsh' threatened ecological community. This area provides a substantial, undisturbed environment for migratory bird species to roost, forage and shelter, and is likely to support the movement of birds between habitat patches on opposite sides of Port Adelaide River.

Bird Island, created from dredge material, has become a haven for migratory shorebirds and other birds, providing valuable undisturbed foraging habitat for various migratory and threatened EPBC Act listed bird species. This includes the Caspian tern (*Hydroprogne caspia*), common greenshank (*Tringa nebularia*), sharp-tailed sandpiper (*Calidris acuminata*) and greater crested tern (*Thalasseus bergii*), which were observed on the island.

Further information on important habitats for Protected Matters, located outside the Strategic Assessment Area is available in **Appendix D** of the **Migratory Shorebird Survey** (Appendix B).

FAUNA HABITATS

Legend

- Railway
- Strategic assessment area

Potential habitat

- Constructed wetland
- Developed/cleared land
- Low open shrubland
- Mangrove shrubland
- Seagrass meadows
- Tidal flats

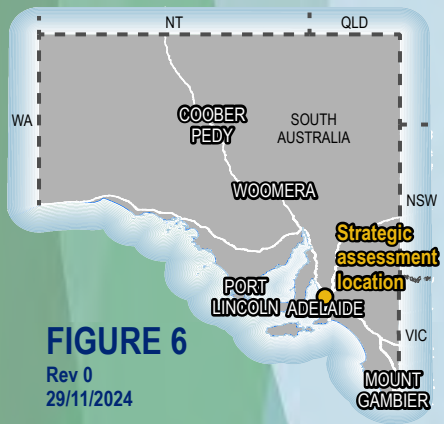


FIGURE 6
Rev 0
29/11/2024

0 100 200 300 400
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_013_PotentialHabitat

Australian Government
Australian Submarine Agency

GHD

Torrens Island Conservation Park
Port Adelaide River
Pelican Point
Power Stations
Container Terminal
Grain Terminal
Snapper Point
Lefevre Peninsula
Pelican Point Road
Fuel Terminal
Mutton Cove
Falie Reserve
Oliver Rogers Road
Victoria Road
Biodiversity Park
North Haven Golf Course
Lady Ruthven Drive
Sir Keith Smith Drive
Osborne Naval Shipyard
Power Station
North Haven Marina

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area (2023) Potential habitat (2024). nearmap.com:

4.3 Fauna species

4.3.1 Desktop results

Overview

The EPBC Act PMST report identified 55 EPBC Act listed threatened fauna species that may be relevant to the Strategic Assessment Area and surrounding region. This includes:

- 44 bird species
- Five (5) reptile species
- Three (3) mammal species
- Two (2) shark species
- One (1) fish species

In addition, the NatureMaps mapping tool identified 43 NP&W Act (SA) listed fauna species previously recorded within the Strategic Assessment Area and surrounding region. A likelihood of occurrence assessment was undertaken following surveys to identify the species known, likely and potentially occurring within the Strategic Assessment Area (Appendix C). Birds observed on-site consisted of woodland, wetland, marine and shorebirds.

Species diversity was greater in areas containing environmental values, such as drainage lines, including Falie Reserve. A full list of species observed within the Strategic Assessment Area during surveys conducted in 2023 and 2024 is included in Appendix E.

Matters potentially eligible for listing

A summary of the review for fauna matters potentially eligible for listing as an EPBC Act threatened species is included in Table 4-2.

Table 4-2 Summary of review of potentially eligible fauna for listing

List reviewed	Assessment
Listing Assessments open for public comment – species	At the time of review there were two fish species. One fish species, the southern bluefin tuna (*Thunnus maccoyii*), currently listed conservation dependent, is nominated to be delisted. The nomination change is not of relevance to the Strategic Assessment Area. Another fish species, the redfish (*Centroberyx affinis*), has been nominated for the critically endangered category. The consultation document prepared by the Threatened Species Scientific Committee indicates that the Australian distribution of the species extends from Cape Moreton in Queensland, southwards to the Bass Strait and eastern Tasmania, and is thought to be most abundant off the coast of New South Wales. Juveniles of the species are found in estuaries to 10 m depth, whilst adults occur offshore to 500 m depth, but predominantly at 100–300 m depth, in waters of the continental shelf and slope (DCCEEW 2023b). Based upon the distribution, it is unlikely that the species would be present within the Strategic Assessment Area.

4.3.2 Field survey results

EPBC Act listed species

Table 4-3 includes EPBC Act listed threatened and migratory species observed within the Strategic Assessment Area during the surveys conducted during 2023 and 2024.

Table 4-3 EPBC Act listed threatened and migratory species recorded within the Strategic Assessment Area

Scientific name	Common name	EPBC Act	
		Threatened status	Migratory
*Actitis hypoleucos**	Common sandpiper	–	Yes
*Calidris acuminata**	Sharp-tailed sandpiper	Vulnerable	Yes
*Calidris ruficollis**	Red-necked stint	–	Yes
Hydroprogne caspia	Caspian tern	–	Yes
Sternula nereis nereis	Australian fairy tern	Vulnerable	No
Thalasseus bergii	Greater crested tern	–	Yes
*Tringa nebularia**	Common greenshank	Endangered	Yes

**migratory shorebird*

NP&W Act listed species

Table 4-4 includes state listed threatened species observed within the Strategic Assessment Area during the surveys conducted in 2023 and 2024.

Table 4-4 NP&W Act listed threatened species recorded within the Strategic Assessment Area

Scientific name	Common name	NP&W Act threatened status
Actitis hypoleucos	Common sandpiper	Rare
Haematopus fuliginosus	Sooty oystercatcher	Rare
Haematopus longirostris	Pied oystercatcher	Rare
Neophema elegans elegans	Elegant parrot	Rare
Neophema petrophila zietzi	Rock parrot	Rare

4.3.3 Likelihood of occurrence – fauna species

A likelihood of occurrence assessment was undertaken for threatened fauna species within the Strategic Assessment Area and surrounding region, listed under the EPBC Act and NP&W Act.

The likelihood of occurrence for threatened fauna species listed under Commonwealth and state legislation, in the Strategic Assessment Area, is included in Appendix C. A summary of the species assessed to have a known, likely or potential likelihood of occurring within the Strategic Assessment Area is included in Table 4-5.

Table 4-5 Fauna species assessed as known, likely or having the potential to occur within the Strategic Assessment Area

Scientific name	Common name	EPBC Act			NP&W Act threatened status	Likelihood of occurrence
		Threatened status	Migratory	Marine		
Birds						
Acanthiza iredalei rosinae	Slender-billed thornbill (Gulf St Vincent)	Vulnerable	–	–	Vulnerable	Likely
Actitis hypoleucos	Common sandpiper	–	Yes	Yes	Rare	Known
Anthus australis	Australasian pipit	–	–	Yes	–	Potential
Apus pacificus	Fork-tailed swift	–	Yes	Yes	–	Potential
Ardea intermedia plumifera	Plumed egret	–	–	Yes	Rare	Potential
Ardea modesta	Eastern great egret	–	–	Yes	–	Known
Arenaria interpres	Ruddy turnstone	Vulnerable	Yes	Yes	Rare	Potential

Scientific name	Common name	EPBC Act			NP&W Act threatened status	Likelihood of occurrence
		Threatened status	Migratory	Marine		
Biziura lobata menziesii	Musk duck	–	–	Yes	Rare	Potential
Burhinus grallarius	Bush stone-curlew	–	–	–	Rare	Likely
Calidris acuminata	Sharp-tailed sandpiper	Vulnerable	Yes	Yes	–	Known
Calidris alba	Sanderling	–	Yes	Yes	Rare	Likely
Calidris ferruginea	Curlew sandpiper	Critically endangered	Yes	Yes	Endangered	Potential
Calidris melanotos	Pectoral sandpiper	–	Yes	Yes	Rare	Potential
Calidris pugnax	Ruff	–	Yes	Yes	Rare	Potential
Calidris ruficollis	Red-necked stint	–	Yes	Yes	–	Known
Calidris subminuta	Long-toed stint	–	Yes	Yes	Rare	Potential
Calidris tenuirostris	Great knot	Vulnerable	Yes	Yes	Endangered	Potential
Chalcites osculans	Black-eared cuckoo	–	–	Yes	–	Potential
Charadrius bicinctus	Double-banded plover	–	Yes	Yes	–	Potential
Charadrius leschenaultii	Greater sand plover	Vulnerable	Yes	Yes	Rare	Potential
Charadrius mongolus	Lesser sand plover	Endangered	Yes	Yes	Endangered	Potential
Charadrius ruficapillus	Red-capped plover	–	–	Yes	–	Likely
Charadrius veredus	Oriental plover	–	Yes	Yes	–	Potential
Chroicocephalus novaehollandiae	Silver gull	–	–	Yes	–	Known
Cladorhynchus leucocephalus	Banded stilt	–	–	–	Vulnerable	Likely
Coturnix ypsilophora australis	Brown quail	–	–	–	Vulnerable	Potential
Haematopus fuliginosus	Sooty oystercatcher	–	–	–	Rare	Known
Haematopus longirostris	Pied oystercatcher	–	–	–	Rare	Known
Haliaeetus leucogaster	White-bellied sea eagle	–	–	Yes	Endangered	Potential
Himantopus himantopus	Pied stilt	–	–	Yes	–	Known
Hydroprogne caspia	Caspian tern	–	Yes	Yes	–	Known
Larus pacificus	Pacific gull	–	–	Yes	–	Known
Limicola falcinellus	Broad-billed sandpiper	–	Yes	Yes	–	Potential
Limosa limosa	Black-tailed godwit	Endangered	Yes	Yes	Rare	Potential
Neophema chrysogaster	Orange-bellied parrot	Critically endangered	–	Yes	Endangered	Potential
Neophema elegans elegans	Elegant parrot	–	–	–	Rare	Known
Neophema petrophila zietzi	Rock parrot	–	–	Yes	Rare	Known
Numenius madagascariensis	Eastern curlew	Critically endangered	Yes	Yes	Endangered	Likely
Numenius phaeopus variegatus	Whimbrel	–	Yes	Yes	Rare	Potential
Pelecanus conspicillatus	Australian pelican	–	–	Yes	–	Known

Scientific name	Common name	EPBC Act			NP&W Act threatened status	Likelihood of occurrence
		Threatened status	Migratory	Marine		
Phalacrocorax fuscescens	Black-faced cormorant	–	–	Yes	–	Potential
Pluvialis fulva	Pacific golden plover	–	Yes	Yes	Rare	Potential
Pluvialis squatarola	Grey plover	Vulnerable	Yes	Yes	–	Likely
Podiceps cristatus australis	Great crested grebe	–	–	–	Rare	Likely
Recurvirostra novaehollandiae	Red-necked avocet	–	–	Yes	–	Potential
Sterna hirundo longipennis	Common tern	–	Yes	Yes	Rare	Potential
Sterna striata	White-fronted tern	–	–	Yes	–	Potential
Sternula albifrons sinensis	Little tern	–	–	–	Endangered	Potential
Sternula nereis nereis	Australian fairy tern	Vulnerable	–	Yes	Endangered	Known
Thalasseus bergii	Greater crested tern	–	Yes	Yes	–	Known
Thinornis cucullatus cucullatus	Eastern hooded plover	Vulnerable	–	Yes	Vulnerable	Likely
Threskiornis moluccus	Australian white ibis	–	–	Yes	–	Known
Tringa brevipes	Grey-tailed tattler	–	Yes	Yes	Rare	Potential
Tringa glareola	Wood sandpiper	–	Yes	Yes	Rare	Potential
Tringa nebularia	Common greenshank	Endangered	Yes	Yes	–	Known
Tringa stagnatilis	Marsh sandpiper	–	Yes	Yes	–	Likely
Xenus cinereus	Terek sandpiper	Vulnerable	Yes	Yes	Rare	Potential
Zapornia tabuensis	Spotless crake	–	–	Yes	Rare	Potential
Mammals						
Neophoca cinerea	Australian sea lion	Endangered	–	Yes	Vulnerable	Potential
Reptiles						
Caretta caretta	Loggerhead turtle	Endangered	Yes	Yes	Endangered	Potential
Chelonia mydas	Green turtle	Vulnerable	Yes	Yes	–	Potential
Dermochelys coriacea	Leatherback turtle	Endangered	Yes	Yes	Vulnerable	Potential

4.3.4 Introduced species

A number of non-native fauna species have migrated to or been introduced to the Lefevre Peninsula. Introduced species observed during field surveys are included in the species list in Appendix E. Nine introduced species were observed, with the fox (*Vulpes vulpes*) and rabbit (*Oryctolagus cuniculus*) recorded in multiple surveys.

4.4 Biologically Important Areas

Biologically Important Areas (BIAs) are designated areas used by marine species for carrying out critical life functions (such as reproduction, feeding, migration or resting). BIAs are recognised under the EPBC Act but are not formally protected areas, although they can assist with informing 'habitat critical to the survival of the species' in Recovery Plans made under the EPBC Act.

Three BIAs recognised for foraging and one recognised for migration are located within the surrounding region:

– Foraging – fairy tern (*Sternula nereis*)
– Foraging – black-faced cormorant (*Phalacrocorax fuscescens*)
– Foraging (male) – Australian sea lion (*Neophoca cinerea*)
– Migration (approx. April – October) – Southern right whale (*Eubalaena australis*)

None of the listed BIAs occur within the Strategic Assessment Area. The likelihood of occurrence assessment (Appendix C) assessed the Southern right whale as 'highly unlikely' to occur, the black-faced cormorant and Australian sea lion as having the 'potential' to occur, and the fairy tern as 'known' to occur within the Strategic Assessment Area.

Neither the black-faced cormorant nor the Australian sea lion were observed within the Strategic Assessment Area during field surveys. Both species are known to inhabit rocky headlands, islands, and coastal bays and inlets. Limited suitable habitat exists for these species within the Strategic Assessment Area.

The fairy tern was observed within the Strategic Assessment Area during field surveys. Within the Strategic Assessment Area, The Port Adelaide River is likely to provide suitable foraging habitat for fairy terns nesting in the surrounding region, including those on Bird Island. While the Strategic Assessment Area contains suitable foraging habitat, the onshore area is considered to only provide marginal nesting habitat due to the ground being comprised of compacted fill material.

5. Other local biodiversity values

5.1 Onshore area

The development of the Lefevre Peninsula has reduced the extent of natural habitats available in the surrounding region, with some species that were previously commonly recorded now in decline, or potentially locally extinct, due to historic removal and deterioration of their preferred habitat. These species are not listed under Commonwealth or state legislation, but are still of value to the local community.

Two butterfly species, the bitter-bush blue butterfly (*Theclinesthes albicincta*) and yellow sedge skipper butterfly (*Hesperilla flavescens*) (Appendix G), have been identified by the local community to be species of local interest. Plants known to be important to these species' survival have been planted by the community in reserves, including Biodiversity Park and Falie Reserve, with the aim to provide food and a breeding place for the species. The rare bitterbush (*Adriana quadripartita*) provides habitat for the bitter-bush blue butterfly (*Theclinesthes albicincta*) (Grund & Feng 2018a), while saw sedge (*Gahnia filum*) is a species that supports the yellow sedge skipper butterfly (*Hesperilla flavescens*) (Grund & Feng 2018b).

5.2 Marine area

The marine area of the Strategic Assessment Area is part of the Adelaide Dolphin Sanctuary, which protects habitat for 20 resident Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), and about 400 transient bottlenose dolphins (Appendix G) that visit the sanctuary throughout the year from the broader Gulf St Vincent (DEW 2024a). The sanctuary extends 118 km^2 along the Port Adelaide River, from Barker Inlet north to Port Gawler (DEW 2022).

The sanctuary is protected by the *Adelaide Dolphin Sanctuary Act 2005*, that aims to protect the environment and habitat of the population of dolphins, in turn protecting the dolphins living in and visiting the sanctuary. It was established following community concern of the safety of the dolphins inhabiting the Port Adelaide River.

Following the establishment of the sanctuary, the population experienced an increase prior to a steady declining trend between 2007 and 2022 which reduced the population of Indo-Pacific bottlenose dolphins by about 10 individuals (J Diversity 2023). An investigative study was undertaken to understand the causes of this decline but was concluded to be uncertain, with many likely factors contributing to the population decline (DEW 2022).

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Appendices

Appendix A

Protected Matters Search Tool Report

Australian Government
Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 24-Sep-2024

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	62
Listed Migratory Species:	65

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	118
Commonwealth Heritage Places:	None
Listed Marine Species:	107
Whales and Other Cetaceans:	8
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	7
Regional Forest Agreements:	None
Nationally Important Wetlands:	2
EPBC Act Referrals:	21
Key Ecological Features (Marine):	None
Biologically Important Areas:	3
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area	In buffer area only
Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia	Critically Endangered	Community may occur within area	In buffer area only
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Acanthiza iredalei rosinae			
Slender-billed Thornbill (Gulf St Vincent) [67080]	Vulnerable	Species or species habitat known to occur within area	In feature area
Aphelocephala leucopsis			
Southern Whiteface [529]	Vulnerable	Species or species habitat known to occur within area	In feature area
Ardenna grisea			
Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Arenaria interpres			
Ruddy Turnstone [872]	Vulnerable	Roosting known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Roosting known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Vulnerable	Roosting known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Roosting known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat likely to occur within area	In feature area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pluvialis squatarola Grey Plover [865]	Vulnerable	Roosting known to occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat known to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche cauta			
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thinornis cucullatus cucullatus			
Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area	In feature area
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In feature area
Xenus cinereus			
Terek Sandpiper [59300]	Vulnerable	Roosting known to occur within area	In feature area
FISH			
Seriolella brama			
Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In feature area
MAMMAL			
Eubalaena australis			
Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Neophoca cinerea			
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pteropus poliocephalus](#)			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
PLANT			
[Caladenia tensa](#)			
Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat likely to occur within area	In feature area
[Prasophyllum pallidum](#)			
Pale Leek-orchid [20351]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Prasophyllum validum](#)			
Sturdy Leek-orchid, Mount Remarkable Leek-orchid [10268]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Pterostylis arenicola](#)			
Sandhill Greenhood Orchid [17919]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Senecio macrocarpus](#)			
Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area	In feature area
[Swainsona pyrophila](#)			
Yellow Swainson-pea [56344]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Tecticornia flabelliformis](#)			
Bead Glasswort, Bead Samphire [82664]	Vulnerable	Species or species habitat known to occur within area	In feature area
REPTILE			
[Aprasia pseudopulchella](#)			
Flinders Ranges Worm-lizard [1666]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Caretta caretta](#)			
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
[Chelonia mydas](#)			
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Tiliqua adelaidensis			
Pygmy Blue-tongue Lizard, Adelaide Blue-tongue Lizard [1270]	Endangered	Species or species habitat may occur within area	In buffer area only
SHARK			
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Galeorhinus galeus			
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea			
Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea antipodensis			
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora			
Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Migratory Marine Species			
Balaenoptera edeni			
Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Caperea marginata			
Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Caretta caretta			
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas			
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Eubalaena australis as Balaena glacialis australis			
Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Lagenorhynchus obscurus			
Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Lamna nasus			
Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In feature area
Megaptera novaeangliae			
Humpback Whale [38]		Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Roosting known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Roosting known to occur within area	In feature area
Calidris alba Sanderling [875]		Roosting known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
Calidris pugnax as Philomachus pugnax Ruff [91256]		Roosting known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area	In feature area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Vulnerable	Roosting known to occur within area	In feature area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In feature area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area	In feature area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area	In feature area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Roosting known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Numenius minutus](#) Little Curlew, Little Whimbrel [848]		Roosting known to occur within area	In feature area
[Numenius phaeopus](#) Whimbrel [849]		Roosting known to occur within area	In feature area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area	In buffer area only
[Phalaropus lobatus](#) Red-necked Phalarope [838]		Roosting known to occur within area	In feature area
[Pluvialis fulva](#) Pacific Golden Plover [25545]		Roosting known to occur within area	In feature area
[Pluvialis squatarola](#) Grey Plover [865]	Vulnerable	Roosting known to occur within area	In feature area
[Thalasseus bergii](#) Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
[Tringa brevipes](#) Grey-tailed Tattler [851]		Roosting known to occur within area	In feature area
[Tringa glareola](#) Wood Sandpiper [829]		Roosting known to occur within area	In feature area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In feature area
[Tringa stagnatilis](#) Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area	In feature area
[Tringa totanus](#) Common Redshank, Redshank [835]		Roosting known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Xenus cinereus			
Terek Sandpiper [59300]	Vulnerable	Roosting known to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

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

Commonwealth Land Name	State	Buffer Status
Defence		
Commonwealth Land - Defence Service Homes Corporation [40498]	SA	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [40462]	SA	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [40397]	SA	In buffer area only
Defence - ALBERTON TRNG DEPOT [40318]	SA	In buffer area only
Defence - ALBERTON TRNG DEPOT [40319]	SA	In buffer area only
Defence - ALBERTON TRNG DEPOT [40315]	SA	In buffer area only
Defence - ALBERTON TRNG DEPOT [40314]	SA	In buffer area only
Defence - ALBERTON TRNG DEPOT [40317]	SA	In buffer area only
Defence - ALBERTON TRNG DEPOT [40316]	SA	In buffer area only
Defence - ALBERTON TRNG DEPOT [40312]	SA	In buffer area only
Defence - ALBERTON TRNG DEPOT [40313]	SA	In buffer area only
Defence - EDINBURGH - RAAF BASE [40003]	SA	In buffer area only
Defence - HMAS ENCOUNTER [40016]	SA	In buffer area only
Defence - PT ADELAIDE SHIPYARD & BOATSHED (TS ADELAIDE) [40234]	SA	In buffer area only
Defence - PT ADELAIDE SHIPYARD & BOATSHED (TS ADELAIDE) [40232]	SA	In buffer area only
Defence - PT ADELAIDE SHIPYARD & BOATSHED (TS ADELAIDE) [40233]	SA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Defence - PT ADELAIDE SHIPYARD & BOATSHED (TS ADELAIDE) [40231]	SA	In buffer area only
Defence - PT ADELAIDE SHIPYARD & BOATSHED (TS ADELAIDE) [40235]	SA	In buffer area only
Defence - PT ADELAIDE SHIPYARD & BOATSHED (TS ADELAIDE) [40236]	SA	In buffer area only
Defence - ST KILDA TRANSMITTING STATION [40229]	SA	In buffer area only
Defence - ST KILDA TRANSMITTING STATION [40222]	SA	In buffer area only
Defence - ST KILDA TRANSMITTING STATION [40226]	SA	In buffer area only
Defence - ST KILDA TRANSMITTING STATION [40227]	SA	In buffer area only
Defence - ST KILDA TRANSMITTING STATION [40224]	SA	In buffer area only
Defence - ST KILDA TRANSMITTING STATION [40225]	SA	In buffer area only
Defence - ST KILDA TRANSMITTING STATION [40223]	SA	In buffer area only
Defence - ST KILDA TRANSMITTING STATION [40230]	SA	In buffer area only
Defence - ST KILDA TRANSMITTING STATION [40228]	SA	In buffer area only
Defence - Defence Housing Authority		
Commonwealth Land - Defence Housing Authority [41423]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [41455]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [41454]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [40552]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [40576]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [41434]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [41435]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [41433]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [40628]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [41371]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [41370]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [41523]	SA	In buffer area only
Commonwealth Land - Defence Housing Authority [41522]	SA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Education, Science and Training - CSIRO		
Commonwealth Land - Commonwealth Scientific & Industrial Research Organisation [40340]	SA	In buffer area only
Commonwealth Land - Commonwealth Scientific & Industrial Research Organisation [40341]	SA	In buffer area only
Commonwealth Land - Commonwealth Scientific & Industrial Research Organisation [40338]	SA	In buffer area only
Commonwealth Land - Commonwealth Scientific & Industrial Research Organisation [40339]	SA	In buffer area only
Commonwealth Land - Commonwealth Scientific & Industrial Research Organisation [41496]	SA	In buffer area only
Transport and Regional Services - Australian Maritime Safety Authority		
Commonwealth Land - Australian Maritime Safety Authority [40390]	SA	In buffer area only
Commonwealth Land - Australian Maritime Safety Authority [40387]	SA	In buffer area only
Commonwealth Land - Australian Maritime Safety Authority [40388]	SA	In buffer area only
Commonwealth Land - Australian Maritime Safety Authority [40389]	SA	In buffer area only
Transport and Regional Services - Australian National Railways Commission		
Commonwealth Land - Australian National Railways Commission [41589]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41587]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40872]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40448]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40449]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40408]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40409]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40407]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41603]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41586]	SA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Australian National Railways Commission [40493]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40494]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41591]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40411]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40475]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40478]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41546]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41547]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40447]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40375]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41610]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41440]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40371]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41542]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41540]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41319]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41318]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41476]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41317]	SA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Australian National Railways Commission [41473]	SA	In feature area
Commonwealth Land - Australian National Railways Commission [41477]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40474]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40476]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40472]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41607]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40446]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40521]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40520]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41557]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41474]	SA	In feature area
Commonwealth Land - Australian National Railways Commission [41320]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41323]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41322]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41588]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41316]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40376]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41315]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41484]	SA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Australian National Railways Commission [41321]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41324]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41528]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [40369]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41325]	SA	In buffer area only
Commonwealth Land - Australian National Railways Commission [41489]	SA	In buffer area only
Unknown		
Commonwealth Land - [40342]	SA	In buffer area only
Commonwealth Land - [40343]	SA	In buffer area only
Commonwealth Land - [40348]	SA	In buffer area only
Commonwealth Land - [40875]	SA	In buffer area only
Commonwealth Land - [40344]	SA	In buffer area only
Commonwealth Land - [40347]	SA	In buffer area only
Commonwealth Land - [40346]	SA	In buffer area only
Commonwealth Land - [40345]	SA	In buffer area only
Commonwealth Land - [40479]	SA	In buffer area only
Commonwealth Land - [40370]	SA	In buffer area only
Commonwealth Land - [40394]	SA	In buffer area only
Commonwealth Land - [40477]	SA	In buffer area only
Commonwealth Land - [40473]	SA	In buffer area only
Commonwealth Land - [40328]	SA	In buffer area only

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]	Vulnerable	Roosting known to occur within area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Roosting known to occur within area	In feature area
Calidris alba Sanderling [875]		Roosting known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris pugnax as Philomachus pugnax Ruff [91256]		Roosting known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area	In feature area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area overfly marine area	In feature area
Calidris tenuirostris Great Knot [862]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area overfly marine area	In feature area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area overfly marine area	In feature area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Roosting known to occur within area overfly marine area	In feature area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area	In feature area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
[Larus dominicanus](#) Kelp Gull [809]		Breeding known to occur within area	In buffer area only
[Limicola falcinellus](#) Broad-billed Sandpiper [842]		Roosting known to occur within area overfly marine area	In feature area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area overfly marine area	In feature area
[Limosa limosa](#) Black-tailed Godwit [845]	Endangered	Roosting known to occur within area overfly marine area	In feature area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area overfly marine area	In feature area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area overfly marine area	In feature area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area	In feature area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In buffer area only
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Breeding known to occur within area	In buffer area only
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area	In feature area
Pluvialis squatarola Grey Plover [865]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area	In buffer area only
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In feature area
Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Roosting known to occur within area	In feature area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area overfly marine area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area	In feature area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area overfly marine area	In buffer area only
Xenus cinereus Terek Sandpiper [59300]	Vulnerable	Roosting known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Fish			
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area	In feature area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area	In feature area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area	In feature area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In feature area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In feature area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area	In feature area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area	In feature area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area	In feature area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In feature area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In feature area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Vanacampus margaritifer			
Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Vanacampus phillipi			
Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In feature area
Vanacampus poecilolaemus			
Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In feature area
Vanacampus vercoi			
Verco's Pipefish [66286]		Species or species habitat may occur within area	In feature area
Mammal			
Arctocephalus forsteri			
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
Arctocephalus pusillus			
Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area	In feature area
Neophoca cinerea			
Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area	In feature area
Reptile			
Caretta caretta			
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In feature area
Chelonia mydas			
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In feature area
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			

Current Scientific Name	Status	Type of Presence	Buffer Status
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat may occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Adelaide	Dolphin Sanctuary	SA	In feature area
Adelaide International Bird Sanctuary-Winaityinaityi Pangkara	National Park	SA	In buffer area only
Barker Inlet-St Kilda	Aquatic Reserve	SA	In feature area
Fort Glanville	Conservation Park	SA	In buffer area only
St Kilda-Chapman Creek	Aquatic Reserve	SA	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Tennyson Dunes	Conservation Reserve	SA	In buffer area only
Torrens Island	Conservation Park	SA	In feature area

Nationally Important Wetlands

[Resource Information]

Wetland Name	State	Buffer Status
Barker Inlet & St Kilda	SA	In feature area
Port Gawler & Buckland Park Lake	SA	In buffer area only

EPBC Act Referrals

[Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Osborne North Car Park and Grade Separated Road	2023/09662		Completed	In feature area
Dry Creek Salt Field Closure, SA	2015/7418	Controlled Action	Completed	In buffer area only
Nava-1 Cable System	2001/510	Controlled Action	Completed	In buffer area only
Not controlled action				
AGL Energy Park	2010/5398	Not Controlled Action	Completed	In buffer area only
Construction of substation and 18km of underground cable	2009/4948	Not Controlled Action	Completed	In buffer area only
Dredging and Spoil Disposal at Outer Harbour of Port Adelaide	2004/1339	Not Controlled Action	Completed	In feature area
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Organics Waste Treatment, Recycling & Research Facility	2002/704	Not Controlled Action	Completed	In buffer area only
Osborne Maritime Precinct	2005/2065	Not Controlled Action	Completed	In feature area
Outer Harbour Wharf Redevelopment	2003/965	Not Controlled Action	Completed	In feature area
Proposed land division, Precinct 2, Buckland Park Residential Project, SA	2013/6947	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
The Northern Connector transport corridor project, SA	2015/7611	Not Controlled Action	Completed	In buffer area only
Torrens Island Battery	2021/8889	Not Controlled Action	Completed	In buffer area only
Upgrade & Revitalisation of Existing Rail Line	2010/5342	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Ceres Wind Farm, SA	2012/6612	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Port Adelaide Outer Harbor Channel Widening Project, SA	2017/8033	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Sale of land at the Edinburgh Defence Precinct	2004/1871	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
SEA Gas Project transmission pipeline	2001/513	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Southern Gas Pipeline Project	2002/619	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Biologically Important Areas			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Phalacrocorax fuscescens Black-faced Cormorant [59660]	Foraging	Known to occur	In buffer area only
Sternula nereis Fairy Tern [82949]	Foraging	Known to occur	In buffer area only
Seals			
Neophoca cinerea Australian Sea Lion [22]	Foraging (male)	Known to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

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

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Appendix B

Migratory Bird Survey Report

Australian Government
Australian Submarine Agency

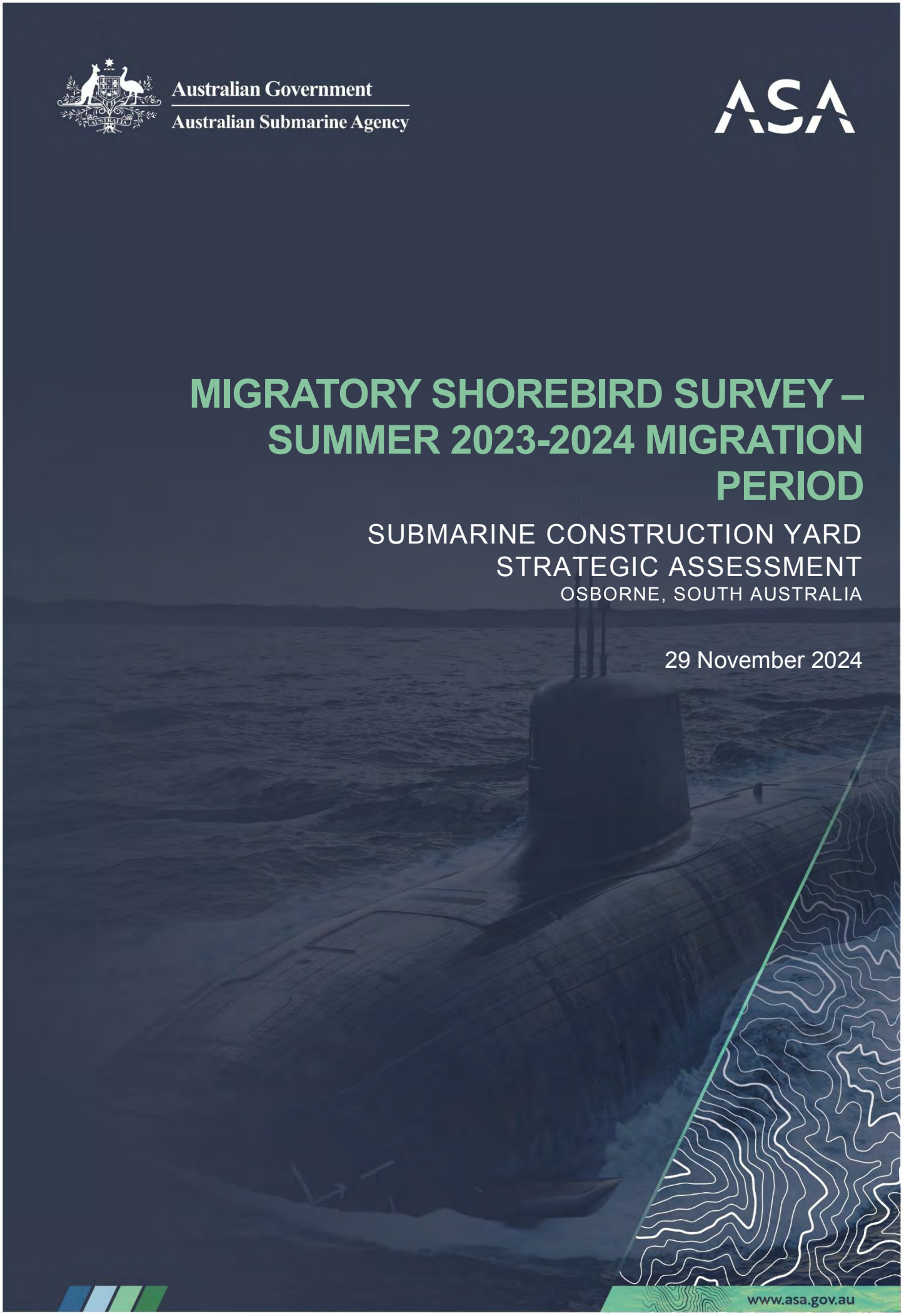
ASA

MIGRATORY SHOREBIRD SURVEY – SUMMER 2023-2024 MIGRATION PERIOD

SUBMARINE CONSTRUCTION YARD STRATEGIC ASSESSMENT

OSBORNE, SOUTH AUSTRALIA

29 November 2024



www.asa.gov.au

Project name	Osborne Submarine Construction Yard Strategic Assessment
Document title	Migratory Bird Survey – Summer 2023-2024 Migration Period | Submarine Construction Yard
This report has been prepared by GHD Pty Ltd for the Australian Submarine Agency	

Executive summary

Overview

This report presents the method and results of 2023–2024 Australian summer period surveys for migratory shorebirds undertaken at the Strategic Assessment Area, which encompasses the onshore and marine areas for the construction and operation of the Submarine Construction Yard on the Lefevre Peninsula. This report has been prepared to provide supporting technical information in relation to migratory shorebird species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It informs a Biodiversity Values Report and the Strategic Impact Assessment Report to be prepared as required by the Terms of Reference for the Strategic Assessment, which is the agreed approval pathway between the Department of Climate Change, Energy, the Environment, and Water (DCCEEW) and the Australian Submarine Agency under the EPBC Act.

Approach

Surveys were undertaken in accordance with the EPBC Act Policy Statement 3.21 *Industry guidelines for avoiding, assessing, and mitigating impacts on EPBC Act listed migratory shorebird species* (Commonwealth of Australia 2017) in four mobilisations, one in December 2023, one in January 2024 and two in February 2024. Transect surveys and habitat assessments were systematically conducted at 12 locations:

– Three Strategic Assessment Area Survey Area sites – sites within the Strategic Assessment Area that contain migratory species habitat, and
– Nine reference sites within the region.

The purpose of reference sites is to provide context of species abundance surrounding the Strategic Assessment Area. Surveys were undertaken predominantly on foot as most of the sites were highly accessible. Surveys from a boat were undertaken for access restricted locations such as Bird Island and Torrens Island. In addition to observational surveys, four motion-sensing cameras were placed overlooking habitats within the Strategic Assessment Area for a period of approximately 58 days to capture supplementary information over the assessment period.

Results

A total of four listed migratory shorebird species were observed within the Strategic Assessment Area, with an additional three migratory shorebird species (total seven) observed within reference sites (Table E-1). The region contains over 10,000 ha of potential migratory shorebird habitat. The region includes the coastlines from Osborne to the northern boundary of the Adelaide International Bird Sanctuary. Several other species historically recorded in the region could potentially visit the Strategic Assessment Area on an occasional basis.

Table E-1 Migratory shorebird species recorded during field surveys in the Strategic Assessment Area and reference sites

Scientific name	Common name	Present in field surveys	
		Strategic Assessment Area Survey Area	Reference sites
Actitis hypoleucos	Common sandpiper	✓	✓
Calidris acuminata	Sharp-tailed sandpiper	✓	✓
Calidris alba	Sanderling		✓
Calidris ruficollis	Red-necked stint	✓	✓
Pluvialis squatarola	Grey plover		✓
Tringa nebularia	Common greenshank	✓	✓
Tringa stagnatilis	Marsh sandpiper		✓

Document navigation

This report is an Appendix to the Biodiversity Values Report, which provides a consolidated overview of migratory species surveys conducted within the Strategic Assessment Area and surrounding region. An assessment of the impact of the construction and operation of the Submarine Construction Yard on matters protected under the EPBC Act, including migratory species, is provided in the Strategic Impact Assessment Report.

Appendix A
Strategic Assessment Agreement

Appendix B
Terms of Reference

Appendix C
Terms of Reference index

Appendix D
EPBC Act Protected Matters provisions relevance assessment

Appendix E
Information sources and reliability

Appendix F
Community and Stakeholder Engagement Report

Appendix G
Biodiversity Values Report

Appendix H
Significance of Impact Assessments

Appendix I
Climate Review Report

Appendix J
Heritage Summary Report

Appendix K
Environmental Risk Assessment

Acronyms and abbreviations

Acronym / abbreviation	Definition
ALA	Atlas of Living Australia
CAMBA	China-Australia Migratory Bird Agreement
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEW	Department of Environment and Water (SA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
IAEA	International Atomic Energy Agency
JAMBA	Japan-Australia Migratory Bird Agreement
NP&W Act	*National Parks and Wildlife Act 1972* (SA)
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SA	South Australia
SSN	Submersible Ship Nuclear

Glossary

Term / phrase	Definition
Actions or Classes of Actions	An 'Action' is a grouping of similar activities.
Activities	Discrete activities or works undertaken during the construction or operation of the Submarine Construction Yard. For example, site clearing is an activity.
AUKUS	Trilateral security partnership between Australia, the United Kingdom, and the United States of America.
the AUKUS partners	The United Kingdom and the United States of America.
Bonn Convention	The Convention on the Conservation of Migratory Species of Wild Animals.
Construction	Construction means: – The erection of a building or structure that is, or is to be, fixed to the ground and wholly or partially fabricated on-site. – The alteration, maintenance, repair or demolition of any building or structure. – Any work which involves breaking of the ground (including pile driving) or bulk earthworks. – The laying of pipes and other prefabricated materials in the ground. – Any associated excavation work.
Conventionally-armed	Submarines (or other defence force vessels / vehicles) that are armed with common weaponry and excludes nuclear weaponry.
Desktop assessment area	Strategic Assessment Area and 10 km search buffer
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
the Guidelines	The EPBC Act policy document 'Industry guidelines for avoiding, assessing, and mitigating impacts on EPBC Act listed migratory shorebird species' (Commonwealth of Australia 2017)
Marine area	A portion of the Strategic Assessment Area located within the Port Adelaide River.
the Minister	The Commonwealth Minister for the Environment and Water, who is responsible for the administration of the EPBC Act. As per the Terms of Reference, this may include a person to whom that Minister's power, under Section 146(1) of the EPBC Act, has been delegated.
Neap tide	A type of tide that occurs when the difference between high and low tide is the least.
Onshore area	Any area of land within the shore area that is not included in the territorial sea or within the Port Adelaide River.
Optimal Pathway	The Optimal Pathway is the approach for Australia to develop a conventionally-armed nuclear powered submarine capability as announced on 13 March 2023.
Osborne Naval Shipyard	Refers to the Osborne Naval Shipyard facilities currently under operation and in construction on property administered by Australian Naval Infrastructure.
The Plan	The Strategic Assessment Plan which describes: – The Actions and Classes of Actions that are to be undertaken to construct and operate the Submarine Construction Yard in the Strategic Assessment Area. – The outcomes that will be achieved for Protected Matters, to which Actions proposed under The Plan relate, in accordance with the requirements of the EPBC Act.
Protected Matter	Means a matter protected by a provision of Part 3 of the EPBC Act. The specific matter protected by each provision is set out in Section 34 of the EPBC Act.
The Report	The Impact Assessment Report assesses the potential environmental impacts associated with the development of the Submarine Construction Yard, and includes: – A description of the environment to which Actions proposed under The Plan relate – An assessment of the potential impacts of implementing The Plan on Protected Matters – Details of how likely or potential impacts will be avoided, mitigated and offset (where necessary or appropriate) to make sure that Protected Matters are protected and managed in the long-term.

Term / phrase	Definition
Spring tide	A type of tide resulting in the highest high tides and the lowest low tides.
SSN-AUKUS	A planned class of nuclear-powered fleet submarine intended to enter service with the United Kingdom's Royal Navy in the late 2030s and Royal Australian Navy in the 2040s. The class will replace the UK's Astute class and Australia's Collins class submarines.
Strategic Assessment	A process where The Minister may approve taking an Action or Class of Actions in accordance with an endorsed policy, plan or program. A Strategic Assessment Agreement provides for this kind of assessment. It's often used for landscape-scale assessments of developments and programs.
Strategic Assessment Area	Means the area displayed within the Strategic Assessment Area in Attachment 1 of the Agreement.
Strategic Assessment Area Survey Area	Shoreline and the swale drain areas in the Strategic Assessment Area where surveys for migratory shorebirds were undertaken.
Surrounding region	The Strategic Assessment Area is surrounded by a variety of natural and manmade infrastructure. It sits in the greater context of the Lefevre Peninsula in Adelaide, South Australia. – North: natural reserves and ecosystems line the coast. This includes the Adelaide International Bird Sanctuary National Park, and Torrens Island – South: The Osborne Naval Shipyard and residential areas – East: Torrens Island, Barker Inlet and St Kilda – West: industrial zoning, and Gulf St Vincent
Terms of Reference	Means the Terms of Reference finalised on 25 March 2024, which details how the impacts from the proposed Actions and activities are to be assessed.

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Appendices

1. Introduction

1.1 Overview

Australia, the United Kingdom, and the United States announced the AUKUS trilateral security partnership in September 2021. The AUKUS partners agreed to support Australia to construct conventionally-armed nuclear-powered submarines (known as 'submersible ship nuclear', or SSN) in South Australia. The conventionally-armed nuclear-powered submarines built under AUKUS will meet Australia's defence requirements in future decades.

The approach for Australia to develop a conventionally-armed nuclear-submarine capability (the 'Optimal Pathway') was announced on 13 March 2023. Under AUKUS, it is planned to build up to five conventionally-armed nuclear-powered submarines in Australia (to be known as SSN-AUKUS), by the early 2040s.

The preferred site for the construction of SSN-AUKUS submarines (the 'Submarine Construction Yard') is located in Osborne on the Lefevre Peninsula, approximately 19 km north of Adelaide, in South Australia. The Submarine Construction Yard would be developed to contain a range of facilities in which the fabrication and manufacturing of submarine parts and components, as well as testing and commissioning of submarines, would occur (Figure 1).

The Australian Submarine Agency and the Commonwealth Minister for the Environment and Water ('the Minister') entered into a Strategic Assessment Agreement in November 2023. This Section 146 agreement, made under Part 10 of the EPBC Act, sets out the content that is required for inclusion within the Strategic Assessment Plan, for the construction and operation of the Submarine Construction Yard ('The Plan'); as well as the requirement to develop relevant Terms of Reference for a Strategic Impact Assessment Report ('The Report').

The area agreed to be designated as the 'Strategic Assessment Area', in which Actions and Classes of Actions outlined under The Plan can be endorsed and approved by the Minister, is shown in Figure 1.

1.2 Purpose of this report

This report provides supplementary information to the Biodiversity Values Report (**Appendix G** of **The Report**) in order to address the Terms of Reference regarding migratory species. The Terms of Reference were prepared by the Department of Climate Change, Energy, the Environment and Water ('the Department') as part of the Strategic Assessment process. Some of those relate to migratory birds, as presented in Table 1.

Table 1 Relevant Terms of Reference

Terms of Reference clause	Section of this report
4.2. The Report must identify and describe Protected Matters to which actions under The Plan relate. This must include:	
d) A description of, and spatial information for listed threatened and/or migratory species relevant to the Strategic Assessment Area. Details are to include listing status, documented habitat type and documented or surveyed estimates of population size or abundance and distribution, habitat presence quality and area (in hectares), landscape context and existing threatening processes (Part 3, Division 1, Subdivision C and D). The Report must also consider matters that are potentially eligible for listing as a result of inclusion in a final priority assessment listing held by the Commonwealth, or a recommendation to the Commonwealth Minister for listing by the Threatened Species Scientific Committee, prior to The Report being submitted.	Section 3 Section 4
e) The identification of critical or important areas for Protected Matters, including consideration of the importance of areas of habitat, habitat connectivity, position in the landscape and areas likely to be important for maintaining ecological processes.	Section 4.1 Section 4.4

The Port Adelaide River is a tidal inlet from Gulf St Vincent, which is recognised as an internationally significant area for migratory shorebirds; and is listed as an internationally significant site within the *Australian national directory of important migratory shorebird habitat* (Weller 2020). The purpose of this report is to document the method and results of migratory shorebird surveys undertaken in accordance with the EPBC Act Policy Statement 3.21 *Industry guidelines for avoiding, assessing, and mitigating impacts on EPBC Act listed migratory shorebird species* (Commonwealth of Australia 2017). Non-shorebird migratory species (e.g., Caspian tern (*Hydroprogne caspia*)) are addressed separately, in the Biodiversity Values Report (**Appendix G** of **The Report**).

STRATEGIC ASSESSMENT AREA

Legend

- Railway
- Strategic assessment area
- Marine area
- Onshore area

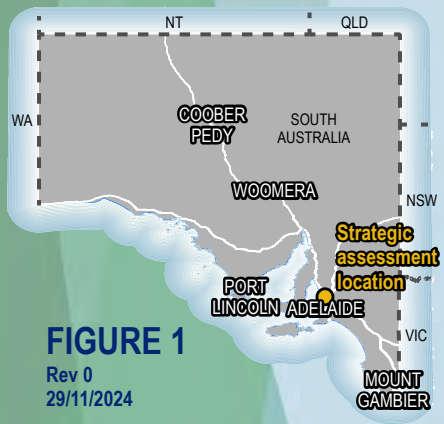


FIGURE 1
Rev 0
29/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_101_AssessmentAreasAgreement

Australian Government
Australian Submarine Agency

GHD

Torrens Island Conservation Park
Port Adelaide River
Pelican Point
Power Stations
Container Terminal
Grain Terminal
Snapper Point
Lefevre Peninsula
Pelican Point Road
Mutton Cove
Falie Reserve
Torrens Island Quarantine Station
Power Station
Oliver Rogers Road
North Haven Golf Course
Biodiversity Park
Victoria Road
Lady Ruthven Drive
Gulf St Vincent
Osborne Naval Shipyard
Port Adelaide
North Haven Marina
Osborne Road

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area (2023). nearmap.com.

1.3 Legislative context

Migratory species are listed under Section 209 of the EPBC Act. This list includes migratory bird species that are:

– Included in the appendices to the Bonn Convention (The Convention on Conservation of Migratory Species of Wild Animals)
– Included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA)
– Considered by the Minister to be relevant to the conservation of migratory species under an international agreement, such as the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

To clarify expectations on how migratory shorebirds and their habitat should be assessed, the Guidelines pertaining to 37 migratory shorebird species that visit Australia were released. The Guidelines provide recommendations for survey timing, effort, and minimum data requirements for undertaking migratory shorebird surveys in tidal and non-tidal environments. The Guidelines also describe some of the actions that would be likely to have a significant impact on migratory shorebirds, and guidance on recommended avoidance and mitigation measures.

A number of migratory shorebird species are listed as threatened under South Australia's *National Parks and Wildlife Act 1972*, and other EPBC Act lists (other than as migratory species), including:

– Threatened species (Section 178, EPBC Act)
– Marine species (Section 248, EPBC Act).

Details and species recorded that relate to listings other than the migratory species list under Section 209 of the EPBC Act are included in the Biodiversity Values Report (**Appendix G** of **The Report**).

1.4 Strategic Assessment Area context

1.4.1 Strategic Assessment Area

Onshore area

The Strategic Assessment Area is comprised largely of developed hardstand and large areas of cleared, vacant land. The vacant land contains low shrubland vegetation that has opportunistically regrown and mostly includes saltmarsh and weed species.

The Strategic Assessment area is flat, except for two drainage features, Falie Reserve and the eastern detention basin. Falie Reserve and roadsides are landscaped with native shrubs bordering the waterline and small grass areas that can be utilised for recreation. A raised earth barrier encapsulates Mutton Cove Conservation Reserve directly adjacent to the Strategic Assessment Area. Where the Strategic Assessment Area borders the Port Adelaide River, a small tidal flat is present with small patches of mangroves remaining.

Prior to historical filling and levelling of much of the Lefevre Peninsula, the Strategic Assessment Area was part of the Port River estuary. Soils underlying the fill layer comprise historic estuarine muds and sands (Cook & Coleman 2003).

Due to the changed landscape, there are no natural surface waterbodies within the onshore area. Water within stormwater basins in Falie Reserve is fresh water that is not tidally influenced. Water from the Falie Reserve detention basin is captured and periodically pumped to the eastern detention basin, north of Mutton Cove Conservation Reserve, which discharges into Port Adelaide River. Water within the eastern detention basin is subject to tidal influence.

Marine area

The marine area of the Strategic Assessment Area comprises the Port Adelaide River, which is a tidal inlet from Gulf St Vincent, and bounds the northern extent of the Lefevre Peninsula. The river includes a dredged shipping channel, and its fringes are characterised by tidal mud flats and mangroves; with intertidal and subtidal eelgrass (*Zostera marina*) beds present on the northern side of the channel.

The shoreline interface between the onshore area and the marine area of the Strategic Assessment Area is a tidal flat with scattered patches of mangroves; largely in the area adjacent to the eastern detention basin discharge point to the Port Adelaide River.

Surrounding region

The northern portion of the Lefevre Peninsula, west of the onshore area of the Strategic Assessment Area, supports industry and logistics; including Flinders Container Port, a cruise ship terminal, and industrial premises including Viterra Outer Harbor, Pelican Point Power, and Snapper Point Power Station. The banks of the Port Adelaide River along the eastern flank of the Lefevre Peninsula, south of the Mutton Cove Conservation Reserve, have largely been hardened for industrial purposes, including ship building within the Osborne Naval Shipyard. An existing seawall along the eastern boundary of Mutton Cove Conservation Reserve, where it meets the Port Adelaide River, was breached in 2016; and the reserve is now subject to tidal influence.

The nearest open space and recreation areas outside of the Strategic Assessment Area are:

– Biodiversity Park, west of the onshore area
– Kardi Yarta Playground, a small playground and park area between Biodiversity Park and the south onshore area
– Mutton Cove Conservation Reserve, east of the onshore area

Biodiversity Park and Kardi Yarta Playground were developed 2010 by Renewal SA as a part of an open space project to introduce conservation areas and recreational facilities to the north Lefevre Peninsula.

Mutton Cove is the last remaining area of remnant vegetation on the Lefevre Peninsula. It has been degraded since European settlement with vegetation changing over time; from being dominated by mangrove species to saltmarsh species depending on connection to the tidal regime. Mutton Cove is also used as a recreational area by nearby local residents, where they walk the boundary path.

The periphery of Gulf St Vincent, including areas along Port Adelaide River, contain coastal and marine habitats; including saltmarsh, sandflats, mudflats, mangroves and tidal creeks (DEW 2012). Eelgrass (*Zostera marina*) beds extend around Barker Inlet (located approximately 3 km north north-east of Lefevre Peninsula, on the eastern edge of Torrens Island).

Adjacent to the Strategic Assessment Area, across the Port Adelaide River, is Torrens Island (east) and Bird Island (north). These areas provide remnant habitat for migratory shorebirds.

Torrens Island contains multiple power stations, a cardon dioxide plant and the historical Torrens Island Quarantine Station along the western extent; with the rest of the island designated as a conservation park. It contains remnant mangroves, samphire and coastal dunes; providing valuable habitat for international migratory and resident native species. The conservation park does not allow public access.

Bird Island was formed along the northern breakwater (originally completed in 1913) of the Outer Harbor entry, approximately 2.5 km northwest of the onshore area and adjacent to the northeast boundary of the marine area. Bird Island was formed from dredged clay and sand spoil placed in 1976, and extended in 1997. It is known to provide habitat to a range of migratory and shorebird species. The island is slowly growing to the north-east as sand and sediment from Adelaide's southern beaches moves north and accumulates. Initially, the island was planted with nitre bush *(Nitraria billardierei)* to stabilise against erosion; and since then, has been colonised by coastal saltbush, samphire and mangroves. Multiple bird species are known to use the island as breeding grounds.

The Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara and the extended Adelaide International Bird Sanctuary, is located along the eastern coastline of the Gulf St Vincent. It spans 60 km from St Kilda to Port Parham. The National Park protects 14,633 ha of critical migratory bird habitat on the southern extent of international migratory flyways; including the East Asian–Australasian Flyway. More information on habitat surrounding the Strategic Assessment Area is available in Appendix A.

2. Method

2.1 Desktop assessment

2.1.1 Database searches

Database searches were undertaken for the Strategic Assessment Area, with an additional 10 km buffer (the 'desktop assessment area') on 31 May 2024, to identify migratory species historically recorded in the Strategic Assessment Area and surrounding region. A summary of the searches conducted is provided in Table 2.

Table 2 Database searches conducted

Source	Data obtained
EPBC Act Protected Matters Search Tool (PMST)	– EPBC Act listed migratory species – Ramsar wetlands
Government of South Australia NatureMaps, Enviro Data SA	– Modelled mapping of broad vegetation types – Fauna records
Atlas of Living Australia (ALA) Database	– Fauna records
eBird Data Australia	– Bird records
Birdlife Australia Records	– Bird records

2.1.2 Previous studies

Previous studies relevant to migratory species within the desktop assessment area were also reviewed; as shown in Table 3.

Table 3 Documents reviewed

Purpose of assessment	Document name	Reference
Surveys conducted in relation to the Submarine Construction Yard	Biodiversity Values Report for Carpark and Road	GHD 2023
	Osborne Preliminary Environmental and Heritage Impact Assessment Ecological Investigation Report	GHD 2023
	Expansion of Osborne Naval Shipyard: Baseline Environmental Report	Succession Ecology 2023
Previous studies related to biodiversity including migratory shorebird species	Mutton Cove Management Plan	Delta Ecology 2003
	Shorebird Management and Conservation	Delta Ecology 2009
	Colony Breeding Birds of Bird Island and the Northern Revetment at Outer Harbor, South Australia 2015–2018	DEW 2018
	Adelaide International Bird Sanctuary Management Plan 2020	DEW 2020

2.2 Field surveys

2.2.1 Overview

The survey plan was developed in accordance with the Guidelines published for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species

Migratory shorebirds are typically present during their non-breeding period in South Australian coastal areas between August to March. Four, week-long surveys were conducted between December 2023 and February 2024. Survey sites containing migratory shorebird habitat were established within the Strategic Assessment Area..

Surveys were conducted at neap (minimum difference between low and high tide) and spring tide (maximum difference between low and high tide) conditions, as recommended in the Guidelines.

Sampling at low and high tide was conducted to understand habitat utilisation within the intertidal zone. During each survey event, surveys were undertaken at low tide to record shoreline foraging and at high tide to document roosting presence and behaviours respectively

In addition to surveys within the Strategic Assessment Survey Area, observations were recorded from reference sites, north and east of the Strategic Assessment Survey Area (refer to Table 5 in Section 2.2.3), including at the Adelaide International Bird Sanctuary. Comparing the extent and utilisation of migratory shorebird habitat in the Strategic Assessment Survey Area against reference sites provided an understanding of its importance in the context of the surrounding landscape.

2.2.2 Survey team

Three appropriately qualified ecologists conducted surveys for migratory shorebirds. A summary of qualifications and experience of the field team is included in Table 4.

Table 4 Survey observers and experience

Observer	Qualification	Years experience
Technical Director – Terrestrial Ecology	PhD (Ecology), MSc (Ecology), BSc (Ecology)	23
Senior Ecologist – Coastal Environments	MSc (Environmental Science), BSc (Environmental Science)	9
Ecologist	BSc (Wildlife Conservation Biology)	1

2.2.3 Survey sites

Surveys were undertaken at 12 locations including tidal flat, constructed wetland/swale and estuarine habitat, likely to be used for foraging and roosting by migratory shorebirds. The 12 locations included the entire area of contiguous habitat where shorebirds may occur within the Strategic Assessment Area along with adjacent estuary areas. A summary of the 12 locations and habitats is provided in Table 5, and mapped in Figure 2.

Table 5 Overview of survey sites

Survey location	Site	Tidal flat	Constructed wetland / swale drain	Estuary
Tidal flat survey sites	Strategic Assessment Survey Area Shoreline	✓		
	Strategic Assessment Survey Area Swale Drain		✓	
	Falie Reserve Swale Drain		✓	
Reference sites	Mutton Cove Mangrove Inlet	✓		✓
	St. Kilda Beach (Shoreline)	✓		

Survey location	Site	Tidal flat	Constructed wetland / swale drain	Estuary
	Port Gawler Beach (Shoreline)	✓		✓
	Port Gawler Swale Drain		✓	
	Thompson Beach South (Shoreline)	✓		
	Thompson Beach North (Estuary)			✓
	Middle Beach Shoreline	✓		
	Bird Island Conservation Area Shoreline	✓		
	Bird Island Conservation Area Estuary			✓

2.2.4 Survey timing

The 12 survey locations were surveyed during four separate week long events between December 2023 and February 2024, as indicated in Table 6.

Table 6 Summary of visual survey transect dates

Survey #	Dates	Duration
Survey 1	19 to 22 December 2023	5 days
Survey 2	15 to 19 January 2024	5 days
Survey 3	29 January to 2 February 2024	5 days
Survey 4	12 to 16 February 2024	5 days

SURVEY SITES

Legend

- Railway
- Strategic assessment area
- Tidal flat survey site
- Mutton Cove inlet survey site
- Adelaide International Bird Sanctuary

Pelican Point

Port Adelaide River

Port Adelaide River shoreline site

Grain Terminal

Swale drain site

Snapper Point

Pelican Point Road

Fuel Terminal

Falie Reserve

Mutton Cove

Mutton Cove inlet

Victoria Road

Parham

Port Prime

Milner

St Kilda

Lefevre Peninsula

Australian Government
Australian Submarine Agency

GHD

FIGURE 2
Rev 0
29/11/2024

0 75 150 225 300
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_102_DistributionOfSurveySites

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area, survey sites (2023/2024). DEW - Reserves (2024). World Imagery (Wayback 2022-11-02): Esri, Maxar, Earthstar Geographics, and the GIS User Community

CAMERA LOCATIONS

Legend

- Railway
- Strategic assessment area
- Camera location
- Approximate field of view

Port Adelaide River

1
2
3
4

Snapper Point

Australian Government
Australian Submarine Agency

GHD

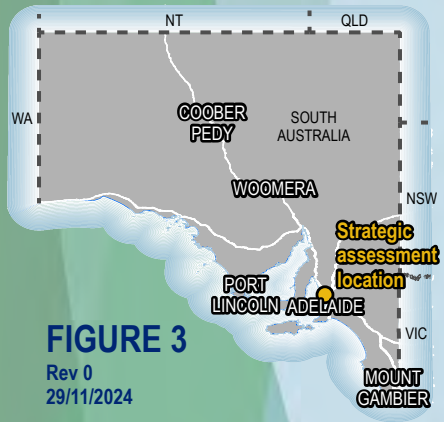


FIGURE 3
Rev 0
29/11/2024

0 25 50 75 100
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_103_CameraLocations

OFFICIAL

MIGRATORY BIRD OBSERVATIONS

Legend

- Railway
- Strategic assessment area

Threatened species sighting

Point dispersal applied

- Common Greenshank
- Common Sandpiper
- Grey Plover
- Marsh Sandpiper
- Red-necked Stint
- Sanderling
- Sharp-tailed Sandpiper

Habitat

- Coastal swale drain wetland
- Intertidal zone

Australian Government
Australian Submarine Agency

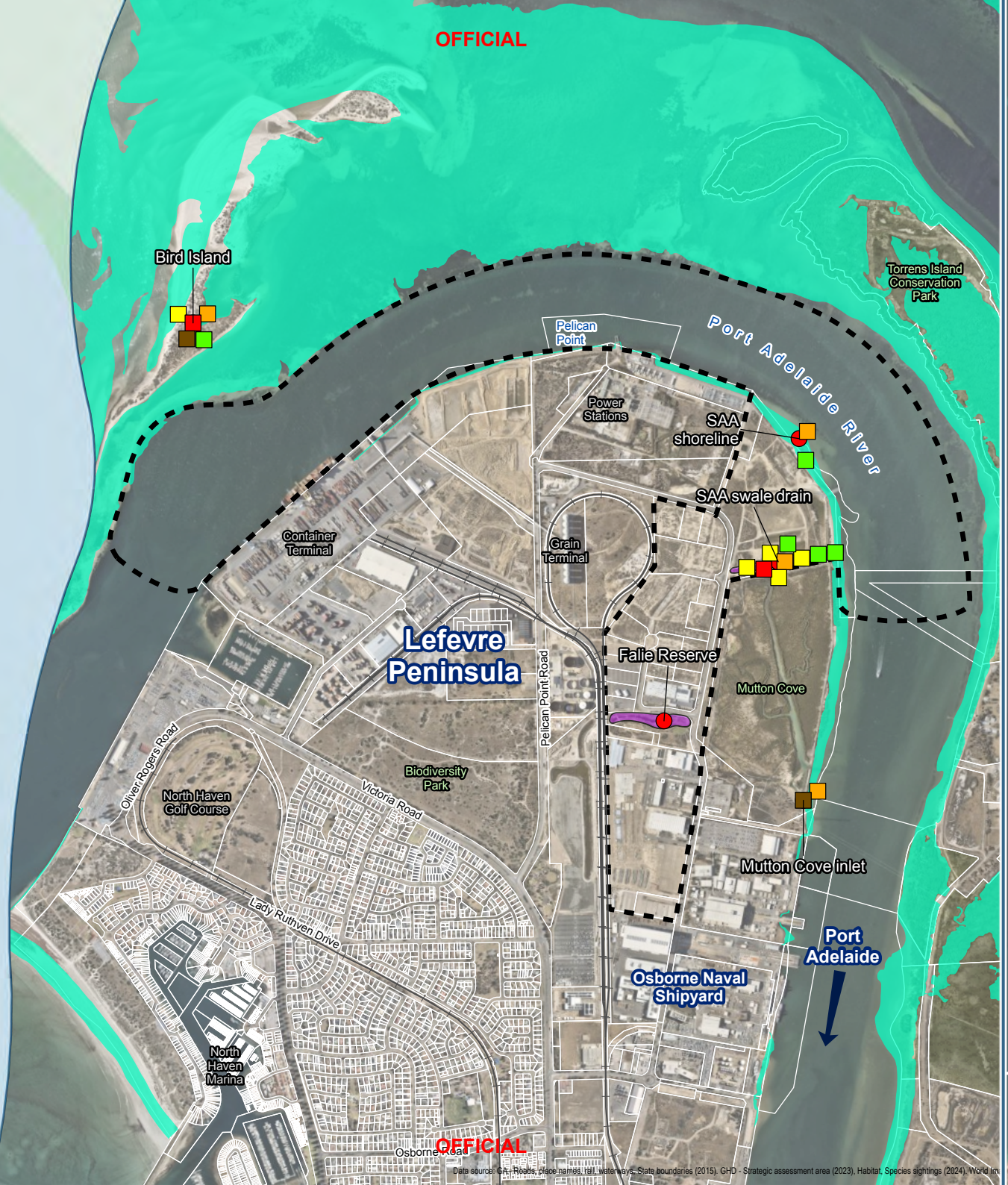
GHD

FIGURE 4
Rev 0
29/11/2024

0 150 300 450 600
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_104_MigratoryBirdHabitat



2.2.5 Tidal variation during surveys (neap and spring tides)

The Guidelines recommend undertaking surveys across a range of tidal conditions, including low tides during two neap and two spring tides (Commonwealth of Australia 2017). To address this recommendation, surveys were undertaken over a range of representative tidal conditions, with two weeks of daily survey undertaken on neap or near-neap tide conditions and two weeks of daily survey undertaken on spring or near-spring tide conditions. Daily tidal range on days of survey are provided in Table 7. A comparison against typical spring and neap tide conditions for Outer Harbor confirmed that the surveys provided representative tidal conditions. Under neap tides, Outer Harbor has a tidal range that typically varies between 0.23 m and 1.24 m, while spring tides have a tidal range that varies between 1.19 m and 2.49 m (based on a review of 10 neap and 10 spring tides in early 2024). Tides during the survey periods were within that range.

Table 7 Tidal range (m) at Outer Harbor on each day of survey

Tidal aspect	Monday	Tuesday	Wednesday	Thursday	Friday
Survey 1: 19 to 22 December 2023 (neap tide conditions)					
Morning high tide	2.36	2.17	1.92	1.63	1.33
Afternoon low tide	0.58	0.68	0.78	0.91	1.06
Tidal range	1.78	1.49	1.14	0.72	0.27
Survey 2: 15 to 21 January 2024 (neap tide conditions)					
Morning high tide	2.51	2.34	2.16	1.97	1.75
Afternoon low tide	0.33	0.42	0.46	0.49	0.54
Tidal range	2.18	1.92	1.7	1.48	1.21
Survey 3: 29 January to 2 February 2024 (spring tide conditions)					
Morning high tide	2.54	2.46	2.36	2.33	2.08
Afternoon low tide	0.22	0.24	0.27	0.31	0.38
Tidal range	2.32	2.22	2.09	1.92	1.7
Survey 4: 12 to 16 February 2024 (spring tide conditions)					
Morning high tide	2.55	2.42	2.34	2.07	1.94
Afternoon low tide	0.21	0.29	0.34	0.33	0.29
Tidal range	2.34	2.13	2.0	1.7	1.65

Source: Bureau of Meteorology Outer Harbor tide chart.

2.2.6 Daily tidal sampling (low and high tides)

To sample migratory shorebirds (particularly roosting activity) under high tide conditions and low tide conditions (particularly tidal flat foraging activity), the two tidal sites within the Strategic Assessment Survey Area as well as the Mutton Cove mangrove inlet reference site were surveyed at low and high tide each day during each survey event. Other reference sites were surveyed at low tide only. The time of day and tide levels for all surveys are provided in Appendix B.

Sampling at low tide and high tide allowed for a comparison to be made of migratory shorebird activity at times when migratory shorebird activity is typically high. Surveys conducted at low tide typically provided information related to foraging shorebirds, whilst surveys at high tide provided insight into roosting habits. Repeating surveys in the morning and afternoon each day at the same time provided variation in tide, temperature and other environmental conditions (e.g., wind, precipitation, cloud cover).

2.2.7 Survey conditions

Weather

Weather conditions were recorded during the surveys, including temperature and wind conditions, as well as daily tide heights. These are provided in Appendix B. Survey conditions were generally favourable with no limitations to the surveys imposed by adverse weather conditions.

The surveys were conducted over four separate weeks across the three-month period between December and February, which allowed for data collection across a range of weather conditions, including variable winds (maximum wind speed 40.3 km/hr). This provided an opportunity to observe use of shelter / roosting habitat during moderately inclement weather in a survey program that otherwise predominantly had fine and warm conditions.

Disturbance

The Strategic Assessment Survey Area is largely restricted from public access and remote from the local industrial activities. Accordingly, there were low levels of human activity during surveys, and the operational activities from the nearby industrial area did not appear to affect migratory shorebird behaviour. Large ships occasionally passed along the Port Adelaide River during surveys, but disturbance of migratory shorebirds as a result was not observed. For the reference sites, although publicly accessible, human activity resulting in disturbance of migratory shorebirds was not observed during surveys.

2.2.8 Survey methods

Survey methods used to assess migratory shorebirds, based upon the Guidelines included:

- Visual assessments along shoreline transects – on foot and by boat (Figure 4)
- Camera surveys
- Birdlife Australia habitat assessment

A description of the methods and locations where they were undertaken is provided in Table 8.

Table 8 Survey methods

Survey type	Locations	Method
Visual assessments along shoreline transects, on foot	All survey locations (except Bird Island Conservation Area)	– Conducted by walking approximate 200 m transects looking and listening for migratory birds, particularly shorebirds. – Conducted by at least two observers for approximately 25 minutes. – In tidal areas, timed to occur at or within two hours of low or high tide.
Visual assessments along shoreline, from boat	Bird Island Conservation Area	– One day survey from a small boat looking and listening for migratory birds, particularly shorebirds.
Camera surveys	Strategic Assessment Area	– Motion-sensing trail cameras placed at four locations (Figure 3) to detect species during and between surveys to provide additional information on temporal changes in migratory shorebird activity, along with other opportunistic footage of fauna species, including pest species. – Cameras active from 20 December 2023 to 15 February 2024 (approximately 58 days).
Birdlife Australia habitat assessments	All survey locations	– Assessment of suitable microhabitats teach habitat assessment site. – Assessing extent and quality of potential foraging, breeding, roosting and nesting resources. – Active searches for secondary wildlife traces including scats, bones, feathers, nests, eggs, and footprints. – Collection of general site data and photographs including documenting ecological values and threatening processes. – Visual observations and documentation of factors that could affect habitat health; such as introduced species hydrological changes, gross pollution such as waste / rubbish, vehicle / boat vessel traffic, and erosion.

2.2.9 Survey effort

Survey effort is summarised in Table 9. The surveys undertaken included:

– A total of 198 surveys and 4,160 minutes of observation time. This effort comprised 76 surveys and 1,600 minutes of observation within the Strategic Assessment Survey Area, and 122 surveys and 2,560 minutes observation in reference site areas.

– Identifying and mapping the location of migratory species listed under the EPBC Act.

Table 9 Survey effort

Site	Transects				Remote camera		
	Frequency during survey period	Survey days	Total surveys	Approximate time (hrs)	#	Days	Total (days)
Tidal flat survey sites							
Strategic Assessment Survey Area shoreline	Twice daily	19	38	13.4	3	58	174
Eastern detention basin	Twice daily	19	38	13.4	1	58	58
Falie Reserve swale drain	Once daily	20	20	6.6	–	–	–
Reference sites							
Mutton Cove mangrove inlet	Twice daily	19	38	13.4	–	–	–
St. Kilda Beach	Once daily	18	18	6	–	–	–
Port Gawler Beach	Once daily	13	13	4.3	–	–	–
Port Gawler swale drain	Once daily	13	13	4.3	–	–	–
Thompson Beach south shoreline	Once daily	4	4	1.3	–	–	–
Thompson Beach north estuary	Once daily	4	4	1.3	–	–	–
Middle Beach	Once daily	4	4	1.3	–	–	–
Bird Island Conservation Area shoreline	One day (boat)	1	1	2	–	–	–
Bird Island Conservation Area estuary	One day (boat)	1	1	2	–	–	–

2.2.10 Guidelines compliance summary

Surveys conducted were compliant with the Guidelines and this compliance is detailed in Table 10.

Table 10 Guideline compliance summary – migratory shorebirds

Guideline recommendation	Survey summary	Compliance
Survey coverage – shoreline habitat areas: – All the habitats thought to be used by the same population of migratory shorebirds. – The entire area of contiguous habitat where shorebirds may occur. – Travel along the full length of mangrove fringe in small boats during high tide periods.	– Strategic Assessment Survey Area – Reference sites likely to be used by the same population of shorebirds i.e. Bird Island, Saint Kilda Beach, Port Gawler, Biodiversity Park, Torrens Island, Thompson Beach, and Falie Reserve. – Surveys undertaken by boat including along areas of contiguous habitat and surveys along the shoreline habitat.	Compliant
Four surveys for birds during the period when most migratory shorebirds are present in the area.	Four discrete survey mobilisations undertaken: – December 2023 – January 2024 – January / February 2024 – February 2024	Compliant
One survey during the northern hemisphere breeding season to capture data on birds that remain in Australia during the breeding season, as well as the double-banded plover (March to August).	While no dedicated survey for migratory shorebirds was done during this period, observations of migratory species were collected in July 2023 as part of the Biodiversity Values Assessment (Biodiversity Values Report 2023).	Compliant
Surveys for foraging migratory shorebirds should be conducted as close to the time of low tide as practicable and at a maximum of no more than two hours either side of low tide.	Surveys conducted during appropriate tidal conditions for foraging migratory shorebirds.	Compliant
External conditions: – Surveys should not be undertaken during periods of high rainfall and strong winds. – Surveys should not be undertaken when activities are taking place which cause shorebird disturbance.	Conditions in the areas at the time of surveying were ideal. There was no rain recorded over the survey period and winds were mostly moderate, not exceeding 40.3 km/hr. The sites in the Strategic Assessment Survey Area have restricted public access, and therefore there was little to no disturbance at these sites. There were rarely other people observed during the surveys in the six reference sites within the protected Adelaide International Bird Sanctuary.	Compliant
Replicate surveys	Replicate surveys were conducted.	Compliant
Four surveys for foraging migratory shorebirds: – Two surveys at spring low tide – Two surveys at neap low tide	Surveys were conducted during the appropriate tidal conditions.	Compliant
For large areas or large populations, at least two people undertake counts and agree on number of birds and species present.	Two or three observers were present for each survey.	Compliant
Appropriately experienced and qualified observers.	Team was lead with appropriately experienced and senior ecologists.	Compliant

2.2.11 Survey limitations

Survey outcomes are subject to the following limitations:

Presence of species in any area can be variable

Each location surveyed over four separate week long events within the 2023 / 2024 non-breeding period consistent with the Guidelines.

Migratory shorebird species not identified during the survey, may be present outside of these survey times. For these species, a likelihood of occurrence assessment has been undertaken based on documented species records, habitat and species characteristics. This likelihood of occurrence assessment is presented separately in the **Biodiversity Values Report**.

The conservative approach ensures that all species likely to be present have been identified and considered.

Survey frequency

Frequency of surveys conducted for reference sites was influenced by accessibility and proximity. More accessible sites in closer proximity to the Strategic Assessment Area, such as Mutton Cove, St Kilda and Port Gawler were surveyed a greater number of times than the more remote sites such as Thompson Beach and Middle Beach within the Adelaide International Bird Sanctuary or Bird Island, (which was accessible only by boat).

The Strategic Assessment Area and nearest reference site, Mutton Cove, were prioritised and surveyed twice daily under high and low tide conditions. Other reference sites (except for Bird Island, which was visited once over the entire survey period) were surveyed once daily, generally coinciding with low tide.

To balance out the differences in survey frequency between the Strategic Assessment Area and the reference sites, a maximum count approach was applied to the survey results.

Disturbances

The Strategic Assessment Area is on the Port River, which is subject to periodic vessel movements. While vessel movements occurred during some surveys. Birds were observed to disperse and resettle a short distance from their original location on the few occasions that a flight response was induced.

Birdwatchers at St Kilda and local workers lunching at Mutton Cove were encountered during surveys. This did not influence survey outcomes, with birds resettling locally on the few occasions a flight response was induced.

3. Desktop assessment results

3.1 Database searches

Desktop searches were undertaken to identify listed (under State and Commonwealth legislation) migratory bird species within the desktop assessment area. A PMST search was undertaken to identify known and likely shorebird species included in the Guidelines. Searches of sightings recorded in other databases including NatureMaps, Atlas of Living Australia (ALA), eBird and BirdLife were also undertaken. A total of 35 shorebird species (as specified in the Guidelines) were identified between the PMST and other databases. These are presented in Table 11.

Table 11 Migratory species identified in desktop searches

Scientific name	Common name	EPBC Act threatened status	NP&W Act threatened status	Present in PMST Report (Y/N)	Other database searches
Actitis hypoleucos	Common sandpiper	–	R	Y	NatureMaps, ALA, eBird, BirdLife
Arenaria interpres	Ruddy turnstone	V	R	Y	ALA, eBird
Calidris acuminata	Sharp-tailed sandpiper	V	–	Y	ALA, eBird, BirdLife
Calidris alba	Sanderling	–	R	Y	ALA, BirdLife
Calidris canutus	Red knot	V	E	Y	ALA, eBird, BirdLife
Calidris ferruginea	Curlew sandpiper	Cr	E	Y	ALA, eBird, BirdLife
Calidris melanotos	Pectoral sandpiper	–	R	Y	NatureMaps, ALA, eBird, BirdLife
Calidris ruficollis	Red-necked stint	–	–	Y	ALA, eBird, BirdLife
Calidris subminuta	Long-toed stint	–	R	Y	ALA, eBird, BirdLife
Calidris tenuirostris	Great knot	V	E	Y	ALA, eBird, BirdLife
Charadrius bicinctus	Double-banded plover	–	–	Y	ALA, eBird, BirdLife
Charadrius dubius	Little ringed plover	–	–	N	ALA
Charadrius leschenaultii	Greater sand plover	V	–	Y	NatureMaps, ALA, eBird, BirdLife
Charadrius mongolus	Lesser sand plover	E	E	Y	NatureMaps, ALA, BirdLife
Charadrius veredus	Oriental plover	–	–	Y	ALA
Gallinago hardwickii	Latham's snipe	V	R	Y	ALA, eBird
Gallinago megala	Swinhoe's snipe	–	–	Y	–
Gallinago stenura	Pin-tailed snipe	–	–	Y	–
Glareola maldivarum	Oriental pratincole	–	–	N	ALA
Limicola falcinellus	Broad-billed sandpiper	–	–	Y	ALA, eBird, BirdLife
Limosa lapponica	Bar-tailed godwit	E,	R	Y	ALA, eBird, BirdLife
Limosa limosa	Black-tailed godwit	E	R	Y	NatureMaps, ALA, eBird, BirdLife
Numenius madagascariensis	Eastern curlew	Cr	E	Y	ALA, eBird, BirdLife
Numenius minutus	Little curlew	–	–	Y	ALA

Scientific name	Common name	EPBC Act threatened status	NP&W Act threatened status	Present in PMST Report (Y/N)	Other database searches
Numenius phaeopus	Whimbrel	–	R	Y	NatureMaps, ALA, eBird, BirdLife
Phalaropus lobatus	Red-necked phalarope	–	–	Y	eBird, BirdLife
Philomachus pugnax	Ruff	–	R	Y	ALA, eBird, BirdLife
Pluvialis fulva	Golden plover	–	R	Y	ALA, eBird, BirdLife
Pluvialis squatarola	Grey plover	V	–	Y	ALA, eBird, BirdLife
Tringa brevipes	Grey-tailed tattler	–	R	N	NatureMaps, ALA, eBird, BirdLife
Tringa glareola	Wood sandpiper	–	R	N	NatureMaps, ALA, eBird, BirdLife
Tringa nebularia	Common greenshank	E	–	Y	ALA, eBird, BirdLife
Tringa stagnatilis	Marsh sandpiper	–	–	N	ALA, eBird, BirdLife
Tringa totanus	Redshank	–	–	N	ALA, eBird, BirdLife
Xenus cinereus	Terek sandpiper	V	R	N	ALA, eBird, BirdLife

All species within Table 11 are listed under the EPBC Act as marine and migratory species. Abbreviations for are as follows: EPBC Act (Cr= Critically Endangered, E = Endangered, V = Vulnerable); NP&W Act (E = Endangered, V = Vulnerable, R = Rare).

4. Field survey results

4.1 Habitat types

Two habitat types that typically support migratory shorebird species occur within the Strategic Assessment Survey Area. Details of these are included in Table 12 and Table 13. A map of the distribution of habitats is included in Figure 5. Images showing the habitat types within the Strategic Assessment Area are provided in Image 1, Image 2, Image 3 and Image 4.

Habitat quality is assessed using the methodology in the **Biodiversity Values Report** (**Appendix F, Table F3**). Further site and habitat descriptions area provided in Appendix C.

Table 12 Habitat type 1 – tidal flat

Description	The tidal flat refers to the ecosystem found on marine shorelines between typical hightide and low tide levels, where organisms living on the shore survive the tidal changes. The tidal flat encompasses small patches of mangrove shrubland.	
Sites surveyed	– Shoreline (Strategic Assessment Survey Area) – St Kilda Beach (reference site) – Port Gawler Beach (reference site) – Middle Beach shoreline (reference site) – Thompson Beach shoreline (reference site) – Bird Island shoreline (reference site)	
Resources for migratory shorebirds	Foraging, resting	
Strategic Assessment Area	**Distribution**	Interface of Strategic Assessment Area onshore area and marine area
	Approximate area (ha)	2.58 ha
	Condition	Moderately disturbed from invasive plants
	Quality	Lower: – Fragmented habitat patch – Small patch size (<25 ha) – Non-remnant vegetation (planted) – Provides foraging and resting habitat for bird species – Low weed cover
Regional occurrence	**Distribution**	Periphery of Port Adelaide River and Gulf St Vincent in undeveloped areas
Photos from Strategic Assessment Area	 *Image 1 Shoreline at northern end of the onshore area (Photo: GHD)*	 *Image 2 Silver gulls and crested terns along the shoreline at the northern end of the onshore area (Photo: GHD)*

Table 13 Habitat type 2 – constructed wetland

Description	Constructed wetland (swale drains) are shallow, vegetated channels, primarily designed for conveying water through a drainage pathway.	
Sites surveyed	– Eastern Detention Basin (Strategic Assessment Survey Area) – Falie Reserve swale drain (Strategic Assessment Survey Area) – Port Gawler swale drain (reference site)	
Resources for migratory birds	Foraging, sheltering, resting	
Strategic Assessment Area	**Distribution**	Stormwater drains – Falie Reserve and Eastern Detention Basin both withing the onshore Strategic Assessment Area
	Approximate area (ha)	2.54 ha
	Condition	Constructed wetland that is moderately disturbed by invasive plants
	Quality	Lower: – Fragmented habitat – Small patch size (<25 ha) – Non-remnant vegetation – High weed cover – Provides foraging, shelter and resting habitat for species
Regional occurrence	**Distribution**	Industrial areas of Lefevre Peninsula and within surrounding salt pans
Photos from Strategic Assessment Area	 *Image 3 Eastern basin looking west (Photo: GHD)*	 *Image 4 Sharp-tailed sandpipers foraging in a swale drain (Photo: GHD)*

MIGRATORY SHOREBIRD HABITAT

Legend

- Railway
- Strategic assessment area
- Habitat area

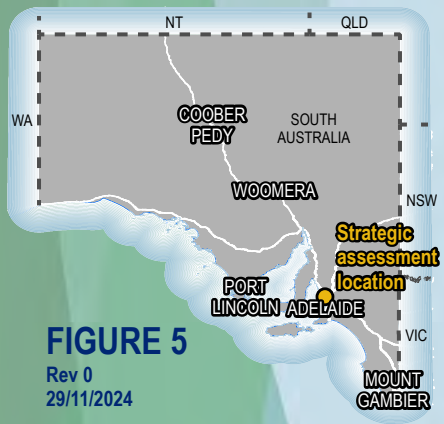


FIGURE 5
Rev 0
29/11/2024

0 0.5 1 1.5 2
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_105_Habitat

Australian Government
Australian Submarine Agency

GHD

St Kilda
Barker Inlet
Dry Creek saltfield
Section Banks (Bird Island)
Port Adelaide River
Outer Harbor
Lefevre Peninsula
Mutton Cove
Torrens Island Conservation Reserve
Yerlo
Osborne Naval Shipyard
Midlunga
Taperoo
Draper
Whicker Road Wetlands
Largs
Peterhead
Dry Creek

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area (2023). nearmap.com:

4.2 Species recorded

A total of 44 bird species were observed during the field surveys, of which seven species are listed as migratory shorebird species. Four of the migratory shorebird species were recorded in the Strategic Assessment Survey Area. Migratory shorebird species that were recorded within the Strategic Assessment Survey Area and reference sites are summarised in Table 14. A list of all bird species (including non-migratory bird species) observed over the survey period can be found in Appendix B.

Table 14 Migratory shorebird species recorded during field surveys

Scientific name	Common name	EPBC Act threatened status	Present in field surveys	
			Strategic Assessment Area	Reference site
Actitis hypoleucos	Common sandpiper	–	✓	✓
Calidris acuminata	Sharp-tailed sandpiper	Vulnerable	✓	✓
Calidris alba	Sanderling	–		✓
Calidris ruficollis	Red-necked stint	–	✓	✓
Pluvialis squatarola	Grey plover	–		✓
Tringa nebularia	Common greenshank	Endangered	✓	✓
Tringa stagnatilis	Marsh sandpiper	–		✓

4.3 Migratory shorebird statistics

In accordance with the Guidelines, migratory shorebird species richness and total abundance were calculated (Table 15). However, because survey sites were not sampled equally, the maximum count of each species from any single survey has been calculated, to remove the influence of the number of surveys on total abundance. The following definitions relate to the data:

– Maximum migratory shorebird count – the highest single survey count of migratory shorebirds observed over each survey site
– Total migratory shorebird abundance – the total count of migratory shorebirds observed over all surveys
– Total migratory shorebird species richness – the total number of migratory shorebird species observed

Figure 6 shows the maximum count of each species from any single survey. This data is representative as not all the survey sites were equally sampled.

Table 15 Summary comparison of migratory shorebird results

	Strategic Assessment Area Survey Sites			Reference sites								
	Shoreline (1)	Eastern detention basin (2)	Falie Reserve swale drain (2)	Mutton Cove mangrove inlet (1,3)	St. Kilda Beach (1)	Port Gawler Beach (1)	Port Gawler swale drain (2)	Thompson Beach south shoreline (1)	Thompson Beach north estuary (3)	Middle Beach (1)	Bird Island Conservation Area shoreline (1)	Bird Island Conservation Area estuary (3)
Species maximum count (single survey)												
Common sandpiper *(Actitis hypoleucos)*	**4**	**8**	0	**1**	**9**	0	0	0	**11**	**2**	0	**5**
Sharp-tailed sandpiper *(Calidris acuminata)*	0	**37**	0	0	0	0	0	**6**	**55**	0	0	**18**
Sanderling *(Calidris alba)*	0	0	0	0	**7**	**10**	0	0	**12**	0	0	0
Red-necked stint *(Calidris ruficollis)*	0	**4**	0	0	**31**	**11**	7	0	**24**	0	**32**	0
Grey plover *(Pluvialis squatarola)*	0	0	0	0	0	0	0	0	**18**	0	0	0
Common greenshank *(Tringa nebularia)*	0	**2**	0	0	**6**	0	0	**6**	0	**4**	0	**16**
Marsh sandpiper *(Tringa stagnatilis)*	0	0	0	**2**	**4**	0	0	0	**12**	0	0	**4**
Totals												
Migratory shorebird combined maximum count	**4**	**51**	**0**	**3**	**57**	**21**	**7**	**12**	**132**	**6**	**32**	**43**
Migratory shorebird species richness	**1**	**4**	**0**	**2**	**5**	**2**	**1**	**2**	**6**	**2**	**1**	**4**
Migratory total count (inclusive of all surveys)	**71**	**330**	**0**	**11**	**415**	**84**	**11**	**16**	**248**	**6**	**32**	**43**

Habitat codes for Table 15 are as follows: 1 = tidal flat, 2 = constructed wetland / swale drain, 3 = coastal estuarine.

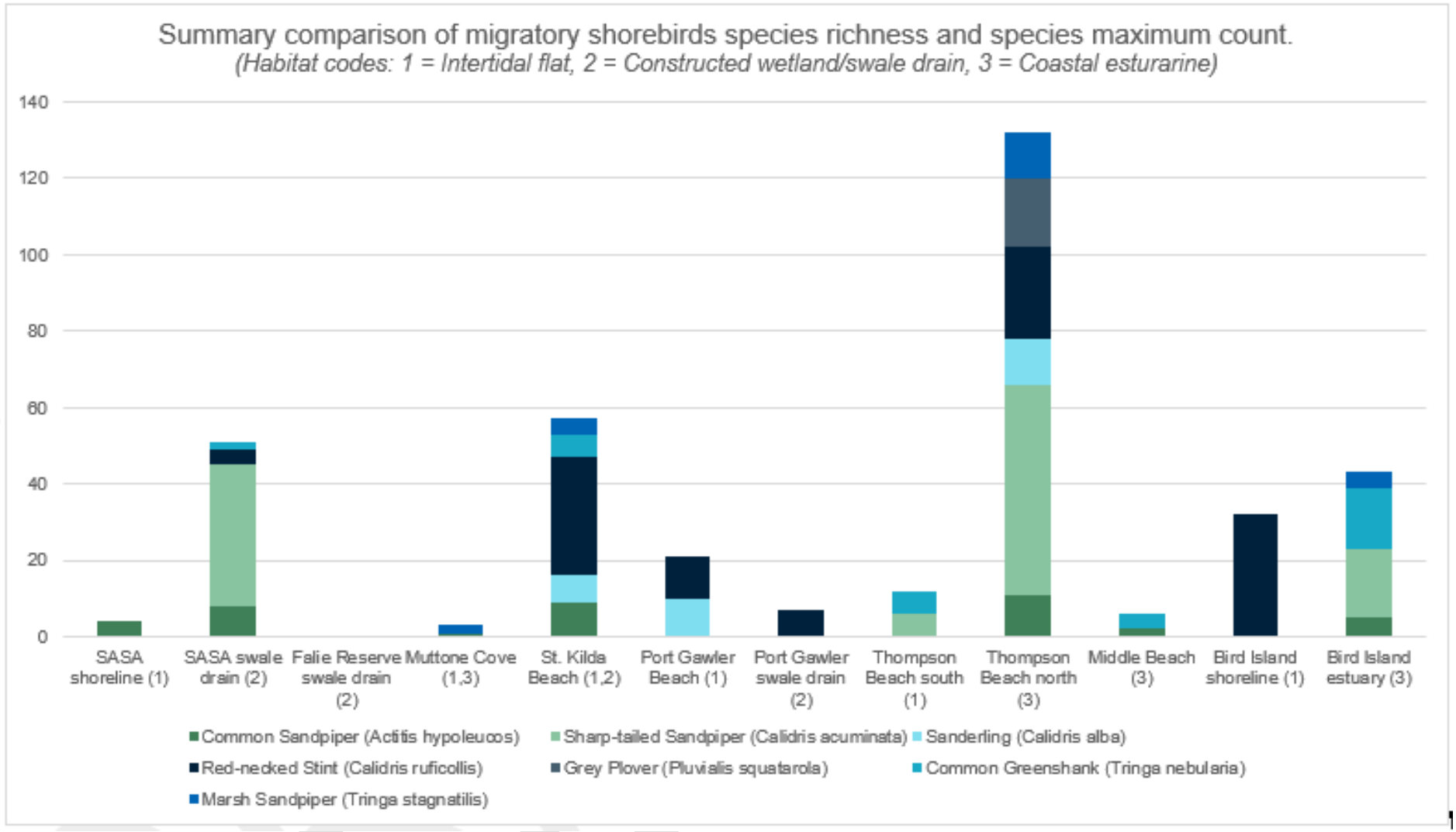


Figure 6 ***Summary comparison of migratory shorebird species richness and species maximum count***

From a comparison of the survey sites from the Strategic Assessment Area and reference sites in consideration of the survey data, the following can be summarised:

– Tidal shoreline habitat present at the survey sites within the Strategic Assessment Area shoreline provides habitat that supports lower species richness (one migratory shorebird species) and lower combined (all species maximum counts) maximum count (four individuals) when compared to reference site areas. The Strategic Assessment Survey Area shoreline had a lower species richness than all reference sites, except for Bird Island Conservation Area shoreline (one migratory shorebird species/32 individuals), where only one migratory bird species was observed. The highest species richness and combined count was observed at St Kilda Beach (five migratory shorebird species; 57 individuals).
– Constructed wetland in the swale drain provides habitat that supports a higher species richness (four migratory shorebird species) and combined maximum count (51 individuals) than swale drain in the regional reference site, Port Gawler (one migratory shorebird species; seven individuals). No migratory shorebirds were observed at Falie Reserve swale drain.

Data presented in Appendix A provides historical and regional context to the results of these migratory shorebird surveys. The historical counts and species identifications (Lees *et al.* 2020) for sites in and around the Strategic Assessment Area correspond to those presented here, which suggests that these results are reasonably representative of the average abundance of species.

4.4 Habitat utilisation

Species observations and utilisation of the migratory shorebird habitats within the Strategic Assessment Survey Area are provided in Table 16.

Table 16 Migratory shorebird species observations within the Strategic Assessment Survey Area

Species	Habitat type			
	Tidal flat (Shoreline)		Constructed wetland (Eastern Detention Basin)	
	Observation	Number observed	Observation	Number observed
Common greenshank *(Tringa nebularia)* **EPBC Act listing: Ma, Mi, E**	– Observed once utilising this area in the survey period through trail camera footage on 2 February 2024 at 6:45 am. – Observed foraging and resting in the tidal flat. – The species was also seen to be threatened by a red fox trying to prey upon it, in the camera footage. – This habitat type is typical of the habitat used by this species in accordance with the available literature (Higgins & Davies 1996).	One (1) individual observed on trail camera footage. No observation during the 38 surveys.	– Observed utilising this area on three occasions throughout the survey period within the month of January 2024. – Observed throughout the swale drain, feeding, resting, and sheltering within the aquatic vegetation (reeds). – This habitat type is typical of the habitat used by this species in accordance with the available literature (Higgins & Davies 1996).	Maximum count of two (2) individuals. Observed in four (4) of 38 surveys. Total count of seven (7) observations.
Common sandpiper *(Actitis hypoleucos)* **EPBC Act listing: Ma, Mi**	– Observed once utilising this area in survey period in January. – Observed foraging and resting on the tidal flat, following the receding tide. – This habitat type is typical of the habitat used by this species in accordance with the available literature (Higgins & Davies 1996).	Maximum count of four (4) individuals. Observed in one of 38 surveys. Total count of four (4) observations.	– Observed utilising this area on three occasions during December survey period and a further two occasions within the January 2024 survey period. – This habitat type is typical of the habitat used by this species in accordance with the available literature (Higgins & Davies 1996).	Maximum count of eight (8) individuals. Observed in five (5) of 38 surveys. Total count of 18 observations.
Sharp-tailed sandpiper *(Calidris acuminata)* **EPBC Act listing: Ma, Mi, V**	Not observed in the tidal flat in the Strategic Assessment Survey Area.	Nil	– Observed utilising this area frequently throughout the survey period, especially from the months of December and January. – Observed throughout the swale drain, feeding, resting, bathing, and sheltering in reeds. – This species was frequently observed being interactive with the water body, as it provides diverse food resource availability to support the species. – This habitat type is typical of the habitat used by this species in accordance literature and conservation advice (Commonwealth of Australia 2024a; Higgins & Davies 1996).	Maximum count of 37 individuals. Observed in 18 of 38 surveys. Total count of 300 observations.

Species	Habitat type			
	Tidal flat (Shoreline)		Constructed wetland (Eastern Detention Basin)	
	Observation	Number observed	Observation	Number observed
Red-necked stint *(Calidris ruficollis)* **EPBC Act listing:** **Ma, Mi**	Not observed in the tidal flat in the Strategic Assessment Survey Area.	Nil	– This species was observed once utilising this area throughout the survey period within the month of January 2024. – Other species were present including the black-winged stilt *(Himantopus himantopus)*, sharp-tailed sandpiper (*Calidris acuminata)*. – The species was observed foraging at the central-western end of the swale drain, resting and sheltering amongst reeds. – This habitat type is typical of the habitat used by this species in accordance with the available literature (Higgins & Davies 1996).	Maximum count of four (4) individuals. Observed in one (1) of 38 surveys. Total count of four (4) observations.

Abbreviations for Table 16 are as follows: Cr = Critically Endangered, E = Endangered, V = Vulnerable, Ma = Marine, Mi = Migratory.

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Appendices

Appendix A

Migratory shorebird history and habitat in Gulf St Vincent: Literature Review

Migratory shorebird history and habitat in Gulf St Vincent

Literature Review

Abstract

This review summarises information regarding the use of habitat by migratory shorebirds in and around the Strategic Assessment Area and gives context as to how development within the Strategic Assessment Area may interact with migratory shorebirds and their habitat at a local scale, within the Port Adelaide area and at a regional context, within the broader Gulf St Vincent region. The information was consolidated to inform the potential for development in the Strategic Assessment Area to influence the life history and population integrity of migratory shorebirds in the local area and region. While some areas of the Strategic Assessment Area appear to provide opportunistic foraging and roosting opportunities for migratory shorebirds, the review found no evidence that it provides reliable or important and productive roosting or foraging opportunities.

1. Introduction

The Strategic Assessment Area is located on the Lefevre Peninsula, within an industrial area on reclaimed land approximately 19 km northwest of Adelaide. The Lefevre Peninsula is located within the southern extent of the Adelaide International Bird Sanctuary, a 60 km long network of coastline in Gulf St Vincent, South Australia. The Adelaide International Bird Sanctuary provides expansive roosting and foraging habitat for migratory shorebirds. Associated with the Adelaide International Bird Sanctuary is the Adelaide International Bird Sanctuary Winaityinaityi Pangkara National Park, which protects the network of coastal areas as national park for the preservation of migratory shorebird habitat. The region is understood to be visited by approximately 27,000 shorebirds each year, including an estimated 14,000 that migrate from the northern hemisphere (Lees et al. 2020; National Parks South Australia 2016). This includes up to 35 species of migratory shorebirds, including 25 which are considered regular migrants (Lees et al. 2020).

Of these regular migrant species, two are listed as critically endangered, four listed as endangered, and eight as vulnerable, under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (National Parks and Wildlife Service South Australia 2020; Lees et al. 2020). This review has been prepared to discuss the habitat values of the Strategic Assessment Area specifically, and how it relates to the broader regional context of important habitat for migratory shorebirds.

2. Purpose of this review

The purpose of this literature review was to summarise available information on the use of habitat in and around the Strategic Assessment Area by migratory shorebirds, and to give context to how development within the Strategic Assessment Area may impact on migratory shorebirds and their available habitat. The information informs the potential for development in the Strategic Assessment Area to impact on migratory shorebirds in the local area and region.

3. Methodology

This review involved a desktop evaluation of scientific literature and database searches of Birdlife Australia and the EPBC Act Protected Matters Search Tool (PMST). BirdLife Australia (Royal Australasian Ornithologists Union) have been conducting annual surveys of migratory shorebirds across Gulf St Vincent since at least 2008. Substantial data from these surveys is available on the BirdLife portal (Birdlife 2024) and has been recently reported in the BirdLife Australia *Shorebird Population Monitoring in Gulf St Vincent – 2017 -2020 report* (Lees et al. 2020).

These sources provide information on the life history and behaviours of migratory shorebirds, including selection of roosting and foraging habitat during the non-breeding season. Due to the inshore context of the Strategic Assessment Area, the review focused on migratory shorebirds that prefer intertidal, inshore marine and estuarine habitats, rather than more pelagic migratory species, which are likely to occur infrequently and experience negligible impact from the project. This literature review focuses on migratory shorebirds only, reviewing their abundance and diversity in the region, and the location of the Strategic Assessment Area in relation to known migratory shorebird habitat within the local and regional landscape.

The literature review was used to provide context to historical distribution records of migratory shorebirds. Desktop information pertaining to the habitats available within, and adjacent to, the Strategic Assessment Area, and more broadly across the Adelaide International Bird Sanctuary and Gulf St Vincent was also provided. Information on species habitat preferences were compared against habitat availability and known records to assess the suitability of habitat available to migratory shorebirds in the Strategic Assessment Area, and its relative importance in the broader area.

4. Life history of migratory birds

4.1 Breeding grounds

Migratory shorebirds have a life history strongly defined by seasons and cost-benefit trade-offs (Rotman et al. 2016). Migratory shorebirds that visit the Adelaide International Bird Sanctuary breed predominantly in the upper latitudes of the northern hemisphere, mostly in Alaska and Siberia. The exception to this is the double-banded plover, the only migratory shorebird identified under the EPBC Act that does not breed in the northern hemisphere, instead migrating to New Zealand to breed (DEE 2017). The remaining migratory shorebirds that visit Australia, occupy the northern hemisphere generally for two to three months each year, during the northern summer, where they exploit seasonally abundant prey.

During their time spent in the northern hemisphere, migratory shorebirds utilise optimal breeding conditions to rear the next generation of offspring in preparation for the southern migration. Offspring are reared for about six weeks before parents begin their southern migration (DCCEEW 2023). After another two weeks or so, the new generation of offspring also undertake the southern migration. Reductions in food abundance and falling temperatures in the northern hemisphere breeding grounds trigger the mass migration (Rotman et al. 2016).

4.2 Migration

The term ‘flyway’ is used to define a broadly shared migration route, used by migratory birds moving between breeding and non-breeding grounds (Hansen et al. 2016). The East Asian-Australasian Flyway (EAAF) is the largest of nine global flyways and encompasses the breeding grounds of Alaska and Siberia, terminal non-breeding grounds in Australia and New Zealand, and 21 countries along the migration route (Hansen et al. 2016; DEE 2017) (Figure 1). The EAAF is used by an estimated five million migratory shorebirds per year, including an estimated 14,000 migratory shorebirds which gather annually at the Adelaide International Bird Sanctuary (Lees et al. 2020; National Parks South Australia 2016).

The southern migration to the Australian non-breeding grounds generally takes six to eight weeks depending on the species (DCCEEW 2023), and the migration usually entails journeys of greater than 9000 km just to reach the northern coast of Australia (DCCEEW 2023). Some shorebirds migrate from their breeding grounds to terminal sites (non-breeding grounds) in a single flight (for example, the bar-tailed godwit) (Gill et al. 2009), while others make numerous stopovers along the way – for example the red knot (Piersma et al. 2021). The number of stopovers can differ between species, and between individuals of the same species within the same year (Piersma et al. 2021; Rotman et al. 2016). Migratory shorebirds may also make several stopovers at staging sites, for days or weeks at a time (Warnock 2010). Some stopover locations are referred to as staging grounds, where migratory birds can use an extended stopover in preparation for a large continuous flight over a known barrier (e.g. ocean or dessert) (Warnock 2010). These sites typically have a reliable and abundant food source that can support refuelling in preparation for large flights.

4.3 Wintering

The occurrence of migratory shorebirds in Australia is referred to as ‘wintering’ (Piersma et al. 2021). Wintering (or over-wintering) describes the non-breeding and non-migrating period of a migratory shorebird’s life history (Piersma et al. 2021). Wintering occurs during the Australian spring and summer but can occur more broadly between August and April (Dann 1999). The wintering period is substantially longer than the breeding period in the northern hemisphere and accounts for roughly half of the yearly migration cycle of migratory shorebirds.

While ‘wintering’, shorebirds spend several months alternating daily between roosting (see Section 5.1) and foraging (see Section 5.2) activities that are driven by tide heights. During this period, shorebirds recuperate from their southern migration and prepare for the northward migration. This includes moulting and replacing old flight feathers and building sufficient flight muscle and fat reserves for the return trip (DEE 2017).

The location of wintering ultimately occurs at ‘terminal sites’, which can be defined as the opposite end of the migration journey to the breeding grounds. Migratory shorebirds often demonstrate strong site fidelity and may stay at a single terminal site for the full duration of wintering (see Section 5.1.1), whereas others stage at northern sites and/or stopover on their way to more southern terminal sites (Rotman et al. 2016). At the conclusion of the Australian summer, migratory shorebirds begin their northward migration back to northern hemisphere breeding grounds.

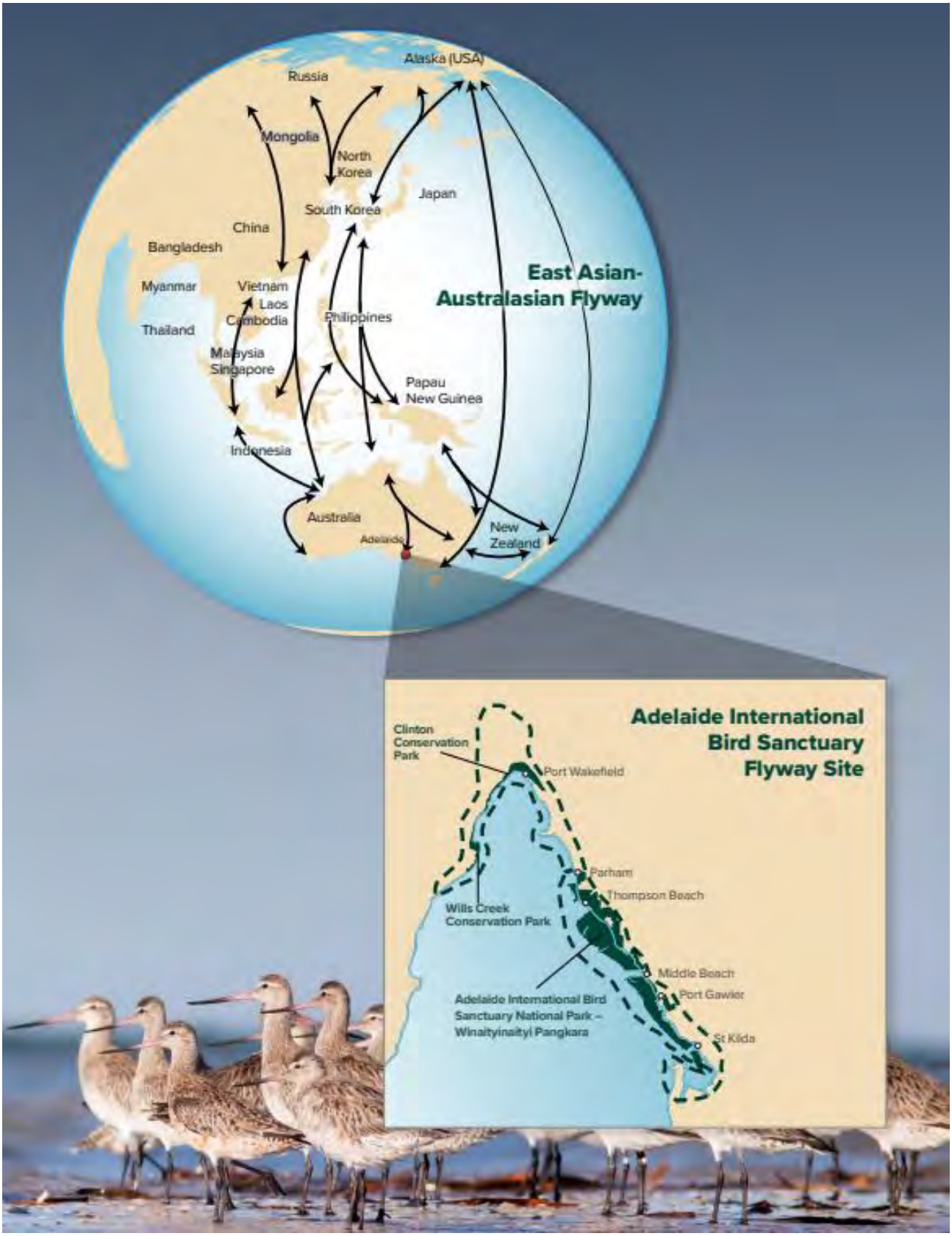

Figure 1 *East Asian-Australasian Flyway (Source: National Parks and Wildlife Service South Australia 2020)*

5. Habitat selection and foraging of migratory birds

During wintering, migratory shorebirds spend their time across two broad types of habitat: roosting habitat and foraging habitat (Zharikov and Milton 2009). Migratory shorebirds are in a constant cycle of recuperation and preparation and must maintain high productivity and foraging rates whilst minimising energy loss when roosting. To achieve this, roosting and foraging sites are usually connected. Whether a migratory shorebird is present in roosting habitat or foraging habitat is largely determined based on the tidal regime and daily energy demands.

5.1 Roosting

Roosting is an important element of a migratory shorebird's daily activity and for many species usually occurs during high tide periods, when tidal foraging is least efficient. Many migratory shorebirds retreat to roosts, usually located above the high tide mark, where they spend time resting, preserving energy, digesting foraged food, and preening, where they groom their feathers with their beak (Lilleyman et al. 2016). The selection of roosting sites by migratory shorebirds is related to perceived safety, proximity to foraging sites, and a suitable microclimate (Lilleyman et al. 2016; Zharikov and Milton 2009; Spruzen et al. 2008). Even sites with high quality and extensive foraging habitat may not be used if they do not offer suitable roosting habitat nearby (Zharikov and Milton 2009).

Roost sites commonly occur on the upper tidal or supratidal zone of sandy beaches and rocky outcrops, in areas with good panoramic visibility (Lilleyman et al. 2016). The preferred roost habitat is not consistent between species of migratory shorebirds, with different species seemingly more influenced by perceived safety, microclimate and the proximity or suitability of foraging grounds. In a study of 12 species of migratory shorebirds roosting at Moreton Bay, Queensland, it was observed that most migratory shorebirds selected roosts within a few kilometres of their foraging sites and with an open field of view (Zharikov and Milton 2009).

The relationship between roosting and foraging sites is presumed to be associated with the avoidance of unnecessary energy expenditure associated with movement, and the time-sensitive opportunity for foraging at optimal tide heights (Zharikov and Milton 2009). As shown by Zharikov and Milton (2009), this association was particularly evident in the great knot, bar-tailed godwit, eastern curlew and whimbrel, because they are not known to forage at high tide and need to minimise energy expenditure when not foraging. Other species which supplemented their feeding at high tide were more likely to travel to more distant foraging grounds (Zharikov and Milton 2009). In the same study of Moreton Bay by Zharikov and Milton (2009), migratory shorebirds differed in their preference for roost selection in areas of structural complexity and areas with high tide foraging opportunities. For example, some species roosted in open areas with broad ranging visibility, some on wet substrates or in shallow water, some on claypans of the upper intertidal range, and others in the cover of mangroves.

5.1.1 Site fidelity

Migratory shorebirds have been shown to demonstrate very high levels of site fidelity within and between seasons (Zhang et al. 2019; DEE 2017; Laurenco et al. 2016; Coleman and Milton 2012). That is, individual migratory shorebirds often return to the same terminal site, and/or same staging sites year after year. For example, 70% of grey-tailed tattlers (*Tringa brevipes*) and bar-tailed godwits (*Limosa lapponica*) tagged at Moreton Bay, Queensland, were shown to return to the same wintering ground the following year (Coleman and Milton 2012). This return rate did not account for mortality of tagged individuals and is likely an underestimate of actual return rates. Similarly, in a study of sanderlings (*Calidris alba*), 81.5% of tagged individuals returned to the same wintering site from one year to the next (Lourenço et al. 2016). Even in the event of severe environmental degradation, great knots (*Calidris tenuirostris*) have been shown to maintain fidelity to their staging grounds (Zhang et al. 2019).

In the study by Lourenço et al. (2016), wintering sanderlings were monitored at five sites, located 3.1 km to 29.8 km apart. Within a single season, 94% of sanderlings were observed only at a single wintering site. When shorebirds did move between sites, the most likely movements were between sites that were located close together. Similar findings were also observed by Coleman and Milton (2012), who noted that grey-tailed tattlers and bar-tailed godwits rarely foraged beyond a few kilometres from their roosting site. It is

evident that wintering shorebirds typically demonstrate high site fidelity within a given season and between seasons, and often occupy a small home range of only a few kilometres (DEE 2017; Lourenço et al. 2016; Coleman and Milton 2012). Despite this, some individual migratory shorebirds may be more transitory, making several stopovers while wintering (Warnock 2010). This may particularly be the case for juvenile individuals, which have been observed as more exploratory in their first year of migration compared to adults (Lilleyman et al. 2016).

Even in the event of repeated disturbance, migratory shorebirds have been shown to remain faithful to their chosen wintering grounds despite higher energetic costs associated with vigilance and alarm flights (Lilleyman et al. 2016). Strong site fidelity may make shorebirds more vulnerable to habitat modification and habitat loss, such as changes in prey abundance and composition, beach erosion and development (Lourenço et al. 2016; Coleman and Milton 2012). In events of strong site fidelity, this may prevent migratory shorebirds from selecting alternative superior sites, and instead may restrict them to areas of declining habitat quality (Lourenço et al. 2016; Coleman and Milton 2012). Ultimately, this can influence their foraging and roosting success, and subsequent migration timing, survival and breeding success (Coleman and Milton 2012).

5.2 Foraging

Migratory shorebirds are often associated with habitats that offer high abundance and biomass of macroinvertebrate prey (Spruzen et al. 2008). Larger and more expansive foraging habitats are associated with higher quality foraging opportunities and greater migratory shorebird abundance (Rotman et al. 2016; Delta Environmental Consulting 2009; Spruzen et al. 2008). These habitats most commonly include the intertidal flats of estuaries, beaches and reefs, but also include a wide variety of habitats including mangrove forests, clay pans, swamps, saltmarsh, rocky shores, saltworks, sewage farms, and various other freshwater and saltwater wetlands (Simpson and Day 2010). Selection of these various habitats is largely defined by the morphology and foraging behaviours of different species, tidal variation, and the need to achieve a net positive energy intake.

The foraging patterns and behaviours used by migratory shorebirds in tidal habitats are strongly related to the tidal regime and temporal exposure of foraging habitats (Lilleyman et al. 2016). For example, shorebirds commonly forage for macroinvertebrates on intertidal flats during an ebbing tide. But at high tide, foraging sites can become submerged and inaccessible, forcing shorebirds to shift to supratidal roost sites to rest (Lilleyman et al. 2016) or to search amongst wetlands in or above the supratidal zone (Zharikov and Milton 2009). Foraging habitat selection is inferably determined by the detectability and accessibility of preferred prey items (Dann, 1999). As a consequence of tidal movements, migratory shorebirds have been observed using networks of connected sites (DEWHA 2009).

Migratory shorebirds use a variety of foraging methods to capture prey located above and below the ground surface. These strategies utilise vision, smell, taste, vibration, touch and remote detection of pressure gradients (De Fouw et al. 2015). Common methods of foraging include visual hunting combined with surface pecking for prey on the ground surface and jabbing or probing in soft intertidal sediments for buried prey (Piersma et al. 2021; Dann 1999). A more sophisticated mode of foraging using the jabbing and probing methods, is 'remote detection', whereby hard objects can be detected without sight or physical contact (De Fouw et al. 2015). Pecking methods are often used to capture gastropods, crustaceans and bivalves off the sediment surface (Spruzen et al. 2008; Dann 1999), whereas jabbing and probing are often used to capture buried bivalves and annelid worms (Spruzen et al. 2008).

Migratory shorebirds are omnivorous and highly opportunistic so have been observed feeding broadly. Common prey items taken by migratory shorebirds include polychaete and other annelid worms, molluscs including gastropods and bivalves, crustaceans including crab and shrimp, insects and plant seeds (Piersma et al. 2021; Spruzen et al. 2008; Dann et al. 1999).

6. Habitat present in Gulf St Vincent

The Strategic Assessment Area is located within Gulf St Vincent, an ecologically diverse coastal region of South Australia, characterised by coastal wetlands, intertidal flats, mangrove forests, seagrass meadows,

tidal saltmarshes and claypans (Weller et al, 2020; Straw 2003; Edyvane, 1999). These habitats serve as vital ecosystems for coastal and marine organisms, including migratory shorebirds (Weller et al. 2020; Straw 2003; Edyvane 1999). Several sites across Gulf St Vincent have gained recognition in the "Directory of Important Wetlands in Australia", underscoring their national and international importance for the conservation of migratory shorebirds (Weller et al. 2020; Lees et al. 2020). Among these, specific areas including Section Banks (Bird Island), Light Beach, Port Gawler, Thompsons Beach, St Kilda, Port Parham and Baker Creek, Webb Beach, Middle Beach, and Dry Creek have been identified as particularly significant habitats for shorebirds (Delta Environmental Consulting, 2009). The most prominent of these locations are shown on Figure 1. Habitats within the region surrounding the Strategic Assessment area (<10 km) are shown on Figure 2.

Gulf St Vincent is reported to contain expansive foraging areas, abundant in food resources for migratory shorebirds, with undisturbed roosting sites that offer minimal risk of predation (Purnell et al 2009). Within Gulf St Vincent, the Adelaide International Bird Sanctuary is a valuable asset designated for the conservation of migratory shorebirds. The Adelaide International Bird Sanctuary is a 60 km stretch of coastline, which has been managed by the National Parks and Wildlife Service of South Australia since 2016 (National Parks South Australia 2016). Protection of the sanctuary has steadily increased over the past decade through the formation of the Adelaide International Bird Sanctuary National Park - Winaityinaityi Pangkara.

The coastal plains of the Adelaide International Bird Sanctuary provide essential resources for migratory shorebirds to rest and refuel for subsequent migration. The Adelaide International Bird Sanctuary is a terminal wintering site for up to 35 species of migratory shorebirds, recognised under the EPBC Act (National Parks and Wildlife Service South Australia 2020) including up to 25 which are considered regular (Lees et al. 2020; National Parks South Australia 2016). A more detailed breakdown of these species, and the distribution of their occurrence, is provided in Section 7. Many of these migratory birds are protected under international agreements, including the Japan – Australia Migratory Bird Agreement, China – Australia Migratory Bird Agreement and Republic of Korea – Australia Migratory Bird (National Parks and Wildlife Service South Australia 2020). Many of migratory species that regularly overwinter within the area are also listed as critically endangered, endangered or vulnerable under the EPBC Act, including the common greenshank (*Tringa nebularia*), grey plover (*Pluvialis squatarola*), curlew sandpiper (*Calidris ferruginea*) and eastern curlew (*Numenius madagascariensis*) (National Parks and Wildlife Service South Australia 2020).

The Adelaide International Bird Sanctuary is estimated to host up to 27,000 migratory and resident shorebirds annually (National Parks South Australia 2016), including up to 14,000 migratory shorebirds (Lees et al. 2020). The sanctuary supports internationally important populations (> 1 per cent of EAAF population) of red-necked stints (*Calidris ruficollis),* red knots (*Calidris canutus*), and sharp-tailed sandpipers (*Calidris acuminata*) (National Parks South Australia 2016; National Parks and Wildlife Service South Australia 2024), in addition to large and sometimes (depending on the year) nationally significant populations (> 0.1 per cent of EAAF population) of several other migratory shorebird species (refer to Section 8). Moreover, the sanctuary contributes to the preservation of the Subtropical and Temperate Coastal Saltmarsh threatened ecological community, a habitat type that is used by migratory shorebirds and listed as vulnerable under the EPBC Act (National Parks and Wildlife Service South Australia 2020).

7. Regional occurrence of migratory shorebirds in Gulf St Vincent

The PMST search (undertaken 31st May 2024) identified that 33 migratory shorebirds were known or likely to occur within 10 km of the Strategic Assessment Area. These species are shown in Table 1 in addition to their respective conservation status, general habitat associations and important population thresholds (i.e., the numbers of birds that would constitute an important population using the definition for the EPBC Act). Of these, two are listed as critically endangered, four listed as endangered, and eight as vulnerable, under the Commonwealth EPBC Act. While most migratory shorebird species occur predominantly in marine and estuarine areas, five of the migratory shorebirds identified as potentially occurring in the locality of the Strategic Assessment Area are usually associated with inland habitats.

7.1 Gulf St Vincent

While up to 33 migratory shorebirds may occur in the Strategic Assessment Area sporadically, historic survey data suggests that only 25 are considered regular migrants to Gulf St Vincent (Lees et al. 2020). Fewer yet are considered regular migrants to the southern portion of the Adelaide International Bird Sanctuary and the Strategic Assessment Area.

During the 2017-2020 monitoring period, a total of 27 species of migratory shorebird were recorded across the whole of Gulf St Vincent (see Table 2). Many of these were recorded in low numbers. Three species were recorded across the whole of Gulf St Vincent in total numbers sufficient to represent an internationally significant proportion of the EAAF population: the red knot, red-necked stint, and sharp-tailed sandpiper. Eight additional species were recorded across the whole of Gulf St Vincent in total numbers sufficient to represent a nationally important proportion of the EAAF population: the bar-tailed godwit, common greenshank, curlew sandpiper, double-banded plover, eastern curlew, grey plover, ruddy turnstone and ruff.

7.2 Strategic Assessment Area locality

Of the 27 species recorded across Gulf St Vincent during the BirdLife Australia Gulf St Vincent – 2017 - 2020 monitoring (Lees et al. 2020), only 16 species were recorded within the southern portion of Gulf St Vincent (see Table 3), that occurs within a 10 km buffer of the Strategic Assessment Area, as presented in Figure 1. Only nine of these species were recorded at more than one site, with the most widespread species being the common greenshank, curlew sandpiper, red-necked stint and sharp-tailed sandpiper. No internationally significant populations were recorded at sites within a 10 km buffer of the Strategic Assessment Area. Three species were recorded in nationally significant numbers in at least one survey event across five sites:

- **Sharp-tailed sandpiper**: at Mutton Cove, Section Banks (Bird Island), St Kilda, Webb Beach and Dry Creek Salt fields
- **Red-necked stint**: at Section Banks (Bird Island), St Kilda, and Dry Creek Salt fields
- **Curlew sandpiper**: at Dry Creek Salt fields

Sharp-tailed sandpipers and common greenshanks were the most frequently reported migratory shorebirds, occurring at all sites except for Barker Inlet. Barker Inlet did not have any reports of migratory shorebirds and is unlikely to provide suitable habitat due to its channelisation and lack of wetland availability. Red-necked stints were the most abundant, followed by the sharp-tailed sandpiper.

Mutton Cove, which adjoins the Strategic Assessment Area boundary on the Lefevre Peninsula, to the south and east, was reportedly used by four migratory shorebird species, the most common being the common greenshank and sharp-tailed sandpiper, which were reported in 55 per cent and 45 per cent of surveys, respectively. The maximum counts for the two species, were 4 and 132 birds, respectively. The curlew sandpiper and red-necked stint were only observed in 18 per cent and 9 per cent of surveys, respectively, with maximum counts of 2 and 6 birds, respectively.

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Table 1 Migratory shorebirds potentially occurring in the strategic assessment area (from PMST output)

Common name	Scientific name	Conservation status (EPBC Act)	Habitat[1]	EAAF Population estimate[2]	1% EAAFP[3]	0.1% EAAFP[4]
Bar-tailed Godwit	*Limosa lapponica †*	Endangered[5]	M	325,000	3,250	325
Black-tailed Godwit	*Limosa limosa*	Endangered	M, IW	160,000	1,600	160
Broad-billed Sandpiper	*Limicola falcinellus*		M	30,000	300	30
Common Greenshank	*Tringa nebularia*	Endangered	M, IW	110,000	1,100	110
Common Redshank, Redshank	*Tringa tetanus*		M	75,000-150,000	750	75
Common Sandpiper	*Actitis hypoleucos*		M, IW	190,000	1,900	190
Curlew Sandpiper	*Calidris ferruginea*	Critically Endangered	M, IW	90,000	900	90
Double-banded Plover	*Charadrius bicinctus*		M, IW	19,000	190	19
Eastern Curlew	*Numenius madagascariensis*	Critically Endangered	M	35,000	350	35
Great Knot	*Calidris tenuirostris*	Vulnerable	M	425,000	4,250	425
Greater Sand Plover	*Charadrius leschenaultia*	Vulnerable	M	200,000-300,000	2,000	200
Grey Plover	*Pluvialis squatarola*	Vulnerable	M	80,000	800	80
Grey-tailed Tattler	*Tringa brevipes*		M	70,000	700	70
Latham's Snipe	*Gallinago hardwickii*	Vulnerable	IW, G	30,000	300	30
Lesser Sand Plover	*Charadrius mongolus †*	Endangered	M	180,000-275,000	1,800	180
Little Curlew, Little Whimbrel	*Numenius minutus*		IW, G	110,000	1,100	110
Long-toed Stint	*Calidris subminuta*		M, IW	230,000	2,300	230
Marsh Sandpiper	*Tringa stagnatilis*		M, IW	130,000	1,300	130
Oriental Plover, Oriental Dotterel	*Charadrius veredus*		M, IW, G	230,000	2,300	230
Pacific Golden Plover	*Pluvialis fulva †*		M	120,000	1,200	120
Pectoral Sandpiper	*Calidris melanotos*		M, IW	1,220,000-1,930,000	12,200	1220
Pin-tailed Snipe	*Gallinago stenura*		IW, G	170,000	1,700	170
Red Knot	*Calidris canutus †*	Vulnerable	M	110,000	1,100	110
Red-necked Phalarope	*Phalaropus lobatus*		M	250,000	2,500	250

[1] Dominant habitat used by shorebird, including M=marine, IW=inland wetlands, and G=grasslands (from Hansen et al. 2016).
[2] Total estimated population of shorebirds within the EAAF, as at September 2016 (Hansen et al. 2016).
[3] One percent of the total estimated population of the species in the East Asian – Australasian Flyway (Hansen et al. 2016).
[4] One-tenth of a percent of the total estimated population of the species in the East Asian – Australasian Flyway (Hansen et al. 2016).
[5] Subspecies *Limosa lapponica baueri* only. *Limosa lapponica menzbieri* is not known to occur at the site.

Common name	Scientific name	Conservation status (EPBC Act)	Habitat[1]	EAAF Population estimate[2]	1% EAAFP[3]	0.1% EAAFP[4]
Red-necked Stint	*Calidris ruficollis*		M, IW	475,000	4,750	475
Ruddy Turnstone	*Arenaria interpres*	Vulnerable	M	30,000	300	30
Ruff	*Philomachus pugnax*		M, IW	25,000-100,000	250	25
Sanderling	*Calidris alba*		M	30,000	300	30
Sharp-tailed Sandpiper	*Calidris acuminata*	Vulnerable	M, IW	85,000	850	85
Swinhoe's Snipe	*Gallinago megala*		IW, G	40,000	400	40
Terek Sandpiper	*Xenus cinereus*	Vulnerable	M	50,000	500	50
Whimbrel	*Numenius phaeopus*		M	65,000	650	65
Wood Sandpiper	*Tringa glareola*		IW	130,000	1,300	130

MIGRATORY SHOREBIRD HABITAT IN THE LOCALITY OF THE STRATEGIC ASSESSMENT AREA

Legend

- Railway
- Strategic assessment area
- Habitat area

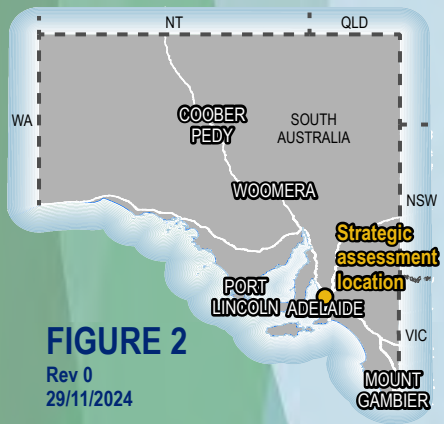

FIGURE 2
Rev 0
29/11/2024

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Kilometres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_117_Habitat

Australian Government
Australian Submarine Agency

GHD

St Kilda
Barker Inlet
Dry Creek saltfield
Section Banks (Bird Island)
Port Adelaide River
Outer Harbor
Lefevre Peninsula
Mutton Cove
Torrens Island Conservation Reserve
Yerlo
Osborne Naval Shipyard
Midlunga
Taperoo
Draper
Whicker Road Wetlands
Largs
Peterhead
Dry Creek

Table 2 Monthly migratory shorebird counts from BirdLife Australia shorebird counts in Gulf St Vincent between 2017 - 2020

	Sig. Population		BirdLife Australia shorebird counts (date) / total count across Gulf St Vincent														
Species	1% EAAFP [6]	0.1% EAAFP [7]	Jan-17	Feb-17	Jun-17	Nov-17	Jan-18	Mar-18	Jun-18	Nov-18	Jan-19	Feb-19	Jun-19	Nov-19	Jan-20	Feb-20	Mar-20
Bar-tailed Godwit	*1460*	*146*	**175**	**236**	1	**231**	**363**	**259**	0	**179**	124	85	6	**430**	**207**	**292**	1
Black-tailed Godwit	*1390*	*139*	0	0	0	0	2	0	0	2	2	15	0	0	20	16	0
Broad-billed Sandpiper	*300*	*30*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Common Greenshank	*1100*	*110*	**249**	**267**	1	**140**	**282**	**334**	0	**215**	**199**	**128**	23	**286**	**157**	**178**	**180**
Common Redshank, Redshank	*750*	*75*	Nil														
Common Sandpiper	*1900*	*190*	2	1	0	1	1	2	27	1	3	0	0	12	1	2	0
Curlew Sandpiper	*900*	*90*	**523**	**682**	1	**286**	**318**	**579**	**109**	**171**	**308**	**141**	-	**483**	**260**	**483**	**116**
Double-banded Plover	*190*	*19*	2	2	45	0	0	0	55	0	0	0	9	0	0	0	**27**
Eastern Curlew	*350*	*35*	**44**	30	2	**75**	**69**	**35**	2	**74**	**52**	**63**	0	32	24	**76**	5
Great Knot	*4250*	*425*	25	276	2	240	73	18	0	250	83	60	0	201	75	60	5
Greater Sand Plover	*2500*	*250*	0	0	0	0	6	6	1	10	8	6	0	9	7	5	0
Grey Plover	*800*	*80*	**177**	**124**	10	**135**	**175**	**235**	8	**94**	**198**	**119**	9	**192**	**175**	**202**	44
Grey-tailed Tattler	*700*	*70*	3	5	0	0	3	4	0	3	3	3	0	3	4	3	4
Latham's Snipe	*300*	*30*	Nil														
Lesser Sand Plover	*2275*	*228*	0	6	0	0	0	0	0	0	2	0	0	0	0	0	0
Little Curlew, Little Whimbrel	*1100*	*110*	Nil														
Long-toed Stint	*2300*	*230*	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0
Marsh Sandpiper	*1300*	*130*	1	1	0	3	10	0	0	3	10	0	0	0	0	1	0
Oriental Plover, Oriental Dotterel	*2300*	*230*	Nil														

[6] One percent of the total estimated population of the species in the East Asian – Australasian Flyway (Hansen et al. 2016).
[7] One-tenth of a percent of the total estimated population of the species in the East Asian – Australasian Flyway (Hansen et al. 2016).

	Sig. Population		BirdLife Australia shorebird counts (date) / total count across Gulf St Vincent													
Species	1% EAAFP [6]	0.1% EAAFP [7]	Jan-17	Feb-17	Jun-17	Nov-17	Jan-18	Mar-18	Jun-18	Nov-18	Jan-19	Feb-19	Jun-19	Nov-19	Jan-20	Feb-20	Mar-20
Pacific Golden Plover	*1200*	*120*	12	2	0	0	1	0	1	0	0	1	0	0	2	0	1
Pectoral Sandpiper	*15750*	*1575*	0	0	0	0	6	0	0	2	3	0	0	0	1	1	0
Pin-tailed Snipe	*1700*	*170*	Nil														
Red Knot	*1100*	*110*	**454**	**824**	0	**1440**	**1853**	**7586**	0	**2560**	**2753**	**722**	40	**2479**	**639**	**334**	**841**
Red-necked Phalarope	*2500*	*250*	Nil														
Red-necked Stint	*4750*	*475*	**6960**	**10318**	**528**	**4874**	**5484**	**7114**	**769**	**3338**	**2688**	**2339**	321	**3748**	**3360**	**4295**	**3509**
Ruddy Turnstone	*300*	*30*	**293**	**132**	19	**63**	**114**	**111**	7	**99**	**57**	**92**	2	**55**	**55**	**59**	**92**
Ruff	*625*	*63*	0	0	0	0	0	**412**	0	1	0	0	0	0	0	0	0
Sanderling	*300*	*30*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Sharp-tailed Sandpiper	*850*	*85*	**318**	**1062**	3	**819**	**1144**	0	**135**	**976**	**1240**	**840**	0	**1970**	**1233**	**1426**	**98**
Swinhoe's Snipe	*400*	*40*	Nil														
Terek Sandpiper	*500*	*50*	0	4	0	1	**70**	0	0	3	6	0	0	2	0	4	0
Whimbrel	*650*	*65*	25	14	0	0	13	0	0	9	11	0	0	27	11	16	1
Wood Sandpiper	*1300*	*130*	0	0	0	0	0	0	0	1	6	0	0	2	0	0	0

Values in **bold** indicate >0.1% of the total estimated population of the species in the East Asian – Australasian Flyway; values in **red** indicate >1% of the total estimated population of the species in the East Asian – Australasian Flyway (Hansen et al. 2016).

Table 3 Site-based migratory shorebird counts from BirdLife Australia shorebird counts between 2017 - 2020

	Recording rate[8] (%)	Max count	Average count	1% EAAF	0.1% EAAF
1. Mutton Cove					
Common Greenshank	55	4	2	1100	110
Curlew Sandpiper	18	2	2	900	90
Red-necked Stint	9	6	6	4750	475
Sharp-tailed Sandpiper	45	**132**	70	850	85
2. Section Banks (Bird Island)					
Bar-tailed Godwit	5	2	2	1460	146
Common Greenshank	14	14	8	1100	110
Curlew Sandpiper	14	17	7	900	90
Double-banded Plover	10	16	14	190	19
Eastern Curlew	14	10	6	350	35
Grey Plover	19	35	20	800	80
Red Knot	10	30	17	1100	110
Red-necked stint	33	**550**	247	4750	475
Sharp-tailed Sandpiper	19	**300**	**97**	850	85
Whimbrel	14	5	2	650	65
3. Whicker Road Wetlands					
Common Greenshank	50	1	1	1100	110
Sharp-tailed Sandpiper	50	8	8	850	85
Wood Sandpiper	100	2	2	1300	130
4. Barker Inlet					
Nil			N/A		
5. St Kilda					
Bar-tailed Godwit	9	8	7	1460	146
Common Greenshank	52	32	13	1100	110
Common Sandpiper	9	2	2	1900	190
Curlew Sandpiper	13	20	14	900	90
Pectoral Sandpiper	4	3	3	15750	1575
Red-necked stint	52	**750**	278	4750	475
Sharp-tailed Sandpiper	48	**95**	26	850	85
6. Dry Creek Salt fields (section 3 and 4)					
Bar-tailed Godwit	83	16	7	1460	146
Common Greenshank	100	46	27	1100	110
Common Sandpiper	17	1	1	1900	190
Curlew Sandpiper	100	**100**	33	900	90
Eastern Curlew	67	14	10	350	35
Marsh Sandpiper	33	6	4	1300	130

[8] This is the rate species were recorded across multiple Birdlife Australia surveys in 2017-2020.

	Recording rate[8] (%)	Max count	Average count	1% EAAF	0.1% EAAF
Red-necked stint	100	**2160**	**876**	4750	475
Ruff	17	1	1	625	63
Sharp-tailed Sandpiper	100	**440**	**278**	850	85
7. Dry Creek Salt fields (section 2)					
Common Greenshank	60	15	12	1100	110
Curlew Sandpiper	60	16	10	900	90
Eastern Curlew	20	7	7	350	35
Marsh Sandpiper	20	9	9	1300	130
Pectoral Sandpiper	20	3	3	15750	1575
Red-necked stint	80	**825**	304	4750	475
Sharp-tailed Sandpiper	60	**570**	**505**	850	85

Values in **bold** indicate >0.1% of the total estimated population of the species in the East Asian – Australasian Flyway (Hansen et al. 2016). No values exceed 1% of the total estimated population of the species in the East Asian – Australasian Flyway.

Section Banks (Bird Island), which is located 2.5 km to the north-west of the Strategic Assessment Area Boundary, was used by 10 migratory shorebird species. These species were generally irregular visitors, with the only shorebird occupying the site in more than 20 percent of surveys being the red-necked stint, which occurred in 33 per cent of surveys. It is not known what tidal conditions were present during the surveys, and how they may have influenced these observation rates. When present, the sharp-tailed sandpiper was recorded in average numbers that exceeded the threshold for a nationally important site (Lees et al 2020).

Whicker Road Wetlands, a constructed wetland in an industrial precinct, and located just 5 km southeast of the Strategic Assessment Area, had only three migratory shorebird species recorded, with a maximum count of eight sharp-tailed sandpipers. It is unknown how many surveys contributed to these results.

Migratory shorebird abundance and diversity were generally higher east of Barker Inlet. Common greenshank, curlew sandpiper, red-necked stint and sharp-tailed sandpiper, while all widespread, were generally more commonly observed and abundant at all survey sites east of Barker Inlet compared to sites west of Barker Inlet. The exception to this was Section Banks (Bird Island) which had the highest species diversity of all survey sites presented in Figure 2. This may be due to the isolation of the island from areas of development and human influence, predatory species like foxes or due to the characteristics of habitat available at the survey site.

There was an apparent trend between level of cumulative human disturbance and species diversity and abundance. This was highlighted by relatively low species diversity and abundance at Whicker Road Wetlands and Mutton Cove, compared to the Dry Creek Salt Fields and intertidal flats of St Kilda. This may be incorrectly inferred due to other influences such as survey effort, area coverage and habitat type.

7.3 Strategic Assessment Area and Lefevre Peninsula

Examination of BirdLife historical data indicates that within the vicinity of the Strategic Assessment Area, Mutton Cove has been subject to extensive survey, while the remainder of the Strategic Assessment Area and onshore area of the Lefevre Peninsula, has been subject to limited survey (BirdLife 2024). Historic survey locations within and surrounding the Strategic Assessment Area, as included on the Bird Life portal (Birdlife 2024), are shown on Figure 3. Note that these exclude surveys from within Mutton Cove itself – those results are shown in Table 3. It is also noted that while survey locations are plotted as a single point, some surveys encompassed wider areas of observation. A summary of migratory shorebird records from these survey locations is provided in Table 4.

In total, seven species of migratory shorebird have been documented as occurring in these surveys. Of these, six have been recorded in the offshore component of the Strategic Assessment Area and two in the onshore component of the Strategic Assessment Area, these being the common greenshank and sharp-tailed sandpiper. Although there have been six in-season surveys (broadly August to April) recorded in the Strategic Assessment Area, only one has resulted in the observation of migratory shorebird (Lees et al. 2020).

Table 4 Survey records from within Strategic Assessment Area (Lees et al. 2020)

	Site (see Figure 3) / count													
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Whimbrel														P
(Far) Eastern Curlew													P	
Common Greenshank					1	P							P	P
Red-necked Stint		4[9]											P	
Sharp-tailed Sandpiper						P					P	8	P	P
Common Sandpiper		P[8]												
Curlew Sandpiper													P	
Number of in season surveys[10]	8	1	1	1	2	1	1	1	1	1	1	1	2	1
Number of off-season surveys	5	2	0	0	0	0		0	0	0	0	0	0	0

[9] Sighting was outside of standard season, in June 1996.
[10] August to April.

SURVEY LOCATIONS

Legend

- Survey sites
- Railway
- Strategic assessment area

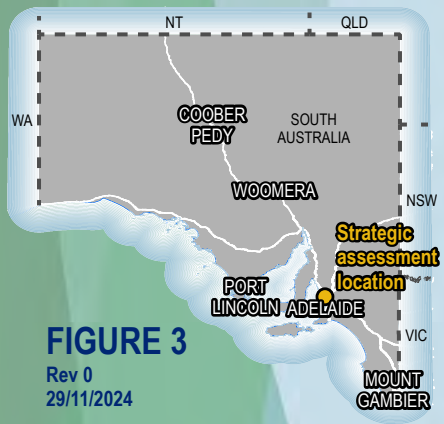


FIGURE 3
Rev 0
29/11/2024

0 150 300 450 600
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_107_SurveySites

Australian Government
Australian Submarine Agency

GHD

Gulf St Vincent
Lefevre Peninsula
Port Adelaide River
Pelican Point
Power Stations
Container Terminal
Grain Terminal
Torrens Island Conservation Park
Mutton Cove
Falie Reserve
Pelican Point Road
Oliver Rogers Road
North Haven Golf Course
Biodiversity Park
Victoria Road
Lady Ruthven Drive
North Haven Marina
Osborne Road
Osborne Naval Shipyard
Port Adelaide
Power Station

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area (2023), Survey sites (2024). nearmap.com:

8. Habitat present in and surrounding the Strategic Assessment Area

8.1 Habitat surrounding the Strategic Assessment Area

The Strategic Assessment Area adjoins two areas of potentially nationally important habitat sites, which are briefly described below.

8.1.1 Section Banks (Bird Island)

Section Banks (Bird Island) is an artificial island which was formed from dredged material in 1976 and is continually growing due to sediment accumulation (Lees et al. 2016; Johnston 2018). Dune vegetation and mangroves have colonised naturally since 2005 and contribute to enhanced sediment accumulation (Johnston 2018). The island comprises extensive intertidal flats, saltmarsh, shrublands and mangrove on the eastern side, near Torrens Island Conservation Park. Habitat provided by Section Banks (Bird Island) has been shown to support nationally important populations of migratory shorebirds. Table 3 provides migratory shorebird diversity and abundance data from annual monitoring undertaken at Section Banks (Bird Island). Bird Island supports numbers of red-necked stint and sharp-tailed sandpiper that exceed the threshold for a nationally important site.

8.1.2 Mutton Cove

Mutton Cove, despite its industrial surroundings and significant cumulative human disturbance, provides habitat for migratory shorebirds (Delta Environmental Consulting 2003). Mutton Cove is centred around Mutton Cove Creek, an estuary which connects the reserve to the tidal regime via a network of branching creeks (Lees et al. 2020). The reserve is characterised by dense samphire saltmarsh and mangrove woodland (Delta Environmental Consulting 2003). Mutton Cove may act as a vital stepping stone for migratory shorebirds, facilitating their movement between larger patches of habitat, such as Torrens Island (Delta Environmental Consulting 2003) and the eastern side of Barker Inlet. Table 3 provides migratory shorebird diversity and abundance data from monitoring at Mutton Cove. Sharp-tailed sandpipers have been recorded at Mutton Cove in numbers exceeding the threshold for a nationally important site.

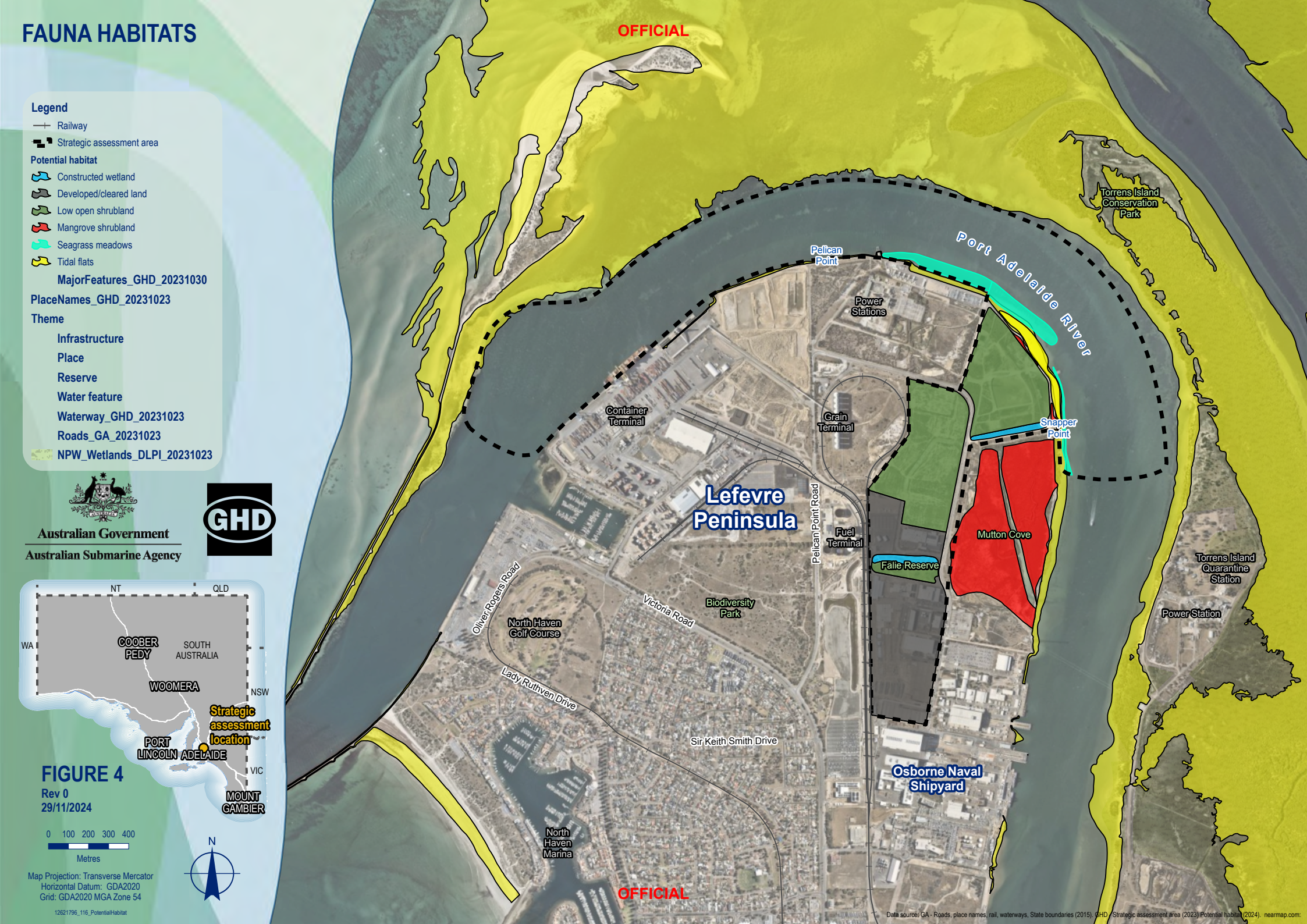
8.2 Habitat within the Strategic Assessment Area

The Strategic Assessment Area comprises approximately 5.12 ha of potentially suitable migratory shorebird habitat. This area comprises two distinct habitat types and encompasses three separate sites (see Figure 4). Habitats occurring in the Strategic Assessment Area are described below.

8.3 Intertidal shore

The tidal flats of the Strategic Assessment Area are located on the northeastern portion of the Lefevre Peninsula, Outer Harbour, extending north from Pelican Point. In total, this Strategic Assessment Area encompasses up to 2.58 ha of tidal flat. The Strategic Assessment Area is located on the banks of the Port Adelaide River, which is highly channelised and frequented by small and large motor vessels. As a result, the gradient of the intertidal shoreline is relatively abrupt and not characteristic of a tidal flat typically favoured by shorebirds. Instead, the site is characterised by a narrow shoreline (generally less than 40 m wide) and is more aptly defined as an estuarine beach or shoreline under tidal influence. In addition, the channelised nature of the site may facilitate relatively quick waterflow through the area of habitat, compared to broad intertidal flats.

FAUNA HABITATS



A narrow dune system is present in between intertidal areas and partially developed areas of the Outer Harbour industrial precinct. In sections, the dune system rises abruptly from the intertidal sands, providing a perched view across the Port Adelaide River to Bird Island and Torrens Island.

Migratory shorebirds rely heavily on the gradual shifting of tidal movements, which modify the activity and accessibility of macroinvertebrate prey (Lilleyman et al. 2016; Spruzen et al. 2008; Dann 1999). Under rapid tidal variation at the site, there are expected to be limited foraging opportunities for migratory shorebirds on the intertidal shore of the Strategic Assessment Area. Migratory shorebird abundance is closely associated with prey availability and biomass which are naturally higher on larger intertidal flats (Rotman et al. 2016; Delta Environmental Consulting 2009; Spruzen et al. 2008). Due to the small area and tidal gradient of the site, the site is unlikely to provide reliable foraging opportunities for any notable populations of migratory shorebird. This is supported by historic surveys which have documented low reporting rates of migratory shorebirds on intertidal shores of the Strategic Assessment Area (refer to Section 8). Migratory shorebird surveys undertaken across the 2023 – 2024 summer survey period identified only one species of migratory shorebird in this habitat, the common sandpiper, with a maximum count of four individuals.

Rapid water movement through the Port Adelaide River is another environmental factor which may inhibit efficient foraging at the site, due to the visual disruption of flowing water and increased opportunity for prey to escape predation. Similarly, wakes and perceived threats from motor vessels may further interrupt foraging behaviour at this site. Although the site is highly constrained in regard to foraging opportunity across the intertidal shore, the berm and dune system may provide some foraging and roosting opportunities, albeit suboptimal.

8.4 Constructed wetlands

The Strategic Assessment Area contains two constructed wetlands, both in the form of swale drains. In total, these two sites comprise approximately 2.54 ha of potential roosting and high tide foraging habitat. Both sites comprise ephemeral freshwater drainage channels used to redirect stormwater from the industrial precinct. Although ephemeral, these wetlands are often inundated and are moderately to heavily vegetated.

8.4.1 Eastern detention basin

The Eastern detention basin within the Strategic Assessment Area adjoins Mutton Cove to the north via an unsealed road. The Eastern detention basin is long (approximately 400 m) and narrow (approximately 15 m) and is surrounded on all sides by unsealed and sealed roads. No industrial facilities are currently present surrounding the Eastern detention basin. Disturbance at the site is only low to moderate in its current state. The Eastern detention basin is relatively shallow and provides good visibility of the surrounding airspace for shorebirds, offering high detectability of aerial predators. The Eastern detention basin adjoins the estuarine shoreline at Snapper Point.

The Eastern detention basin is expected to provide reasonable high tide foraging or roosting habitat. This is due to the reliability of surface water, which provides suitable thermoregulation and foraging opportunities for longer-billed shorebirds. The openness and proximity to undeveloped areas and the Port Adelaide River shoreline are likely to provide acceptable levels of perceived safety. While this is the case, the Eastern detention basin is unlikely to be a productive foraging ground. This is because of its restricted size, but also the highly vegetated nature of the channel which can interfere with prey detection (De Fouw et al. 2015; Spruzen et al. 2008; Dann 1999). This conclusion is supported by historic surveys by Birdlife Australia (Lees et al. 2020), which documented low reporting rates of migratory shorebirds in the Eastern detention basin (refer to Section 7.3). Migratory shorebird surveys undertaken by GHD over the 2023 – 2024 summer survey period identified four species of migratory shorebirds, including a maximum single count of 37 sharp-tailed sandpipers.

8.4.2 Falie Reserve

Falie Reserve adjoins Mutton Cove to the east but is otherwise surrounded by a highly disturbed and modified industrial precinct. The reserve is narrow, with walking paths and sealed roads overlooking the wetlands. Falie Reserve contains an incised channel, which provides limited visibility to areas outside of the channel. Falie Reserve is located several hundred metres from any areas of tidal influence.

Falie Reserve is not considered to provide suitable foraging or roosting habitat for migratory shorebirds as energetic costs associated with disturbance and increased vigilance are unlikely to be outweighed by the foraging or roosting opportunities at the site. There were no historic survey records identified to demonstrate the use of Falie Reserve Swale Drain by migratory shorebirds (Lees et al. 2020). There were no detections of migratory shorebirds by GHD during over the 2023 – 2024 summer survey period.

9. Discussion

Migratory shorebirds typically migrate over 9,000 km to reach terminal wintering grounds in south-eastern Australia and New Zealand, including Gulf St Vincent and the Strategic Assessment Area. It is in these wintering habitats that migratory shorebirds spend more time than anywhere else in their annual migration cycle. Protection of this habitat is critical because it provides foraging and roosting opportunities that are essential for recuperation and the accumulation of fat reserves for the northward migration by these birds to northern hemisphere breeding grounds.

Habitat in Gulf St Vincent and the Adelaide International Bird Sanctuary comprises internationally important habitat and sustains nationally and internationally significant populations of migratory shorebirds, including the red knot, red-necked stint, and sharp-tailed sandpiper.

Recent monitoring data from 2017 – 2020 shows that habitat within 10 km of the Strategic Assessment Area supports nationally significant populations of sharp-tailed sandpipers, red-necked stints, and curlew sandpipers, but does not appear to support internationally significant populations. Key habitat areas in the locality of the Strategic Assessment Area include Dry Creek Salt fields and St Kilda, and to a lesser extent Mutton Cove and Section Banks (Bird Island), which occur immediately adjacent to and 2.5 km north-west of the Strategic Assessment Area, respectively.

A low diversity and abundance of migratory shorebirds visit the Strategic Assessment Area. On the basis of historical and recent surveys, no site within the Strategic Assessment Area is regarded as nationally or internationally important habitat. While migratory shorebirds have been observed in intertidal areas and constructed wetlands across the Strategic Assessment Area, they have not been observed in counts that indicate national or international significance. The Strategic Assessment Area provides sub-optimal habitat for migratory shorebirds, potentially for roosting or foraging when preferable areas are inundated and inaccessible.

To conserve energy, migratory shorebirds need to be able to access roosting sites and foraging sites with minimal travel distance in between. While shorebirds are attracted to abundant food sources at large foraging sites, they may not remain there unless a suitable roosting site is nearby. Anything which prevents shorebirds from achieving a net energy balance, such as insufficient foraging abundance, wasted energy moving to and from forage sites, and wasted energy on increased vigilance and escape responses, could be detrimental and have carryover effects on migration and breeding success. Based on the low detection rates, abundance and diversity of migratory shorebirds historically recorded (Rees et al. 2020), it is evident that the Strategic Assessment Area occurs within the range of non-breeding migratory shorebirds but does not comprise important roosting or foraging habitat. While migratory shorebirds do not appear to reliably occupy the Strategic Assessment Area in important numbers for foraging or roosting, development of the area could impact upon the success of individuals that preferentially occur regularly in the Strategic Assessment Area. Those individuals would be expected to seek and find equivalent and potentially superior alternative habitat in nearby areas.

Existing industrial activities and boat traffic on Port Adelaide River are also potential causes of frequent disturbance which may reduce selection of habitats in this site by migratory shorebirds. Based on the location of the Strategic Assessment Area on the outer fringe of the Barker Inlet and slight separation from the Adelaide International Bird Sanctuary, the Strategic Assessment Area does not appear to provide the same high-quality foraging or roosting grounds that are found within the Adelaide International Bird Sanctuary itself.

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Appendix B

Shorebird Survey Results

Migratory Shorebird Survey Results

									Australian Crow (*Corvus orru*)	Australian Fairy Tern (*Sternula nereis nereis*)	Australian Ibis (*Threskiornis molucca*)	*Australian magpie (Gymnorhina tibicen)*	*Australian Pelican (Pelecanus conspicillatus)*	Australian Wood Duck (*Chenonetta jubata*)	*Banded Lapwing (Vanellus tricolor)*	Banded Stilt (*Cladorhynchus leuccocephalus*)	Black Swan (*Cygnus atratus*)	Black-winged Stilts (*Himantopus himantopus*)	Bottlenose Dolphin (*Tursiops truncatus*)	Brown Honeyeater (*Lichmera indistincta*)	Brown Songlark (*Cincloramphus cruralis*)	Brown Thornbill (*Acanthiza pusilla*)	Bush Stone-Curlew (*Burhinus grallarius*)	Caspian Tern (*Hydroprogne (sterna) caspia*)	Chestnut Teal (*Anas castanea*)	Common Greenshank (*Tringa nebularia*)	*Common Sandpiper (Actitis hypoleucos)*	Common Starling (*Sturnus vulgaris*)	Crested Pigeon (*Ocyphaps lophotes*)	Eastern Great Egret (*Ardea modesta*)	Eurasian coot (*Fulica atra*)
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine										Ma, V	Ma		Ma	Ma	Ma	Ma	Ma	Ma	Ma												
NP&W Act Listing																Vulnerable						Rare							Rare				
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																								
Strategic Assessment Area Shoreline	19/12/2023	9.50AM	17°C	30.6km/hr	S	2.00	0.00	L.W., A.O.											1	3												
		1.08PM	21°C	38.9km/hr	S	1	0.00	L.W., A.O.																								
	20/12/2023	7.30AM	14°C	10.8km/hr	SSE	1.8	0.00	L.W., A.O.			1																			3		
		1.10PM	20°C	19.4km/hr	SSW	1.1	0.00	L.W., A.O.		4	1																			2		
	21/12/2023	8.10AM	14°C	16.6km/hr	ESE	1.5	0.00	A.O., E.B.			2	1																				
		2:08PM	22°C	37.8km/hr	SW	1.1	0.00	A.O., E.B.		2																		2		1		
	22/12/2023	8.20AM	18°C	10.8km/hr	NE	1.2	0.00	A.O.JM			1	1																		2		
		1.23PM	24°C	22.7km/hr	SW	1.3	0.00	A.O.JM																								
	15/01/2024	8.10 AM	25°C	10.4km/hr	E	2.5	0.00	A.O., S.H.		1																						
		2:30 PM	31°C	28.4km/hr	SSW	0.4	0.00	A.O., S.H.																								
	16/01/2024	8:10 AM	29°C	7.6km/hr	NNW	2.5	0.00	A.O., S.H.			3																					
		12:20 PM	31°C	21.6km/hr	SW	0.5	0.00	A.O., S.H.		8			12																			
	17/01/2024	9:10 AM	17°C	41.0km/hr	S	2.3	0.00	A.O., S.H.																						2		
		1.10PM	20°C	32.4km/hr	S	0.5	0.00	A.O., S.H.			2		1																	2		
	18/01/2024	8:28 AM	17°C	18.4km/hr	SSE	1.9	0.00	A.O., S.H., L.W.		3			1						2													
		1:25 PM	21°C	29.5km/hr	SSW	0.6	0.00	A.O., S.H., L.W.		8	1																			1		
	19/01/2024	8:22 AM	18°C	18.4km/hr	ENE	1.8	0.00	A.O., S.H.		2																				2		
		1:30 PM	26°C	22.7km/hr	SSW	0.9	0.00	A.O., S.H.					2																			
	29/01/2024	8.40AM	22°C	5.0km/hr	SW	2.5	0.00	A.O., S.H.																								
		1.20PM	28°C	22.7km/hr	SW	0.3	0.00	A.O., S.H.																								
	30/01/2024	7:50AM	19°C	10.8km/hr	NE	2.46	0.00	J.M., A.O., S.H.		2																						
		12:54PM	29°C	29.5km/hr	SW	0.24	0.00	J.M., A.O., S.H.		6	3		2																	2		
	31/01/2024	8.10AM	17°C	15.5km/hr	SE	2.36	0.00	A.O, L.W, S.H, J.W			1													2								
		1.10PM	23°C	25.9km/hr	SSW	0.27	0.00	A.O, L.W, S.H, J.W			2		2											6								
	1/02/2024	7:50AM	17°C	5.4km/hr	NE	2.23	0.00	A.O, LW																								
		12:54PM	23°C	22.3km/hr	SSW	0.31	0.00	A.O, LW																								
	2/02/2024	8:24AM	19°C	7.6km/hr	NE	2.08	0.00	A.O., J.A., E.B.	2	4																				3		
		1:14PM	27°C	20.9km/hr	SSW	0.38	0.00	A.O., J.A., E.B.					10																			
	12/02/2024	7.47AM	19°C	10.4km/hr	NE	2.55	0.00	A.O,S.H, L.W																								
		12:07PM	34°C	16.2km/hr	SW	0.21	0.00	A.O., S.H., L.W.		2	1																					
	13/02/2024	8.10AM	23°C	12.6km/hr	N	2.42	0.00	A.O., S.H., L.W.				2												2						2		
		1.10PM	23°C	27.4km/hr	S	0.29	0.00	A.O., S.H., L.W.		6			2																	2		
	14/02/2024	7:15AM	14°C	22.0km/hr	SSE	2.24	0.00	A.O., S.H., L.W.																								
		1:10PM	21°C	24.1km/hr	SW	0.34	0.00	A.O., S.H., L.W.																								
	15/02/2024	7:50AM	14°C	13.7km/hr	E	2,.07	0.00	A.O, J.A., J.M			1													4					6			
		12:54PM	24°C	24.1km/hr	SW	0.33	0.00	A.O, J.A., J.M		6	2	2												4			4		2			
	16/02/2024	8.10AM	17°C	3.2km/hr	NE	1.94	0.00	A.O, L.W, E.B			2	2												2								
		1.10PM	26°C	19.8km/hr	SW	0.29	0.00	A.O, L.W, E.B			2	2	1											4								
Strategic Assessment Area Shoreline Abundance										**54**	**25**	**10**	**33**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**0**	**0**	**0**	**26**	**0**	**0**	**4**	**6**	**26**	**0**	**0**
	19/12/2023	8.10AM	16°C	35.3km/hr	S	2.17	0.00	L.W., A.O.	1			1																			8
		1.50PM	21°C	48.6km/hr	S	0.68	0.00	L.W., A.O.				2																			6
	20/12/2023	8.00AM	15°C	14.8km/hr	E	1.92	0.00	L.W., A.O.	1																						
		1.30PM	21°C	22.0km/hr	S	0.78	0.00	L.W., A.O.																							
	21/12/2023	7.20AM	14°C	29.5km/hr	SSE	1.63	0.00	A.O., E.B.					6														1		8		
		1.55PM	22°C	34.6km/hr	SW	0.91	0.00	A.O., E.B.	1																		8				8
	22/12/2023	8:12AM	18°C	10.8km/hr	NE	1.19	0.00	A.O.JM										4											3		
		2.30PM	24°C	24.1km/hr	SW	1.33	0.00	A.O.JM	1																2	6					
	15/01/2024	8:50AM	30°C	31.3km/hr	ESE	0.33	0.00	A.O., S.H.										2													
		2:10PM	31°C	31.0km/hr	SSW	0.33	0.00	A.O., S.H.																							
	16/01/2024	8:55 AM	30°C	6.8km/hr	WNW	2.34	0.00	A.O., S.H.	2									2													
		1:10 PM	30°C	28.8km/hr	S	0.42	0.00	A.O., S.H.			1							2													

Migratory Shorebird Survey Results

									Australian Crow (*Corvus orru*)	Australian Fairy Tern (*Sternula nereis nereis*)	Australian Ibis (*Threskiornis molucca*)	*Australian magpie (Gymnorhina tibicen)*	*Australian Pelican (Pelecanus conspicillatus)*	Australian Wood Duck (*Chenonetta jubata*)	*Banded Lapwing (Vanellus tricolor)*	Banded Stilt (*Cladorhynchus leucocephalus*)	Black Swan (*Cygnus atratus*)	Black-winged Stilts (*Himantopus himantopus*)	Bottlenose Dolphin (*Tursiops truncatus*)	Brown Honeyeater (*Lichmera indistincta*)	Brown Songlark (*Cincloramphus cruralis*)	Brown Thornbill (*Acanthiza pusilla*)	Bush Stone-Curlew (*Burhinus grallarius*)	Caspian Tern (*Hydroprogne (sterna) caspia*)	Chestnut Teal (*Anas castanea*)	Common Greenshank (*Tringa nebularia*)	*Common Sandpiper (Actitis hypoleucos)*	Common Starling (*Sturnus vulgaris*)	Crested Pigeon (*Ocyphaps lophotes*)	Eastern Great Egret (*Ardea modesta*)	Eurasian coot (*Fulica atra*)
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine									Ma	Ma, V	Ma		Ma	Ma	Ma	Ma	Ma	Ma	Ma							Ma, Mi			Ma	Ma
NP&W Act Listing																Vulnerable							Rare				Rare				
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																								
Strategic Assessment Area swale drain	17/01/2024	9.10AM	24°C	41.0km/hr	S	2.16	0.00	A.O., S.H.																								
		2.00PM	26°C	39.6km/hr	SSW	0.46	0.00	A.O., S.H.																								
	18/01/2024	9:00 AM	18°C	28.8km/hr	S	1.97	0.00	A.O., S.H.										2											2			
		1:50 PM	20°C	28.1km/hr	SSW	0.49	0.00	A.O., S.H.					1					2										1				
	19/01/2024	8.35AM	18°C	19.1km/hr	ENE	1.75	0.00	A.O., S.H.			3							4										2	2	10	5		
		1.25PM	26°C	20.9km/hr	S	0.54	0.00	A.O., S.H.																				1					
	29/01/2024	7:30AM	21°C	4.0km/hr	ENE	2.54	0.00	A.O., S.H.										2														
		1.45PM	27°C	29.2km/hr	SW	0.22	0.00	A.O., S.H.						8																		
	30/01/2024	8:25AM	21°C	9.4km/hr	ENE	2.46	0.00	J.M., A.O., S.H.										2												20		
		1:21PM	29°C	38.9km/hr	SW	0.24	0.00	J.M., A.O., S.H.					2					2														
	31/01/2024	9.10AM	18°C	15.5km/hr	SSE	2.36	0.00	A.O										4														
		2.52PM	26°C	32.8km/hr	SSW	0.27	0.00	A.O										2										2				
	1/02/2024	9.20AM	21°C	4.0km/hr	NNW	2.23	0.00	A.O, LW																								
		2.45PM	24°C	35.3km/hr	SSW	0.31	0.00	A.O, LW																								
	2/02/2024	8:50AM	19°C	6.8km/hr	NE	2.08	0.00	A.O., J.A., E.B.	1																					4		
		2.35 PM	29°C	33.1km/hr	SSW	0.38	0.00	A.O., J.A., E.B.																								
	12/02/2024	8:00AM	19°C	9.7km/hr	NE	2.55	0.00	A.O,S.H, L.W																								
		12:37PM	37°C	15.5km/hr	SW	0.21	0.00	A.O., S.H., L.W.																						4		
	13/02/2024	8.20AM	23°C	12.6km/hr	N	2.42	0.00	A.O., S.H., L.W.																								
		1.25PM	24°C	26.6km/hr	SSW	0.29	0.00	A.O., S.H., L.W.																								
	14/02/2024	7:45AM	14°C	20.9km/hr	SE	2.24	0.00	A.O., S.H., L.W.																						2		
		12:35PM	21°C	19.8km/hr	SSW	0.5	0.00	A.O., S.H., L.W.																					1	5		
	15/02/2024	8.30AM	17°C	15.1km/hr	E	2.07	0.00	A.O, J.A., J.M																								
		1.55PM	24°C	27.4km/hr	SW	0.33	0.00	A.O, J.A., J.M																								
	16/02/2024	8.50AM	20°C	4.3km/hr	NNE	1.94	0.00	A.O, L.W, E.B																								
		2.05PM	27°C	23.4km/hr	SW	0.29	0.00	A.O, L.W, E.B																								
Strategic Assessment Area swale drain Abundance										**0**	**7**		**9**	**8**	**0**	**0**	**0**	**30**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**18**	**15**	**49**	**0**	**22**
Reference Sites																																
Mutton Cove mangrove inlet	19/12/2023	9.00AM	18°C	33.8km/hr	S	2.17	0.00	L.W., A.O.					6							2												
		1.50PM	21°C	48.6km/hr	S	0.9	0.00	L.W., A.O.					2																			
	20/12/2023	8.30AM	15°C	15.1km/hr	ESE	1.92	0.00	L.W., A.O.							2						12								4			
		1.55PM	21°C	28.1km/hr	S	0.4	0.00	L.W., A.O.			5																		2			
	21/12/2023	8.00AM	14°C	19.1km/hr	SE	1.63	0.00	A.O., E.B.			3																					
		2:45PM	22°C	29.5km/hr	SSW	0.91	0.00	A.O., E.B.																					1			
	22/12/2023	7:39AM	17°C	11.5km/hr	NE	1.19	0.00	A.O.JM	3		4																		10	2		12
		1.25PM	24°C	22.7km/hr	SW	1	0.00	A.O.JM																								
	15/01/2024	8.15AM	25°C	10.4km/hr	E	2.51	0.00	A.O., S.H.					2																			
		1.10PM	30°C	23.4km/hr	SSW	0.33	0.00	A.O., S.H.																								
	16/01/2024	9:55 PM	17.C	22.7km/hr	W	2.34	0.00	A.O., S.H.																								
		1:55 PM	31°C	27.7km/hr	SSW	0.42	0.00	A.O., S.H.																								
	17/01/2024	9.45AM	19°C	33.8km/hr	S	2.16	0.00	A.O., S.H.			4	1																1		1		
		2.20PM	21°C	43.2km/hr	SSW	0.46	0.00	A.O., S.H.																								
	18/01/2024	9:45 AM	18°C	23.0km/hr	SSW	1.97	0.00	A.O., S.H., L.W.	1		4	2																1			2	
		2:07PM	21°C	29.2km/hr	SSW	0.41	0.00	A.O., S.H., L.W.			1			16																		
		2:30 PM	21°C	29.5km/hr	SSW	0.49	0.00	A.O., S.H., L.W.																								
	19/01/2024	10:00 AM	22°C	26.3km/hr	NE	1.75	0.00	A.O., S.H.																								
		2.10PM	30°C	27.7km/hr	SSW	0.54	0.00	A.O., S.H.				1																				
	29/01/2024	9.45AM	26°C	11.9km/hr	SSW	2.54	0.00	A.O., S.H.			5																	1				
		1.52PM	27°C	32.8km/hr	SW	0.22	0.00	A.O., S.H.																								
	30/01/2024	8:57AM	21°C	4.0km/hr	E	2.46	0.00	J.M., A.O., S.H.			1																	1	2			
		1:43PM	29°C	40.3km/hr	SW	0.24	0.00	J.M., A.O., S.H.																								

									Australian Crow (*Corvus orru*)	Australian Fairy Tern (*Sternula nereis nereis*)	Australian Ibis (*Threskiornis molucca*)	*Australian magpie (Gymnorhina tibicen)*	*Australian Pelican (Pelecanus conspicillatus)*	Australian Wood Duck (*Chenonetta jubata*)	*Banded Lapwing (Vanellus tricolor)*	Banded Stilt (*Cladorhynchus leucocephalus*)	Black Swan (*Cygnus atratus*)	Black-winged Stilts (*Himantopus himantopus*)	Bottlenose Dolphin (*Tursiops truncatus*)	Brown Honeyeater (*Lichmera indistincta*)	Brown Songlark (*Cincloramphus cruralis*)	Brown Thornbill (*Acanthiza pusilla*)	Bush Stone-Curlew (*Burhinus grallarius*)	Caspian Tern (*Hydroprogne (sterna) caspia*)	Chestnut Teal (*Anas castanea*)	Common Greenshank (*Tringa nebularia*)	*Common Sandpiper (Actitis hypoleucos)*	Common Starling (*Sturnus vulgaris*)	Crested Pigeon (*Ocyphaps lophotes*)	Eastern Great Egret (*Ardea modesta*)	Eurasian coot (*Fulica atra*)
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine									Ma	Ma, V	Ma		Ma	Ma	Ma	Ma	Ma	Ma	Ma	Ma							Ma, Mi	Ma, Mi, En	Ma, Mi			Ma	Ma
NP&W Act Listing																Vulnerable						Rare					Rare				
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																							
	31/01/2024	9.22AM	18°C	18.7km/hr	S	2.36	0.00	A.O, S.H., L.W			2		1														1		2		
		2.11PM	25°C	25.9km/hr	SSW	0.27	0.00	A.O, S.H., L.W																							
	1/02/2024	10.01AM	22°C	5km/hr	SE	2.23	0.00	A.O, LW			6	1															1				
		2.45PM	24°C	35.3km/hr	SSW	0.31	0.00	A.O, LW																							
	2/02/2024	9:15AM	21°C	7.9km/hr	ENE	2.08	0.00	A.O., J.A., E.B.			4																			1	
		2.50PM	31°C	30.2km/hr	SW	0.38	0.00	A.O., J.A., E.B.																							
	12/02/2024	8:30AM	22°C	11.5km/hr	ENE	2.55	0.00	A.O,S.H, L.W			1		2														1			2	
		2.45PM	37°C	17.3km/hr	S	0.21	0.00	A.O., S.H., L.W.			1		1																		
	13/02/2024	9.10AM	25°C	16.9km/hr	WSW	2.42	0.00	A.O., S.H., L.W.																							
		1.55PM	24°C	25.9km/hr	S	0.21	0.00	A.O., S.H., L.W.																							
	14/02/2024	7:55AM	14°C	20.9km/hr	SSE	2.24	0.00	A.O., S.H., L.W.			2																			3	2
		12:10PM	22°C	22.7km/hr	SSW	0.34	0.00	A.O., S.H., L.W.			3																				
	15/02/2024	9.45AM	19°C	8.6km/hr	SE	2.07	0.00	A.O, J.A., J.M					2																		1
		2.45PM	24°C	25.2km/hr	SW	0.33	0.00	A.O, J.A., J.M																							
	16/02/2024	8.45AM	20°C	5.8km/hr	NNE	1.94	0.00	A.O, L.W, E.B																						1	
		2.10PM	27°C	25.9km/hr	SW	0.29	0.00	A.O, L.W, E.B																							
Mutton Cove mangrove inlet Abundance										**0**	**46**	**5**	**16**	**16**	**2**	**0**	**0**	**0**	**0**	**2**	**12**	**0**	**0**	**0**	**0**	**0**	**7**	**12**	**15**	**9**	**12**
	19/12/2023	11.10AM	21°C	33.5km/hr	S	2.17	0.00	L.W., A.O.			12						350								12			4			40
	20/12/2023	10.50AM	18°C	18.4km/hr	ESE	1.92	0.00	L.W., A.O.			20						200														34
	21/12/2023	10.43AM	18°C	13.3km/hr	ESE	1.63	0.00	A.O., E.B.			1						400								8			1			20
	22/12/2023	11:30AM	23°C	18.0km/hr	SW	1.33	0.00	A.O.JM			8						150														6
	15/01/2024	11:00AM	26°C	18.4km/hr	SSW	2.51	0.00	A.O., S.H.			14		10			3	100	2									1				15
	16/01/2024	11:20AM	31°C	2.2km/hr	WSW	2.34	0.00	A.O., S.H.			10		6			5	125	6								2	4				
	17/01/2024	10:50AM	18°C	38.2km/hr	SSW	2.16	0.00	A.O., S.H.			6					4	100	12								3	9				
	18/01/2024	10:45 AM	18°C	25.9km/hr	S	1.97	0.00	A.O., S.H., L.W.			11		7			5	200	6													
St Kilda Beach	19/01/2024	11.17AM	26°C	18.4km/hr	ENE	1.75	0.00	A.O., S.H.			6					4	100	12								3	9				
(Shoreline)	29/01/2024	10:55AM	27°C	18.0km/hr	SSW	2.54	0.00	A.O., S.H.			9		2				90	4								2					
	30/01/2024	11:03AM	27°C	19.1km/hr	SSW	2.54	0.00	J.M., A.O., S.H.			13		1				110	6								2					
	1/02/2024	10:47AM	22°C	14.8km/hr	S	2.23	0.00	A.O, LW			6					2	200	7													
	2/02/2024	11:05AM	26°C	2.2km/hr	W	2.08	0.00	A.O., J.A., E.B.			4						400														
	12/02/2024	10:50AM	28°C	11.5km/hr	S	2.55	0.00	A.O,S.H, L.W			10					8	150	8								4			4		
	13/02/2024	11:11AM	25°C	9.7km/hr	SSW	2.42	0.00	A.O., S.H., L.W.			4					8	150	8								4					
	14/02/2024	10:40AM	19°C	19.8km/hr	SSW	2.24	0.00	A.O., S.H., L.W.			2					6	75	10								4					
	15/02/2024	11:25AM	24°C	14.0km/hr	SW	2.07	0.00	A.O, J.A., J.M			9					6	100	20								6			3		
	16/02/2024	11:00AM	26°C	5.8km/hr	WSW	1.94	0.00	A.O, L.W, E.B			20					4	250	32								5					
St Kilda Beach (Shoreline) Total Abundance										**0**	**165**	**0**	**26**	**0**	**0**	**55**	**3250**	**133**	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**35**	**23**	**5**	**7**	**0**	**115**
	16/01/2024	10:20 AM	33°C	10.4km/hr	SW	2.34	0.00	A.O., S.H.																	5						
	17/01/2024	10:18AM	18°C	35.6km/hr	SSW	2.16	0.00	A.O., S.H.																							
	18/01/2024	10:52 AM	18°C	21.2km/hr	S	1.97	0.00	A.O., S.H., L.W.			1																				
	19/01/2024	11:40AM	26°C	14.8km/hr	ENE	1.75	0.00	A.O., S.H.			6																				
	29/01/2024	10:15AM	27°C	8.6km/hr	S	2.54	0.00	A.O., S.H.			2																				
	30/01/2024	9:50AM	23°C	7.9km/hr	SW	2.46	0.00	J.M., A.O., S.H.			3																				
Pt Gawler Shoreline Habitat	1/02/2024	10:10AM	22°C	5.4km/hr	SSE	2.23	0.00	A.O, LW			5																				
	2/02/2024	10:20AM	22°C	4.7km/hr	ENE	2.08	0.00	A.O., J.A., E.B.			5																				
	12/02/2024	10:15AM	28°C	0km/hr	SSW	2.55	0.00	A.O,S.H, L.W			2																				
	13/02/2024	10:22AM	23°C	23.8km/hr	SSW	2.42	0.00	A.O., S.H., L.W.			6																				
	14/02/2024	10:35AM	19°C	14.0km/hr	S	2.24	0.00	A.O., S.H., L.W.																							
	15/02/2024	10:20AM	21°C	7.2km/hr	SSW	2.07	0.00	A.O, J.A., J.M			3																				
	16/02/2024	11:00AM	26°C	5.8km/hr	WSW	1.94	0.00	A.O, L.W, E.B			10																				
Port Gawler Shoreline Total Abundance										**0**	**43**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	20/12/2023	11.37AM	19°C	18.0km/hr	SE	1.92	0.00	L.W., A.O.			2												2	2							

									Australian Crow (*Corvus orru*)	Australian Fairy Tern (*Sternula nereis nereis*)	Australian Ibis (*Threskiornis molucca*)	*Australian magpie (Gymnorhina tibicen)*	*Australian Pelican (Pelecanus conspicillatus)*	Australian Wood Duck (*Chenonetta jubata*)	*Banded Lapwing (Vanellus tricolor)*	Banded Stilt (*Cladorhynchus leucocephalus*)	Black Swan (*Cygnus atratus*)	Black-winged Stilts (*Himantopus himantopus*)	Bottlenose Dolphin (*Tursiops truncatus*)	Brown Honeyeater (*Lichmera indistincta*)	Brown Songlark (*Cincloramphus cruralis*)	Brown Thornbill (*Acanthiza pusilla*)	Bush Stone-Curlew (*Burhinus grallarius*)	Caspian Tern (*Hydroprogne (sterna) caspia*)	Chestnut Teal (*Anas castanea*)	Common Greenshank (*Tringa nebularia*)	*Common Sandpiper (Actitis hypoleucos)*	Common Starling (*Sturnus vulgaris*)	Crested Pigeon (*Ocyphaps lophotes*)	Eastern Great Egret (*Ardea modesta*)	Eurasian coot (*Fulica atra*)
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine									Ma	Ma, V	Ma		Ma	Ma	Ma	Ma	Ma	Ma	Ma					Ma, Mi	Ma, Mi, En	Ma, Mi			Ma	Ma
NP&W Act Listing																Vulnerable							Rare			Rare				
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																							
Middle Beach Shoreline	21/12/2023	11:32 AM	21°C	4.3km/hr	SW	1.63	0.00	A.O., E.B.			6														4	2				
	22/12/2023	11:23AM	23°C	16.2km/hr	SW	1.33	0.00	A.O.JM					15																	
	15/01/2024	10:55AM	27°C	18.7km/hr	SSW	2.51	0.00	A.O., S.H.			4	1																	1	
Middle Beach Shoreline Total Abundance										**0**	**12**	**1**	**15**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**0**	**4**	**2**	**0**	**0**	**1**	**0**
Thompson Beach Shoreline	20/12/2023	10:00AM	18°C	12.6km/hr	SE	1.92	0.00	A.O., E.B			2																			
	19/01/2024	11:00 AM	26°C	20.2km/hr	NE	1.75	0.00	A.O., S.H.					10																	
	1/02/2024	11:10AM	24°C	13.3km/hr	SSW	2.23	0.00	A.O, LW																						
	13/02/2024	10:50AM	23°C	12.6km/hr	S	2.42	0.00	A.O., S.H., L.W.	1		2		9					4						4		6				
Thompson Beach Shoreline Total Abundance										**0**	**4**	**0**	**19**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**6**	**0**	**0**	**0**	**0**	**0**
Bird Island Shoreline	31/01/2024	9:00AM	17°C	9.0km/hr	SE	2.36	0.00	A.O, L.W, S.H.		90	10		32																	
Bird Island Shoreline Total Abundnace										**90**	**10**	**0**	**32**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Shoreline Refrence Sites Total Abundance										**90**	**234**	**1**	**92**	**0**	**0**	**55**	**3250**	**137**	**0**	**0**	**0**	**2**	**2**	**9**	**20**	**45**	**25**	**5**	**7**	**1**	**115**
Thompson Beach Estuary	20/12/2023	10:50AM	18°C	12.6km/hr	ESE	1.92	0.00	A.O., E.B			12		35																2	
	19/01/2024	11:20AM	26°C	20.2km/hr	NE	1.75	0.00	A.O., S.H.			19		40																	
	1/02/2024	12:00PM	23°C	16.6km/hr	SW	0.31	0.00	A.O, LW			48		58														11		6	
	13/02/2024	11:45AM	25°C	18.4km/hr	SW	0.29	0.00	A.O., S.H., L.W.			15		36														6			
Thompson Beach Estuary Total Abundance										**0**	**94**	**0**	**169**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**17**	**0**	**0**	**8**	**0**
Bird Island Estuary	31/01/2024	10:30AM	18°C	18.7km/hr	S	2.36	0.00	A.O, L.W, S.H			31		56				100	18						6		12	5				
Bird Island Estuary Total Abundance										**0**	**31**	**0**	**56**	**0**	**0**	**0**	**100**	**18**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**12**	**5**	**0**	**0**	**0**	**0**
Estaurine Reference Sites Total Abundance										**0**	**125**	**0**	**225**	**0**	**0**	**0**	**100**	**18**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**12**	**22**	**0**	**0**	**8**	**0**
Port Gawler Swale Drain	16/01/2024	10:40AM	31°C	10.1km/hr	WSW	2.34	0.00	A.O., S.H.			4													1						
	17/01/2024	10:50AM	19°C	38.2km/hr	SSW	2.16	0.00	A.O., S.H.			9	1	12					2											2	
	18/01/2024	11:57AM	19°C	23.0km/hr	SSW	1.97	0.00	A.O., S.H., L.W.		1	1																			
	19/01/2024	12:10PM	26°C	11.5km/hr	E	1.75	0.00	A.O., S.H., L.W.																						
	29/01/2024	10:27AM	23°C	12.2km/hr	SW	2.54	0.00	J.M., A.O., S.H.			3																			
	30/01/2024	10:27AM	23°C	12.2km/hr	S	2.46	0.00	J.M., A.O., S.H.			3																			
	1/02/2024	10:40AM	22°C	14.8km/hr	S	2.23	0.00	A.O, E.B					10																	
	2/02/2024	10:50AM	22°C	0km/hr	SE	2.08	0.00	A.O, J..A																						
	12/02/2024	10:00AM	28°C	1.8km/hr	S	2.55	0.00	A.O., S.H., L.W.																						
	13/02/2024	11:00AM	25°C	10.1km/hr	S	2.42	0.00	A.O., S.H., L.W.																						
	14/02/2024	11:01AM	19°C	16.2km/hr	SSW	2.24	0.00	A.O., S.H., L.W.			10																			
	15/02/2024	10:50AM	21°C	13.3km/hr	SW	2.07	0.00	A.O, J.A, J.M					8																	
	16/02/2024	11:40AM	26°C	13.3km/hr	SW	1.94	0.00	A.O, L.W, E,B			12																			
Port Gawler Swale Drain Total Abundance										**1**	**42**	**1**	**30**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**0**
Falie Reserve swale drain	21/12/2023	8.30AM	14°C	18.7km/hr	ESE	1.6	0.00	A.O.										8												8
	22/12/2023	8:32AM	20°C	7.2km/hr	NNE	1.2	0.00	A.O., J.M.			8	1						6										10		
	2/02/2024	9:10AM	19°C	7.9km/hr	ENE	2.08	0.00				4							6												6
	16/02/2024	9.30AM	20°C	4.3km/hr	ENE	1.8	0.00				8							6												
Osborne Failie Reserve Total Abundance										**0**	**20**	**1**	**0**	**0**	**0**	**0**	**0**	**26**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**14**
Swale Drain Reference Sites Total Abundance										**1**	**62**	**2**	**30**	**0**	**0**	**0**	**0**	**28**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**10**	**2**	**14**

Migratory Shorebird Survey Results

									Fairy Martin *(Petrochelidon ariel)*	Great Crested Grebe *(Podiceps cristatus)*	Great White Egret *(Ardea alba)*	Greater Crested Tern *(Thalasseus bergii)*	Grey Fantail *(Rhipidura albiscapa)*	Grey Plover *(Pluvialis squatarola)*	Grey Teal Duck *(Anas gracilis)*	Hoary-headed Grebe *(Poliocephalus poliocephalus)*	Hooded Plover *(Charadrius cucullatus)*	Letter-winged Kite *(Elanus scriptus)*	Little Black Cormorant *(Phalacrocorax sulcirostris)*	Little Egret *(Egretta garzetta)*	Little Pied Cormorant *(Microcarbo melanoleucos)*	Long- toed Stint *(Calidris subminuta)*	Magpie-lark *(Gralllina cyanoleuca)*	Marsh Frog *(Pelophylax ridibundus)*	Marsh Sandpiper *(Tringa stagnatilis)*	Masked Lapwing *(Vanellus miles)*	Medium Egret *(Ardea intermedia)*	Pacific Black Duck *(Anas sperciliosa)*	Pacific Gull *(Larus pacificus)*	Pied Cormorant *(Phalacrocorax varius)*	Pied Oystercatcher *(Haematopus longirostris)*	Pied Silt *(Himantopus leucocephalus)*	Red-capped Plover *(Charadrius ruficapillus)*
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine										Ma	Ma	Ma, Mi		Ma, Mi, V	Ma	Ma	Ma		Ma	Ma	Ma	Ma, Mi			Ma, Mi	Ma	Ma	Ma	Ma	Ma	Ma	Ma
NP&W Act Listing																		Vulnerable				Rare								Rare		
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																								
	19/12/2023	9.50AM	17°C	30.6km/hr	S	2.00	0.00	L.W., A.O.				2																	1	2		
		1.08PM	21°C	38.9km/hr	S	1	0.00	L.W., A.O.													1								1			
	20/12/2023	7.30AM	14°C	10.8km/hr	SSE	1.8	0.00	L.W., A.O.	3				1		14				1											1	2		
		1.10PM	20°C	19.4km/hr	SSW	1.1	0.00	L.W., A.O.													4								1	3		
	21/12/2023	8.10AM	14°C	16.6km/hr	ESE	1.5	0.00	A.O., E.B.							12											2					2		
		2:08PM	22°C	37.8km/hr	SW	1.1	0.00	A.O., E.B.													2					1			6	8		
	22/12/2023	8.20AM	18°C	10.8km/hr	NE	1.2	0.00	A.O.JM													2					2			4	6		
		1.23PM	24°C	22.7km/hr	SW	1.3	0.00	A.O.JM							6											1				8		
	15/01/2024	8.10 AM	25°C	10.4km/hr	E	2.5	0.00	A.O., S.H.							11				11														
		2:30 PM	31°C	28.4km/hr	SSW	0.4	0.00	A.O., S.H.													2		1							4		
	16/01/2024	8:10 AM	29°C	7.6km/hr	NNW	2.5	0.00	A.O., S.H.							12															24		
		12:20 PM	31°C	21.6km/hr	SW	0.5	0.00	A.O., S.H.													2									4		
	17/01/2024	9:10 AM	17°C	41.0km/hr	S	2.3	0.00	A.O., S.H.				4									2								1				
		1.10PM	20°C	32.4km/hr	S	0.5	0.00	A.O., S.H.							10														6	8		
	18/01/2024	8:28 AM	17°C	18.4km/hr	SSE	1.9	0.00	A.O., S.H., L.W.			1				3						1									3		
		1:25 PM	21°C	29.5km/hr	SSW	0.6	0.00	A.O., S.H., L.W.													4		2									
	19/01/2024	8:22 AM	18°C	18.4km/hr	ENE	1.8	0.00	A.O., S.H.													1									3		
		1:30 PM	26°C	22.7km/hr	SSW	0.9	0.00	A.O., S.H.																								
	29/01/2024	8.40AM	22°C	5.0km/hr	SW	2.5	0.00	A.O., S.H.			1										2								2	4		
		1.20PM	28°C	22.7km/hr	SW	0.3	0.00	A.O., S.H.																		2			2	2		
	30/01/2024	7:50AM	19°C	10.8km/hr	NE	2.46	0.00	J.M., A.O., S.H.							2						2					2				4		
		12:54PM	29°C	29.5km/hr	SW	0.24	0.00	J.M., A.O., S.H.							16								2						4	5		
	31/01/2024	8.10AM	17°C	15.5km/hr	SE	2.36	0.00	A.O, L.W, S.H, J.W							12															6		
		1.10PM	23°C	25.9km/hr	SSW	0.27	0.00	A.O, L.W, S.H, J.W							8											4			4	12		
	1/02/2024	7:50AM	17°C	5.4km/hr	NE	2.23	0.00	A.O, LW																								
		12:54PM	23°C	22.3km/hr	SSW	0.31	0.00	A.O, LW																								
	2/02/2024	8:24AM	19°C	7.6km/hr	NE	2.08	0.00	A.O., J.A., E.B.				19			7								2			7						
		1:14PM	27°C	20.9km/hr	SSW	0.38	0.00	A.O., J.A., E.B.				6																				
	12/02/2024	7.47AM	19°C	10.4km/hr	NE	2.55	0.00	A.O,S.H, L.W																								
		12:07PM	34°C	16.2km/hr	SW	0.21	0.00	A.O., S.H., L.W.				2			1								1						1			
	13/02/2024	8.10AM	23°C	12.6km/hr	N	2.42	0.00	A.O., S.H., L.W.							8						2					2			2	4		
		1.10PM	23°C	27.4km/hr	S	0.29	0.00	A.O., S.H., L.W.							12											4				8		
	14/02/2024	7:15AM	14°C	22.0km/hr	SSE	2.24	0.00	A.O., S.H., L.W.				3			5								1			4				2		
		1:10PM	21°C	24.1km/hr	SW	0.34	0.00	A.O., S.H., L.W.				5			21						2		5			2			5			
	15/02/2024	7:50AM	14°C	13.7km/hr	E	2,.07	0.00	A.O, J.A., J.M																		2				2		
		12:54PM	24°C	24.1km/hr	SW	0.33	0.00	A.O, J.A., J.M			2															6			6	10		
	16/02/2024	8.10AM	17°C	3.2km/hr	NE	1.94	0.00	A.O, L.W, E.B													1								2	4		
		1.10PM	26°C	19.8km/hr	SW	0.29	0.00	A.O, L.W, E.B							12						2					2			6	6		
Strategic Assessment Area Shoreline Abundance									**3**	**0**	**4**	**41**	**1**	**0**	**172**	**0**	**0**	**0**	**12**	**0**	**32**	**0**	**14**	**0**	**0**	**43**	**0**	**0**	**1**	**54**	**146**	**0**	**0**
Strategic Assessment Area Shoreline	19/12/2023	8.10AM	16°C	35.3km/hr	S	2.17	0.00	L.W., A.O.							12								2									
		1.50PM	21°C	48.6km/hr	S	0.68	0.00	L.W., A.O.							6								1									
	20/12/2023	8.00AM	15°C	14.8km/hr	E	1.92	0.00	L.W., A.O.							12											1					5		
		1.30PM	21°C	22.0km/hr	S	0.78	0.00	L.W., A.O.					1																	4		
	21/12/2023	7.20AM	14°C	29.5km/hr	SSE	1.63	0.00	A.O., E.B.																		2		12		4		
		1.55PM	22°C	34.6km/hr	SW	0.91	0.00	A.O., E.B.																								
	22/12/2023	8:12AM	18°C	10.8km/hr	NE	1.19	0.00	A.O.JM							2													12				
		2.30PM	24°C	24.1km/hr	SW	1.33	0.00	A.O.JM							8																	
	15/01/2024	8:50AM	30°C	31.3km/hr	ESE	0.33	0.00	A.O., S.H.																								
		2:10PM	31°C	31.0km/hr	SSW	0.33	0.00	A.O., S.H.																								
	16/01/2024	8:55 AM	30°C	6.8km/hr	WNW	2.34	0.00	A.O., S.H.																								
		1:10 PM	30°C	28.8km/hr	S	0.42	0.00	A.O., S.H.															1									

Migratory Shorebird Survey Results

									Fairy Martin *(Petrochelidon ariel)*	Great Crested Grebe *(Podiceps cristatus)*	Great White Egret *(Ardea alba)*	Greater Crested Tern *(Thalasseus bergii)*	Grey Fantail *(Rhipidura albiscapa)*	Grey Plover *(Pluvialis squatarola)*	Grey Teal Duck *(Anas gracilis)*	Hoary-headed Grebe *(Poliocephalus poliocephalus)*	Hooded Plover *(Charadrius cucullatus)*	Letter-winged Kite *(Elanus scriptus)*	Little Black Cormorant *(Phalacrocorax sulcirostris)*	Little Egret *(Egretta garzetta)*	Little Pied Cormorant *(Microcarbo melanoleucos)*	Long- toed Stint *(Calidris subminuta)*	Magpie-lark *(Gralllina cyanoleuca)*	Marsh Frog *(Pelophytax ridibundus)*	Marsh Sandpiper *(Tringa stagnatilis)*	Masked Lapwing *(Vanellus miles)*	Medium Egret *(Ardea intermedia)*	Pacific Black Duck *(Anas sperciliosa)*	Pacific Gull *(Larus pacificus)*	Pied Cormorant *(Phalacrocorax varius)*	Pied Oystercatcher *(Haematopus longirostris)*	Pied Silt *(Himantopus leucocephalus)*	Red-capped Plover *(Charadrius ruficapillus)*
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine										Ma	Ma	Ma, Mi		Ma, Mi, V	Ma	Ma	Ma		Ma	Ma	Ma	Ma, Mi			Ma, Mi	Ma	Ma	Ma	Ma	Ma	Ma
NP&W Act Listing																		Vulnerable				Rare							Rare		
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																							
Strategic Assessment Area swale drain	17/01/2024	9.10AM	24°C	41.0km/hr	S	2.16	0.00	A.O., S.H.																							
		2.00PM	26°C	39.6km/hr	SSW	0.46	0.00	A.O., S.H.																							
	18/01/2024	9:00 AM	18°C	28.8km/hr	S	1.97	0.00	A.O., S.H.																	2						
		1:50 PM	20°C	28.1km/hr	SSW	0.49	0.00	A.O., S.H.														1									
	19/01/2024	8.35AM	18°C	19.1km/hr	ENE	1.75	0.00	A.O., S.H.							10																
		1.25PM	26°C	20.9km/hr	S	0.54	0.00	A.O., S.H.																							
	29/01/2024	7:30AM	21°C	4.0km/hr	ENE	2.54	0.00	A.O., S.H.							1																
		1.45PM	27°C	29.2km/hr	SW	0.22	0.00	A.O., S.H.														2			2						
	30/01/2024	8:25AM	21°C	9.4km/hr	ENE	2.46	0.00	J.M., A.O., S.H.														2	1								
		1:21PM	29°C	38.9km/hr	SW	0.24	0.00	J.M., A.O., S.H.							1							1			1						
	31/01/2024	9.10AM	18°C	15.5km/hr	SSE	2.36	0.00	A.O																							
		2.52PM	26°C	32.8km/hr	SSW	0.27	0.00	A.O																							
	1/02/2024	9.20AM	21°C	4.0km/hr	NNW	2.23	0.00	A.O, LW																							
		2.45PM	24°C	35.3km/hr	SSW	0.31	0.00	A.O, LW																							
	2/02/2024	8:50AM	19°C	6.8km/hr	NE	2.08	0.00	A.O., J.A., E.B.					1									5									
		2.35 PM	29°C	33.1km/hr	SSW	0.38	0.00	A.O., J.A., E.B.																							
	12/02/2024	8:00AM	19°C	9.7km/hr	NE	2.55	0.00	A.O,S.H, L.W														1									
		12:37PM	37°C	15.5km/hr	SW	0.21	0.00	A.O., S.H., L.W.																							
	13/02/2024	8.20AM	23°C	12.6km/hr	N	2.42	0.00	A.O., S.H., L.W.																							
		1.25PM	24°C	26.6km/hr	SSW	0.29	0.00	A.O., S.H., L.W.																							
	14/02/2024	7:45AM	14°C	20.9km/hr	SE	2.24	0.00	A.O., S.H., L.W.							4										2						
		12:35PM	21°C	19.8km/hr	SSW	0.5	0.00	A.O., S.H., L.W.														2									
	15/02/2024	8.30AM	17°C	15.1km/hr	E	2.07	0.00	A.O, J.A., J.M																	2						
		1.55PM	24°C	27.4km/hr	SW	0.33	0.00	A.O, J.A., J.M																							
	16/02/2024	8.50AM	20°C	4.3km/hr	NNE	1.94	0.00	A.O, L.W, E.B																	6						
		2.05PM	27°C	23.4km/hr	SW	0.29	0.00	A.O, L.W, E.B																							
Strategic Assessment Area swale drain Abundance									**0**	**0**	**0**	**0**	**2**	**0**	**56**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**1**	**0**	**18**	**0**	**24**	**0**	**0**	**0**	**13**	**0**
Reference Sites																															
Mutton Cove mangrove inlet	19/12/2023	9.00AM	18°C	33.8km/hr	S	2.17	0.00	L.W., A.O.			1																				
		1.50PM	21°C	48.6km/hr	S	0.9	0.00	L.W., A.O.													1										
	20/12/2023	8.30AM	15°C	15.1km/hr	ESE	1.92	0.00	L.W., A.O.																							
		1.55PM	21°C	28.1km/hr	S	0.4	0.00	L.W., A.O.													2										
	21/12/2023	8.00AM	14°C	19.1km/hr	SE	1.63	0.00	A.O., E.B.																							
		2:45PM	22°C	29.5km/hr	SSW	0.91	0.00	A.O., E.B.					1									2			5						
	22/12/2023	7:39AM	17°C	11.5km/hr	NE	1.19	0.00	A.O.JM											1	3				2							
		1.25PM	24°C	22.7km/hr	SW	1	0.00	A.O.JM																							
	15/01/2024	8.15AM	25°C	10.4km/hr	E	2.51	0.00	A.O., S.H.																					1		
		1.10PM	30°C	23.4km/hr	SSW	0.33	0.00	A.O., S.H.																					2		
	16/01/2024	9:55 PM	17.C	22.7km/hr	W	2.34	0.00	A.O., S.H.																							
		1:55 PM	31°C	27.7km/hr	SSW	0.42	0.00	A.O., S.H.																							
	17/01/2024	9.45AM	19°C	33.8km/hr	S	2.16	0.00	A.O., S.H.																							
		2.20PM	21°C	43.2km/hr	SSW	0.46	0.00	A.O., S.H.												2									1		
	18/01/2024	9:45 AM	18°C	23.0km/hr	SSW	1.97	0.00	A.O., S.H., L.W.	2										1			1			2						
		2:07PM	21°C	29.2km/hr	SSW	0.41	0.00	A.O., S.H., L.W.			1																				
		2:30 PM	21°C	29.5km/hr	SSW	0.49	0.00	A.O., S.H., L.W.														1									
	19/01/2024	10:00 AM	22°C	26.3km/hr	NE	1.75	0.00	A.O., S.H.																							
		2.10PM	30°C	27.7km/hr	SSW	0.54	0.00	A.O., S.H.																							
	29/01/2024	9.45AM	26°C	11.9km/hr	SSW	2.54	0.00	A.O., S.H.																							
		1.52PM	27°C	32.8km/hr	SW	0.22	0.00	A.O., S.H.																							
	30/01/2024	8:57AM	21°C	4.0km/hr	E	2.46	0.00	J.M., A.O., S.H.														4									
		1:43PM	29°C	40.3km/hr	SW	0.24	0.00	J.M., A.O., S.H.		5																					

Migratory Shorebird Survey Results

									Fairy Martin (*Petrochelidon ariel*)	Great Crested Grebe (*Podiceps cristatus*)	Great White Egret (*Ardea alba*)	Greater Crested Tern (*Thalasseus bergii*)	Grey Fantail (*Rhipidura albiscapa*)	Grey Plover (*Pluvialis squatarola*)	Grey Teal Duck (*Anas gracilis*)	Hoary-headed Grebe (*Poliocephalus poliocephalus*)	Hooded Plover (*Charadrius cucullatus*)	Letter-winged Kite (*Elanus scriptus*)	Little Black Cormorant (*Phalacrocorax sulcirostris*)	Little Egret (*Egretta garzetta*)	Little Pied Cormorant (*Microcarbo melanoleucos*)	Long- toed Stint (*Calidris subminuta*)	Magpie-lark (*Gralllina cyanoleuca*)	Marsh Frog (*Pelophytax ridibundus*)	Marsh Sandpiper (*Tringa stagnatilis*)	Masked Lapwing (*Vanellus miles*)	Medium Egret (*Ardea intermedia*)	Pacific Black Duck (*Anas sperciliosa*)	Pacific Gull (*Larus pacificus*)	Pied Cormorant (*Phalacrocorax varius*)	Pied Oystercatcher (*Haematopus longirostris*)	Pied Silt (*Himantopus leucocephalus*)	Red-capped Plover (*Charadrius ruficapillus*)
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine										Ma	Ma	Ma, Mi		Ma, Mi, V	Ma	Ma	Ma		Ma	Ma	Ma, Mi			Ma, Mi	Ma	Ma	Ma	Ma		Ma	Ma	Ma
NP&W Act Listing																		Vulnerable				Rare								Rare		
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																								
	31/01/2024	9.22AM	18°C	18.7km/hr	S	2.36	0.00	A.O, S.H., L.W							8						2		2		2						
		2.11PM	25°C	25.9km/hr	SSW	0.27	0.00	A.O, S.H., L.W																							
	1/02/2024	10.01AM	22°C	5km/hr	SE	2.23	0.00	A.O, LW												2											
		2.45PM	24°C	35.3km/hr	SSW	0.31	0.00	A.O, LW																							
	2/02/2024	9:15AM	21°C	7.9km/hr	ENE	2.08	0.00	A.O., J.A., E.B.																						1		
		2.50PM	31°C	30.2km/hr	SW	0.38	0.00	A.O., J.A., E.B.																							
	12/02/2024	8:30AM	22°C	11.5km/hr	ENE	2.55	0.00	A.O,S.H, L.W													1										
		2.45PM	37°C	17.3km/hr	S	0.21	0.00	A.O., S.H., L.W.																							
	13/02/2024	9.10AM	25°C	16.9km/hr	WSW	2.42	0.00	A.O., S.H., L.W.																						1		
		1.55PM	24°C	25.9km/hr	S	0.21	0.00	A.O., S.H., L.W.																							
	14/02/2024	7:55AM	14°C	20.9km/hr	SSE	2.24	0.00	A.O., S.H., L.W.																		1					
		12:10PM	22°C	22.7km/hr	SSW	0.34	0.00	A.O., S.H., L.W.																	2						
	15/02/2024	9.45AM	19°C	8.6km/hr	SE	2.07	0.00	A.O, J.A., J.M																							
		2.45PM	24°C	25.2km/hr	SW	0.33	0.00	A.O, J.A., J.M																						2		
	16/02/2024	8.45AM	20°C	5.8km/hr	NNE	1.94	0.00	A.O, L.W, E.B																							
		2.10PM	27°C	25.9km/hr	SW	0.29	0.00	A.O, L.W, E.B																						1		
Mutton Cove mangrove inlet Abundance									**2**	**5**	**2**	**0**	**1**	**0**	**8**	**0**	**0**	**0**	**2**	**7**	**6**	**0**	**10**	**0**	**4**	**9**	**1**	**0**	**0**	**4**	**5**	**0**	**0**
St Kilda Beach (Shoreline)	19/12/2023	11.10AM	21°C	33.5km/hr	S	2.17	0.00	L.W., A.O.	8						28						12	4			8		12				35
	20/12/2023	10.50AM	18°C	18.4km/hr	ESE	1.92	0.00	L.W., A.O.							13							1			12						20
	21/12/2023	10.43AM	18°C	13.3km/hr	ESE	1.63	0.00	A.O., E.B.							8							3					1				
	22/12/2023	11:30AM	23°C	18.0km/hr	SW	1.33	0.00	A.O.JM							25										8						42
	15/01/2024	11:00AM	26°C	18.4km/hr	SSW	2.51	0.00	A.O., S.H.													20				2				1	20		1
	16/01/2024	11:20AM	31°C	2.2km/hr	WSW	2.34	0.00	A.O., S.H.																	6				2	8		19
	17/01/2024	10:50AM	18°C	38.2km/hr	SSW	2.16	0.00	A.O., S.H.																								22
	18/01/2024	10:45 AM	18°C	25.9km/hr	S	1.97	0.00	A.O., S.H., L.W.					6		20						4				30					9		30
	19/01/2024	11.17AM	26°C	18.4km/hr	ENE	1.75	0.00	A.O., S.H.																								22
	29/01/2024	10:55AM	27°C	18.0km/hr	SSW	2.54	0.00	A.O., S.H.																	12	4			2	10		20
	30/01/2024	11:03AM	27°C	19.1km/hr	SSW	2.54	0.00	J.M., A.O., S.H.																	20	2			5	5		25
	1/02/2024	10:47AM	22°C	14.8km/hr	S	2.23	0.00	A.O, LW																								32
	2/02/2024	11:05AM	26°C	2.2km/hr	W	2.08	0.00	A.O., J.A., E.B.																	4					10		12
	12/02/2024	10:50AM	28°C	11.5km/hr	S	2.55	0.00	A.O,S.H, L.W	8						25							2			20					8		33
	13/02/2024	11:11AM	25°C	9.7km/hr	SSW	2.42	0.00	A.O., S.H., L.W.	8						27							2		2	24					10		42
	14/02/2024	10:40AM	19°C	19.8km/hr	SSW	2.24	0.00	A.O., S.H., L.W.	8						20										19					9		41
	15/02/2024	11:25AM	24°C	14.0km/hr	SW	2.07	0.00	A.O, J.A., J.M	8						10									2	16					12		29
	16/02/2024	11:00AM	26°C	5.8km/hr	WSW	1.94	0.00	A.O, L.W, E.B	8						50							1		4	11					21		28
St Kilda Beach (Shoreline) Total Abundance									**48**	**0**	**0**	**0**	**6**	**0**	**226**	**0**	**0**	**0**	**0**	**0**	**0**	**36**	**13**	**0**	**8**	**192**	**6**	**13**	**0**	**10**	**122**	**0**	**453**
Pt Gawler Shoreline Habitat	16/01/2024	10:20 AM	33°C	10.4km/hr	SW	2.34	0.00	A.O., S.H.									1		2	4					4						10
	17/01/2024	10:18AM	18°C	35.6km/hr	SSW	2.16	0.00	A.O., S.H.												2					6						16
	18/01/2024	10:52 AM	18°C	21.2km/hr	S	1.97	0.00	A.O., S.H., L.W.																							2
	19/01/2024	11:40AM	26°C	14.8km/hr	ENE	1.75	0.00	A.O., S.H.																	2						8
	29/01/2024	10:15AM	27°C	8.6km/hr	S	2.54	0.00	A.O., S.H.																							12
	30/01/2024	9:50AM	23°C	7.9km/hr	SW	2.46	0.00	J.M., A.O., S.H.																	1						11
	1/02/2024	10:10AM	22°C	5.4km/hr	SSE	2.23	0.00	A.O, LW																							9
	2/02/2024	10:20AM	22°C	4.7km/hr	ENE	2.08	0.00	A.O., J.A., E.B.																							
	12/02/2024	10:15AM	28°C	0km/hr	SSW	2.55	0.00	A.O,S.H, L.W																							
	13/02/2024	10:22AM	23°C	23.8km/hr	SSW	2.42	0.00	A.O., S.H., L.W.																							
	14/02/2024	10:35AM	19°C	14.0km/hr	S	2.24	0.00	A.O., S.H., L.W.																							4
	15/02/2024	10:20AM	21°C	7.2km/hr	SSW	2.07	0.00	A.O, J.A., J.M																							9
	16/02/2024	11:00AM	26°C	5.8km/hr	WSW	1.94	0.00	A.O, L.W, E.B																							6
Port Gawler Shoreline Total Abundance									**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**6**	**0**	**0**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**87**
	20/12/2023	11.37AM	19°C	18.0km/hr	SE	1.92	0.00	L.W., A.O.												1	1				2						

Migratory Shorebird Survey Results

									Fairy Martin *(Petrochelidon ariel)*	Great Crested Grebe *(Podiceps cristatus)*	Great White Egret *(Ardea alba)*	Greater Crested Tern *(Thalasseus bergii)*	Grey Fantail *(Rhipidura albiscapa)*	Grey Plover *(Pluvialis squatarola)*	Grey Teal Duck *(Anas gracilis)*	Hoary-headed Grebe *(Poliocephalus poliocephalus)*	Hooded Plover *(Charadrius cucullatus)*	Letter-winged Kite *(Elanus scriptus)*	Little Black Cormorant *(Phalacrocorax sulcirostris)*	Little Egret *(Egretta garzetta)*	Little Pied Cormorant *(Microcarbo melanoleucos)*	Long- toed Stint *(Calidris subminuta)*	Magpie-lark *(Gralllina cyanoleuca)*	Marsh Frog *(Pelophytax ridibundus)*	Marsh Sandpiper *(Tringa stagnatilis)*	Masked Lapwing *(Vanellus miles)*	Medium Egret *(Ardea intermedia)*	Pacific Black Duck *(Anas sperciliosa)*	Pacific Gull *(Larus pacificus)*	Pied Cormorant *(Phalacrocorax varius)*	Pied Oystercatcher *(Haematopus longirostris)*	Pied Silt *(Himantopus leucocephalus)*	Red-capped Plover *(Charadrius ruficapillus)*
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine										Ma	Ma	Ma, Mi		Ma, Mi, V	Ma	Ma	Ma		Ma	Ma	Ma	Ma, Mi			Ma, Mi	Ma	Ma	Ma	Ma	Ma	Ma	Ma
NP&W Act Listing																		Vulnerable				Rare								Rare		
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																								
Middle Beach Shoreline	21/12/2023	11:32 AM	21°C	4.3km/hr	SW	1.63	0.00	A.O., E.B.																	2						
	22/12/2023	11:23AM	23°C	16.2km/hr	SW	1.33	0.00	A.O.JM																	5						
	15/01/2024	10:55AM	27°C	18.7km/hr	SSW	2.51	0.00	A.O., S.H.																							
Middle Beach Shoreline Total Abundance									**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Thompson Beach Shoreline	20/12/2023	10:00AM	18°C	12.6km/hr	SE	1.92	0.00	A.O., E.B																								
	19/01/2024	11:00 AM	26°C	20.2km/hr	NE	1.75	0.00	A.O., S.H.			10										10				2						
	1/02/2024	11:10AM	24°C	13.3km/hr	SSW	2.23	0.00	A.O, LW																							
	13/02/2024	10:50AM	23°C	12.6km/hr	S	2.42	0.00	A.O., S.H., L.W.																							
Thompson Beach Shoreline Total Abundance									**0**	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Bird Island Shoreline	31/01/2024	9:00AM	17°C	9.0km/hr	SE	2.36	0.00	A.O, L.W, S.H.									2						1		8				30	18		76
Bird Island Shoreline Total Abundnace									**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**8**	**0**	**0**	**30**	**18**	**0**	**0**	**76**
Shoreline Refrence Sites Total Abundance									**48**	**0**	**10**	**0**	**6**	**0**	**226**	**0**	**3**	**0**	**2**	**7**	**11**	**36**	**14**	**0**	**8**	**224**	**6**	**13**	**30**	**28**	**122**	**0**	**616**
Thompson Beach Estuary	20/12/2023	10:50AM	18°C	12.6km/hr	ESE	1.92	0.00	A.O., E.B															3		8				9				47
	19/01/2024	11:20AM	26°C	20.2km/hr	NE	1.75	0.00	A.O., S.H.			10												2		7	15			20				36
	1/02/2024	12:00PM	23°C	16.6km/hr	SW	0.31	0.00	A.O, LW						18			6								12	12			17				29
	13/02/2024	11:45AM	25°C	18.4km/hr	SW	0.29	0.00	A.O., S.H., L.W.	7														2			6			9				30
Thompson Beach Estuary Total Abundance									**7**	**0**	**10**	**0**	**0**	**18**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**19**	**41**	**0**	**0**	**55**	**0**	**0**	**0**	**142**
Bird Island Estuary	31/01/2024	10:30AM	18°C	18.7km/hr	S	2.36	0.00	A.O, L.W, S.H				6			29		7								4				28	29		
Bird Island Estuary Total Abundance									**0**	**0**	**0**	**6**	**0**	**0**	**29**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**28**	**29**	**0**	**0**
Estaurine Reference Sites Total Abundance									**7**	**0**	**10**	**6**	**0**	**18**	**29**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**23**	**41**	**0**	**0**	**55**	**28**	**29**	**0**	**142**
Port Gawler Swale Drain	16/01/2024	10:40AM	31°C	10.1km/hr	WSW	2.34	0.00	A.O., S.H.			6				10				2	4		4				4			8			
	17/01/2024	10:50AM	19°C	38.2km/hr	SSW	2.16	0.00	A.O., S.H.							8				4	2	3		1			4			12			
	18/01/2024	11:57AM	19°C	23.0km/hr	SSW	1.97	0.00	A.O., S.H., L.W.							16				2		4	7				4	1			2		
	19/01/2024	12:10PM	26°C	11.5km/hr	E	1.75	0.00	A.O., S.H., L.W.																								
	29/01/2024	10:27AM	23°C	12.2km/hr	SW	2.54	0.00	J.M., A.O., S.H.				1														4			1			
	30/01/2024	10:27AM	23°C	12.2km/hr	S	2.46	0.00	J.M., A.O., S.H.				1																	1			
	1/02/2024	10:40AM	22°C	14.8km/hr	S	2.23	0.00	A.O, E.B																								
	2/02/2024	10:50AM	22°C	0km/hr	SE	2.08	0.00	A.O, J..A																		5			10			
	12/02/2024	10:00AM	28°C	1.8km/hr	S	2.55	0.00	A.O., S.H., L.W.								1													7			
	13/02/2024	11:00AM	25°C	10.1km/hr	S	2.42	0.00	A.O., S.H., L.W.																		3			9			
	14/02/2024	11:01AM	19°C	16.2km/hr	SSW	2.24	0.00	A.O., S.H., L.W.				2																	4			
	15/02/2024	10:50AM	21°C	13.3km/hr	SW	2.07	0.00	A.O, J.A, J.M				4														8			2			
	16/02/2024	11:40AM	26°C	13.3km/hr	SW	1.94	0.00	A.O, L.W, E,B																					4			
Port Gawler Swale Drain Total Abundance									**0**	**0**	**6**	**8**	**0**	**0**	**34**	**1**	**0**	**0**	**8**	**6**	**7**	**11**	**1**	**0**	**0**	**32**	**1**	**0**	**0**	**58**	**2**	**0**	**0**
Falie Reserve swale drain	21/12/2023	8.30AM	14°C	18.7km/hr	ESE	1.6	0.00	A.O.															1					7				
	22/12/2023	8:32AM	20°C	7.2km/hr	NNE	1.2	0.00	A.O., J.M.							5								2					4				
	2/02/2024	9:10AM	19°C	7.9km/hr	ENE	2.08	0.00								12											2						
	16/02/2024	9.30AM	20°C	4.3km/hr	ENE	1.8	0.00								10																	
Osborne Failie Reserve Total Abundance									**0**	**0**	**0**	**0**	**0**	**0**	**27**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**2**	**0**	**11**	**0**	**0**	**0**	**0**	**0**
Swale Drain Reference Sites Total Abundance									**0**	**0**	**6**	**8**	**0**	**0**	**61**	**1**	**0**	**0**	**8**	**6**	**7**	**11**	**4**	**0**	**0**	**34**	**1**	**11**	**0**	**58**	**2**	**0**	**0**

Migratory Shorebird Survey Results

									Red-kneed Dotterel (*Erthrogonys cinctus*)	Red-necked Stint (*Calidris ruficollis*)	Rock Parrot (*Neophema petrophila*)	Royal Spoonbill (*Platalea regia*)	Sanderling (*Calidris alba*)	Sharp-tailed Sandpiper (*Calidris acuminata*)	Shingleback Lizard (*Tiliqua rugosa*)	Silver Gull (*Chroicocephalus novaehollandiae*)	Singing honeyeater (*Gavicalis virescens*)	Sooty Oystercatcher (*Haematopus fuliginosus*)	Spotted Crake (*Porzana porzana*)	*Welcome Swallow (Hirundo neoxena)*	White-faced Heron (*Egretta novaehollandiae*)	White-fronted Chat (*Epthianura albifrons*)	Willie Wagtail (*Rhipidura leucophrys*)	Wood Sandpiper (*Tringa glareola*)	Yellow-billed Tern (*Sternula superciliaris*)	**TOTAL ABUNDANCE**
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine									Ma	Ma, Mi		Ma	Ma, Mi	Ma, Mi, V		Ma		Ma	Ma					Ma,Mi	Ma	
NP&W Act Listing																								Rare		
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																		
Strategic Assessment Area Shoreline	19/12/2023	9.50AM	17°C	30.6km/hr	S	2.00	0.00	L.W., A.O.							1	7				5	2				
		1.08PM	21°C	38.9km/hr	S	1	0.00	L.W., A.O.								40+		5		9					
	20/12/2023	7.30AM	14°C	10.8km/hr	SSE	1.8	0.00	L.W., A.O.			4					6	2	6		4	3	1			
		1.10PM	20°C	19.4km/hr	SSW	1.1	0.00	L.W., A.O.								12	2	4		2	2				
	21/12/2023	8.10AM	14°C	16.6km/hr	ESE	1.5	0.00	A.O., E.B.								13	2	2			4				
		2:08PM	22°C	37.8km/hr	SW	1.1	0.00	A.O., E.B.								40	3			2	3				
	22/12/2023	8.20AM	18°C	10.8km/hr	NE	1.2	0.00	A.O.JM								8		10			6				
		1.23PM	24°C	22.7km/hr	SW	1.3	0.00	A.O.JM								10	4	4		2					
	15/01/2024	8.10 AM	25°C	10.4km/hr	E	2.5	0.00	A.O., S.H.								50									
		2:30 PM	31°C	28.4km/hr	SSW	0.4	0.00	A.O., S.H.										8			2				
	16/01/2024	8:10 AM	29°C	7.6km/hr	NNW	2.5	0.00	A.O., S.H.								30	8	5		2	3				
		12:20 PM	31°C	21.6km/hr	SW	0.5	0.00	A.O., S.H.										8			2				
	17/01/2024	9:10 AM	17°C	41.0km/hr	S	2.3	0.00	A.O., S.H.								13				2	1				
		1.10PM	20°C	32.4km/hr	S	0.5	0.00	A.O., S.H.								20		16		6	4				
	18/01/2024	8:28 AM	17°C	18.4km/hr	SSE	1.9	0.00	A.O., S.H., L.W.								1	3	7							
		1:25 PM	21°C	29.5km/hr	SSW	0.6	0.00	A.O., S.H., L.W.								50	1	5		4	1				
	19/01/2024	8:22 AM	18°C	18.4km/hr	ENE	1.8	0.00	A.O., S.H.			1							4							
		1:30 PM	26°C	22.7km/hr	SSW	0.9	0.00	A.O., S.H.																	
	29/01/2024	8.40AM	22°C	5.0km/hr	SW	2.5	0.00	A.O., S.H.								24	2	10			6				
		1.20PM	28°C	22.7km/hr	SW	0.3	0.00	A.O., S.H.										4							
	30/01/2024	7:50AM	19°C	10.8km/hr	NE	2.46	0.00	J.M., A.O., S.H.								8		3			5				
		12:54PM	29°C	29.5km/hr	SW	0.24	0.00	J.M., A.O., S.H.				2				25				2	6				
	31/01/2024	8.10AM	17°C	15.5km/hr	SE	2.36	0.00	A.O, L.W, S.H, J.W								12		4			4				
		1.10PM	23°C	25.9km/hr	SSW	0.27	0.00	A.O, L.W, S.H, J.W								24		10			6				
	1/02/2024	7:50AM	17°C	5.4km/hr	NE	2.23	0.00	A.O, LW																	
		12:54PM	23°C	22.3km/hr	SSW	0.31	0.00	A.O, LW																	
	2/02/2024	8:24AM	19°C	7.6km/hr	NE	2.08	0.00	A.O., J.A., E.B.								5		7				12			
		1:14PM	27°C	20.9km/hr	SSW	0.38	0.00	A.O., J.A., E.B.								26		2							
	12/02/2024	7.47AM	19°C	10.4km/hr	NE	2.55	0.00	A.O,S.H, L.W																	
		12:07PM	34°C	16.2km/hr	SW	0.21	0.00	A.O., S.H., L.W.				1						2			2				
	13/02/2024	8.10AM	23°C	12.6km/hr	N	2.42	0.00	A.O., S.H., L.W.								14		10				8			
		1.10PM	23°C	27.4km/hr	S	0.29	0.00	A.O., S.H., L.W.				1				28		16		6	4	12			
	14/02/2024	7:15AM	14°C	22.0km/hr	SSE	2.24	0.00	A.O., S.H., L.W.								3		1			1				
		1:10PM	21°C	24.1km/hr	SW	0.34	0.00	A.O., S.H., L.W.								35	2	4							
	15/02/2024	7:50AM	14°C	13.7km/hr	E	2,.07	0.00	A.O, J.A., J.M								12	6	4			2				
		12:54PM	24°C	24.1km/hr	SW	0.33	0.00	A.O, J.A., J.M				1				28		14		4					4
	16/02/2024	8.10AM	17°C	3.2km/hr	NE	1.94	0.00	A.O, L.W, E.B									4	5			2				
		1.10PM	26°C	19.8km/hr	SW	0.29	0.00	A.O, L.W, E.B				1					4	9		6	6				
Strategic Assessment Area Shoreline Abundance									**0**	**0**	**5**	**6**	**0**	**0**	**1**	**504**	**43**	**189**	**0**	**42**	**89**	**35**	**0**	**0**	**4**	**1631**
	19/12/2023	8.10AM	16°C	35.3km/hr	S	2.17	0.00	L.W., A.O.																		
		1.50PM	21°C	48.6km/hr	S	0.68	0.00	L.W., A.O.																		
	20/12/2023	8.00AM	15°C	14.8km/hr	E	1.92	0.00	L.W., A.O.									2			3	1			1		
		1.30PM	21°C	22.0km/hr	S	0.78	0.00	L.W., A.O.									4			8						
	21/12/2023	7.20AM	14°C	29.5km/hr	SSE	1.63	0.00	A.O., E.B.	2		7					2	4			12	1					
		1.55PM	22°C	34.6km/hr	SW	0.91	0.00	A.O., E.B.												10						
	22/12/2023	8:12AM	18°C	10.8km/hr	NE	1.19	0.00	A.O.JM									4			12	1					
		2.30PM	24°C	24.1km/hr	SW	1.33	0.00	A.O.JM									4			10						
	15/01/2024	8:50AM	30°C	31.3km/hr	ESE	0.33	0.00	A.O., S.H.									2			6						
		2:10PM	31°C	31.0km/hr	SSW	0.33	0.00	A.O., S.H.															2			
	16/01/2024	8:55 AM	30°C	6.8km/hr	WNW	2.34	0.00	A.O., S.H.						12			6			10						
		1:10 PM	30°C	28.8km/hr	S	0.42	0.00	A.O., S.H.						22												

Migratory Shorebird Survey Results

									Red-kneed Dotterel (*Erthrogonys cinctus*)	Red-necked Stint (*Calidris ruficollis*)	Rock Parrot (*Neophema petrophila*)	Royal Spoonbill (*Platalea regia*)	Sanderling (*Calidris alba*)	Sharp-tailed Sandpiper (*Calidris acuminata*)	Shingleback Lizard (*Tiliqua rugosa*)	Silver Gull (*Chroicocephalus novaehollandiae*)	Singing honeyeater (*Gavicalis virescens*)	Sooty Oystercatcher (*Haematopus fuliginosus*)	Spotted Crake (*Porzana porzana*)	*Welcome Swallow (Hirundo neoxena)*	White-faced Heron (*Egretta novaehollandiae*)	White-fronted Chat (*Epthianura albifrons*)	Willie Wagtail (*Rhipidura leucophrys*)	Wood Sandpiper (*Tringa glareola*)	Yellow-billed Tern (*Sternula superciliaris*)	**TOTAL ABUNDANCE**
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine									Ma	Ma, Mi		Ma	Ma, Mi	Ma, Mi, V		Ma		Ma	Ma					Ma,Mi	Ma	
NP&W Act Listing																								Rare		
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																		
Strategic Assessment Area swale drain	17/01/2024	9.10AM	24°C	41.0km/hr	S	2.16	0.00	A.O., S.H.						16												
		2.00PM	26°C	39.6km/hr	SSW	0.46	0.00	A.O., S.H.						20								3				
	18/01/2024	9:00 AM	18°C	28.8km/hr	S	1.97	0.00	A.O., S.H.			3			18					1	1						
		1:50 PM	20°C	28.1km/hr	SSW	0.49	0.00	A.O., S.H.						34												
	19/01/2024	8.35AM	18°C	19.1km/hr	ENE	1.75	0.00	A.O., S.H.		4	2			28			4			4		1				
		1.25PM	26°C	20.9km/hr	S	0.54	0.00	A.O., S.H.						37												
	29/01/2024	7:30AM	21°C	4.0km/hr	ENE	2.54	0.00	A.O., S.H.						16			2									
		1.45PM	27°C	29.2km/hr	SW	0.22	0.00	A.O., S.H.						18						8		2				
	30/01/2024	8:25AM	21°C	9.4km/hr	ENE	2.46	0.00	J.M., A.O., S.H.						17						16						
		1:21PM	29°C	38.9km/hr	SW	0.24	0.00	J.M., A.O., S.H.						12			5		2	5						
	31/01/2024	9.10AM	18°C	15.5km/hr	SSE	2.36	0.00	A.O						12								1				
		2.52PM	26°C	32.8km/hr	SSW	0.27	0.00	A.O						12			4			12						
	1/02/2024	9.20AM	21°C	4.0km/hr	NNW	2.23	0.00	A.O, LW						8			8			6		2				
		2.45PM	24°C	35.3km/hr	SSW	0.31	0.00	A.O, LW						6												
	2/02/2024	8:50AM	19°C	6.8km/hr	NE	2.08	0.00	A.O., J.A., E.B.						6			15									
		2.35 PM	29°C	33.1km/hr	SSW	0.38	0.00	A.O., J.A., E.B.						6								4				
	12/02/2024	8:00AM	19°C	9.7km/hr	NE	2.55	0.00	A.O,S.H, L.W									5			20						
		12:37PM	37°C	15.5km/hr	SW	0.21	0.00	A.O., S.H., L.W.																		
	13/02/2024	8.20AM	23°C	12.6km/hr	N	2.42	0.00	A.O., S.H., L.W.									2			6						
		1.25PM	24°C	26.6km/hr	SSW	0.29	0.00	A.O., S.H., L.W.												4		5				
	14/02/2024	7:45AM	14°C	20.9km/hr	SE	2.24	0.00	A.O., S.H., L.W.									6									
		12:35PM	21°C	19.8km/hr	SSW	0.5	0.00	A.O., S.H., L.W.									2			2						
	15/02/2024	8.30AM	17°C	15.1km/hr	E	2.07	0.00	A.O, J.A., J.M																		
		1.55PM	24°C	27.4km/hr	SW	0.33	0.00	A.O, J.A., J.M									3			4						
	16/02/2024	8.50AM	20°C	4.3km/hr	NNE	1.94	0.00	A.O, L.W, E.B									4									
		2.05PM	27°C	23.4km/hr	SW	0.29	0.00	A.O, L.W, E.B									1			6						
Strategic Assessment Area swale drain Abundance									**2**	**4**	**12**	**0**	**0**	**300**	**0**	**2**	**87**	**0**	**3**	**165**	**3**	**0**	**20**	**1**	**0**	**889**
Reference Sites																										
Mutton Cove mangrove inlet	19/12/2023	9.00AM	18°C	33.8km/hr	S	2.17	0.00	L.W., A.O.								7										
		1.50PM	21°C	48.6km/hr	S	0.9	0.00	L.W., A.O.								8	2									
	20/12/2023	8.30AM	15°C	15.1km/hr	ESE	1.92	0.00	L.W., A.O.								5	2				1					
		1.55PM	21°C	28.1km/hr	S	0.4	0.00	L.W., A.O.								12					1					
	21/12/2023	8.00AM	14°C	19.1km/hr	SE	1.63	0.00	A.O., E.B.								6	11				10					
		2:45PM	22°C	29.5km/hr	SSW	0.91	0.00	A.O., E.B.								3					1					
	22/12/2023	7:39AM	17°C	11.5km/hr	NE	1.19	0.00	A.O.JM								5	4			2	2					
		1.25PM	24°C	22.7km/hr	SW	1	0.00	A.O.JM								8										
	15/01/2024	8.15AM	25°C	10.4km/hr	E	2.51	0.00	A.O., S.H.								7										
		1.10PM	30°C	23.4km/hr	SSW	0.33	0.00	A.O., S.H.								6										
	16/01/2024	9:55 PM	17.C	22.7km/hr	W	2.34	0.00	A.O., S.H.								20					2					
		1:55 PM	31°C	27.7km/hr	SSW	0.42	0.00	A.O., S.H.								14										
	17/01/2024	9.45AM	19°C	33.8km/hr	S	2.16	0.00	A.O., S.H.								8	2				2					
		2.20PM	21°C	43.2km/hr	SSW	0.46	0.00	A.O., S.H.								4										
	18/01/2024	9:45 AM	18°C	23.0km/hr	SSW	1.97	0.00	A.O., S.H., L.W.								8										
		2:07PM	21°C	29.2km/hr	SSW	0.41	0.00	A.O., S.H., L.W.																		
		2:30 PM	21°C	29.5km/hr	SSW	0.49	0.00	A.O., S.H., L.W.								7										
	19/01/2024	10:00 AM	22°C	26.3km/hr	NE	1.75	0.00	A.O., S.H.								3										
		2.10PM	30°C	27.7km/hr	SSW	0.54	0.00	A.O., S.H.								6										
	29/01/2024	9.45AM	26°C	11.9km/hr	SSW	2.54	0.00	A.O., S.H.								8										
		1.52PM	27°C	32.8km/hr	SW	0.22	0.00	A.O., S.H.								4										
	30/01/2024	8:57AM	21°C	4.0km/hr	E	2.46	0.00	J.M., A.O., S.H.								6										
		1:43PM	29°C	40.3km/hr	SW	0.24	0.00	J.M., A.O., S.H.								12				1						

Migratory Shorebird Survey Results

									Red-kneed Dotterel (*Erthrogonys cinctus*)	Red-necked Stint (*Calidris ruficollis*)	Rock Parrot (*Neophema petrophila*)	Royal Spoonbill (*Platalea regia*)	Sanderling (*Calidris alba*)	Sharp-tailed Sandpiper (*Calidris acuminata*)	Shingleback Lizard (*Tiliqua rugosa*)	Silver Gull (*Chroicocephalus novaehollandiae*)	Singing honeyeater (*Gavicalis virescens*)	Sooty Oystercatcher (*Haematopus fuliginosus*)	Spotted Crake (*Porzana porzana*)	*Welcome Swallow (Hirundo neoxena)*	White-faced Heron (*Egretta novaehollandiae*)	White-fronted Chat (*Epthianura albifrons*)	Willie Wagtail (*Rhipidura leucophrys*)	Wood Sandpiper (*Tringa glareola*)	Yellow-billed Tern (*Sternula superciliaris*)	**TOTAL ABUNDANCE**
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine									Ma	Ma, Mi		Ma	Ma, Mi	Ma, Mi, V		Ma		Ma	Ma					Ma,Mi	Ma	
NP&W Act Listing																								Rare		
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																		
	31/01/2024	9.22AM	18°C	18.7km/hr	S	2.36	0.00	A.O, S.H., L.W								8			6	5					
		2.11PM	25°C	25.9km/hr	SSW	0.27	0.00	A.O, S.H., L.W								12									
	1/02/2024	10.01AM	22°C	5km/hr	SE	2.23	0.00	A.O, LW								8									
		2.45PM	24°C	35.3km/hr	SSW	0.31	0.00	A.O, LW								4									
	2/02/2024	9:15AM	21°C	7.9km/hr	ENE	2.08	0.00	A.O., J.A., E.B.								13									
		2.50PM	31°C	30.2km/hr	SW	0.38	0.00	A.O., J.A., E.B.								11									
	12/02/2024	8:30AM	22°C	11.5km/hr	ENE	2.55	0.00	A.O,S.H, L.W								5									
		2.45PM	37°C	17.3km/hr	S	0.21	0.00	A.O., S.H., L.W.								6									
	13/02/2024	9.10AM	25°C	16.9km/hr	WSW	2.42	0.00	A.O., S.H., L.W.								12									
		1.55PM	24°C	25.9km/hr	S	0.21	0.00	A.O., S.H., L.W.								8									
	14/02/2024	7:55AM	14°C	20.9km/hr	SSE	2.24	0.00	A.O., S.H., L.W.								5			1						
		12:10PM	22°C	22.7km/hr	SSW	0.34	0.00	A.O., S.H., L.W.								6									
	15/02/2024	9.45AM	19°C	8.6km/hr	SE	2.07	0.00	A.O, J.A., J.M								7			2						
		2.45PM	24°C	25.2km/hr	SW	0.33	0.00	A.O, J.A., J.M								10									
	16/02/2024	8.45AM	20°C	5.8km/hr	NNE	1.94	0.00	A.O, L.W, E.B								6			1						
		2.10PM	27°C	25.9km/hr	SW	0.29	0.00	A.O, L.W, E.B								14									
Mutton Cove mangrove inlet Abundance									**0**	**0**	**0**	**0**	**0**	**0**	**0**	**302**	**21**	**0**	**0**	**13**	**24**	**0**	**0**	**0**	**0**	**580**
	19/12/2023	11.10AM	21°C	33.5km/hr	S	2.17	0.00	L.W., A.O.		18		2				150	8	12		8			2			
	20/12/2023	10.50AM	18°C	18.4km/hr	ESE	1.92	0.00	L.W., A.O.		24						320	2			2						
	21/12/2023	10.43AM	18°C	13.3km/hr	ESE	1.63	0.00	A.O., E.B.								200	4			2						
	22/12/2023	11:30AM	23°C	18.0km/hr	SW	1.33	0.00	A.O.JM		31						150				22						
	15/01/2024	11:00AM	26°C	18.4km/hr	SSW	2.51	0.00	A.O., S.H.								200	1	15		1						
	16/01/2024	11:20AM	31°C	2.2km/hr	WSW	2.34	0.00	A.O., S.H.		12						125		24		10						
	17/01/2024	10:50AM	18°C	38.2km/hr	SSW	2.16	0.00	A.O., S.H.		31						170				2						
	18/01/2024	10:45 AM	18°C	25.9km/hr	S	1.97	0.00	A.O., S.H., L.W.					7			200	1	21			2					
St Kilda Beach	19/01/2024	11.17AM	26°C	18.4km/hr	ENE	1.75	0.00	A.O., S.H.		31						170				2						
(Shoreline)	29/01/2024	10:55AM	27°C	18.0km/hr	SSW	2.54	0.00	A.O., S.H.		12							9	23								
	30/01/2024	11:03AM	27°C	19.1km/hr	SSW	2.54	0.00	J.M., A.O., S.H.									15	5		15	1					
	1/02/2024	10:47AM	22°C	14.8km/hr	S	2.23	0.00	A.O, LW		19										2	6					
	2/02/2024	11:05AM	26°C	2.2km/hr	W	2.08	0.00	A.O., J.A., E.B.		12						5				1						
	12/02/2024	10:50AM	28°C	11.5km/hr	S	2.55	0.00	A.O,S.H, L.W		24						100	4	12		12			8			
	13/02/2024	11:11AM	25°C	9.7km/hr	SSW	2.42	0.00	A.O., S.H., L.W.		25						65		9		9			6			
	14/02/2024	10:40AM	19°C	19.8km/hr	SSW	2.24	0.00	A.O., S.H., L.W.		19						115		15		2			9			
	15/02/2024	11:25AM	24°C	14.0km/hr	SW	2.07	0.00	A.O, J.A., J.M		17						120	1	16		22			11			
	16/02/2024	11:00AM	26°C	5.8km/hr	WSW	1.94	0.00	A.O, L.W, E.B		31						100		20		35			5			
St Kilda Beach (Shoreline) Total Abundance									**0**	**306**	**0**	**2**	**7**	**0**	**0**	**2190**	**45**	**172**	**0**	**147**	**9**	**0**	**41**	**0**	**0**	**7886**
	16/01/2024	10:20 AM	33°C	10.4km/hr	SW	2.34	0.00	A.O., S.H.					10				4					6				
	17/01/2024	10:18AM	18°C	35.6km/hr	SSW	2.16	0.00	A.O., S.H.		9			6				2					2				
	18/01/2024	10:52 AM	18°C	21.2km/hr	S	1.97	0.00	A.O., S.H., L.W.												3						
	19/01/2024	11:40AM	26°C	14.8km/hr	ENE	1.75	0.00	A.O., S.H.					1													
	29/01/2024	10:15AM	27°C	8.6km/hr	S	2.54	0.00	A.O., S.H.		3			6													
	30/01/2024	9:50AM	23°C	7.9km/hr	SW	2.46	0.00	J.M., A.O., S.H.		5			4													
Pt Gawler Shoreline Habitat	1/02/2024	10:10AM	22°C	5.4km/hr	SSE	2.23	0.00	A.O, LW		6																
	2/02/2024	10:20AM	22°C	4.7km/hr	ENE	2.08	0.00	A.O., J.A., E.B.		11										3	1					
	12/02/2024	10:15AM	28°C	0km/hr	SSW	2.55	0.00	A.O,S.H, L.W																		
	13/02/2024	10:22AM	23°C	23.8km/hr	SSW	2.42	0.00	A.O., S.H., L.W.																		
	14/02/2024	10:35AM	19°C	14.0km/hr	S	2.24	0.00	A.O., S.H., L.W.		4										6						
	15/02/2024	10:20AM	21°C	7.2km/hr	SSW	2.07	0.00	A.O, J.A., J.M		6																
	16/02/2024	11:00AM	26°C	5.8km/hr	WSW	1.94	0.00	A.O, L.W, E.B		8											4					
Port Gawler Shoreline Total Abundance									**0**	**52**	**0**	**0**	**27**	**0**	**0**	**0**	**6**	**0**	**0**	**12**	**5**	**8**	**0**	**0**	**0**	**267**
	20/12/2023	11.37AM	19°C	18.0km/hr	SE	1.92	0.00	L.W., A.O.								4	3			2						

Migratory Shorebird Survey Results

									Red-kneed Dotterel (*Erthrogonys cinctus*)	Red-necked Stint (*Calidris ruficollis*)	Rock Parrot (*Neophema petrophila*)	Royal Spoonbill (*Platalea regia*)	Sanderling (*Calidris alba*)	Sharp-tailed Sandpiper (*Calidris acuminata*)	Shingleback Lizard (*Tiliqua rugosa*)	Silver Gull (*Chroicocephalus novaehollandiae*)	Singing honeyeater (*Gavicalis virescens*)	Sooty Oystercatcher (*Haematopus fuliginosus*)	Spotted Crake (*Porzana porzana*)	*Welcome Swallow (Hirundo neoxena)*	White-faced Heron (*Egretta novaehollandiae*)	White-fronted Chat (*Epthianura albifrons*)	Willie Wagtail (*Rhipidura leucophrys*)	Wood Sandpiper (*Tringa glareola*)	Yellow-billed Tern (*Sternula superciliaris*)	**TOTAL ABUNDANCE**
EPBC ACT (E = Endangered, Mi = Migratory, Ma=Marine									Ma	Ma, Mi		Ma	Ma, Mi	Ma, Mi, V		Ma		Ma	Ma					Ma,Mi	Ma	
NP&W Act Listing																								Rare		
		Time	**Temp. ©**	**Wind (km/hr)**	**Wind Direction**	**Tide (m)**	**Rain (mm)**	**Observers**																		
Middle Beach Shoreline	21/12/2023	11:32 AM	21°C	4.3km/hr	SW	1.63	0.00	A.O., E.B.								10										
	22/12/2023	11:23AM	23°C	16.2km/hr	SW	1.33	0.00	A.O.JM								3				5	10					
	15/01/2024	10:55AM	27°C	18.7km/hr	SSW	2.51	0.00	A.O., S.H.								9	2			3	2					
Middle Beach Shoreline Total Abundance									**0**	**0**	**0**	**0**	**0**	**0**	**0**	**26**	**5**	**0**	**0**	**10**	**12**	**0**	**0**	**0**	**0**	**103**
Thompson Beach Shoreline	20/12/2023	10:00AM	18°C	12.6km/hr	SE	1.92	0.00	A.O., E.B				1		6		10	4			4	2					
	19/01/2024	11:00 AM	26°C	20.2km/hr	NE	1.75	0.00	A.O., S.H.				2					2			2						
	1/02/2024	11:10AM	24°C	13.3km/hr	SSW	2.23	0.00	A.O, LW									5			2						
	13/02/2024	10:50AM	23°C	12.6km/hr	S	2.42	0.00	A.O., S.H., L.W.				1					7			2	4					
Thompson Beach Shoreline Total Abundance									**0**	**0**	**0**	**4**	**0**	**6**	**0**	**10**	**18**	**0**	**0**	**10**	**6**	**0**	**0**	**0**	**0**	**113**
Bird Island Shoreline	31/01/2024	9:00AM	17°C	9.0km/hr	SE	2.36	0.00	A.O, L.W, S.H.		32						34	4				6					
Bird Island Shoreline Total Abundnace									**0**	**32**	**0**	**0**	**0**	**0**	**0**	**34**	**4**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**343**
Shoreline Refrence Sites Total Abundance									**0**	**390**	**0**	**6**	**34**	**6**	**0**	**2260**	**78**	**172**	**0**	**179**	**38**	**8**	**82**	**0**	**0**	**8428**
Thompson Beach Estuary	20/12/2023	10:50AM	18°C	12.6km/hr	ESE	1.92	0.00	A.O., E.B		24		1	12	18		82	4			12	13					
	19/01/2024	11:20AM	26°C	20.2km/hr	NE	1.75	0.00	A.O., S.H.		9				55		65				23	19					
	1/02/2024	12:00PM	23°C	16.6km/hr	SW	0.31	0.00	A.O, LW		22			8	27		90				12	21					
	13/02/2024	11:45AM	25°C	18.4km/hr	SW	0.29	0.00	A.O., S.H., L.W.		19						58				10	18					
Thompson Beach Estuary Total Abundance									**0**	**74**	**0**	**1**	**20**	**100**	**0**	**295**	**4**	**0**	**0**	**57**	**71**	**0**	**0**	**0**	**0**	**1215**
Bird Island Estuary	31/01/2024	10:30AM	18°C	18.7km/hr	S	2.36	0.00	A.O, L.W, S.H				2		18		30		38			9			4		
Bird Island Estuary Total Abundance									**0**	**0**	**0**	**2**	**0**	**18**	**0**	**30**	**0**	**38**	**0**	**0**	**9**	**0**	**0**	**4**	**0**	**432**
Estaurine Reference Sites Total Abundance									**0**	**74**	**0**	**3**	**20**	**118**	**0**	**325**	**4**	**38**	**0**	**57**	**80**	**0**	**0**	**4**	**0**	**1647**
Port Gawler Swale Drain	16/01/2024	10:40AM	31°C	10.1km/hr	WSW	2.34	0.00	A.O., S.H.								10					4					
	17/01/2024	10:50AM	19°C	38.2km/hr	SSW	2.16	0.00	A.O., S.H.								18										
	18/01/2024	11:57AM	19°C	23.0km/hr	SSW	1.97	0.00	A.O., S.H., L.W.								17					3					
	19/01/2024	12:10PM	26°C	11.5km/hr	E	1.75	0.00	A.O., S.H., L.W.								23										
	29/01/2024	10:27AM	23°C	12.2km/hr	SW	2.54	0.00	J.M., A.O., S.H.								20					1				1	
	30/01/2024	10:27AM	23°C	12.2km/hr	S	2.46	0.00	J.M., A.O., S.H.								20					1				1	
	1/02/2024	10:40AM	22°C	14.8km/hr	S	2.23	0.00	A.O, E.B								14										
	2/02/2024	10:50AM	22°C	0km/hr	SE	2.08	0.00	A.O, J..A								9										
	12/02/2024	10:00AM	28°C	1.8km/hr	S	2.55	0.00	A.O., S.H., L.W.													1					
	13/02/2024	11:00AM	25°C	10.1km/hr	S	2.42	0.00	A.O., S.H., L.W.								12										
	14/02/2024	11:01AM	19°C	16.2km/hr	SSW	2.24	0.00	A.O., S.H., L.W.													1					
	15/02/2024	10:50AM	21°C	13.3km/hr	SW	2.07	0.00	A.O, J.A, J.M								10					1					
	16/02/2024	11:40AM	26°C	13.3km/hr	SW	1.94	0.00	A.O, L.W, E,B													6					
Port Gawler Swale Drain Total Abundance									**0**	**0**	**0**	**0**	**0**	**0**	**0**	**153**	**0**	**0**	**0**	**0**	**18**	**0**	**0**	**0**	**2**	**427**
Falie Reserve swale drain	21/12/2023	8.30AM	14°C	18.7km/hr	ESE	1.6	0.00	A.O.	2		7						9			12						
	22/12/2023	8:32AM	20°C	7.2km/hr	NNE	1.2	0.00	A.O., J.M.	2																	
	2/02/2024	9:10AM	19°C	7.9km/hr	ENE	2.08	0.00		2																	
	16/02/2024	9.30AM	20°C	4.3km/hr	ENE	1.8	0.00																			
Osborne Failie Reserve Total Abundance									**6**	**0**	**7**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**148**
Swale Drain Reference Sites Total Abundance									**6**	**0**	**7**	**0**	**0**	**0**	**0**	**153**	**9**	**0**	**0**	**12**	**18**	**0**	**0**	**0**	**2**	**575**

Appendix C

Survey Site Descriptions

Detail	Location and description
Strategic Assessment Survey Area Shoreline	
Description	This area provides tidal habitat, used for foraging, roosting and shelter by a range of migratory birds including shorebirds. This habitat provides abundant feeding grounds for migratory bird species. Additionally, this area was found to be relatively undisturbed allowing for these organic substrates to develop, with also moderate presence of invasive species present as well.
Introduced species	– **Animals:** • European rabbit (*Oryctolagus cuniculus*) • Red fox (*Vulpes vulpes*) – footage from the remote cameras shows the red fox is a frequent and regular visitor to this environment, creating high predation pressure on migratory birds. – **Plants:** • African boxthorn (*Lycium ferocissimum*) – Weeds of National Significance (WoNS) • Silverleaf nightshade *(Solanum elaeagnifolium)* • Buffel grass *(Cenchrus ciliaris)*
Photos	 *Image C1 Strategic Assessment Area shoreline (Photo: GHD)*  *Image C2 Red fox (vulpes vulpes) at Strategic Assessment Area shoreline (Photo: GHD – remote trail camera)*
Strategic Assessment Survey Area Swale Drain	
Description	This area provides constructed wetland (swale drain) habitat with coastal saltmarsh and groundcover along the edges of the water body and aquatic vegetation (reeds) within, as shown in Image C4. This survey area provides habitat for foraging, roosting and shelter for a range of migratory birds, particularly shorebirds. This area was found to be moderately disturbed by invasive plants and stormwater run-off impacts onto the swale drain were observed specifically. The swale drain is ephemeral in nature, with surface water pooling in the drain forming a marsh following rainfall. During periods of rainfall, surface water drains from west to east, discharging into the Port Adelaide River.

Detail	Location and description
Introduced species	– **Animals:** • Common starling (*Sturnus vulgaris*) • Common blackbird (*Turdus merula merula*) • European rabbit (*Oryctolagus cuniculus*) – **Plants:** • African boxthorn (*Lycium ferocissimum*) – Weed of National Significance (WoNs) • Onion weed (*Asphodelus fistulosus*) • Artichoke thistle (*Cynara cardunculus*)
Photos	 *Image C3 Eastern detention basin (Photo: GHD)*  *Image C4 Black-winged stilts (Himantopus himantopus) in the eastern detention basin (Photo: GHD)*

Detail	Location and description
Falie Reserve Swale Drain	
Description	Falie Reserve is within the onshore Strategic Assessment Area and provides constructed wetland habitat. The drainage line located in Falie Reserve supports samphire shrubland and other planted vegetation.
Photo	 *Image C9 Falie Reserve swale drain (Photo: GHD)*
Mutton Cove Mangrove Inlet	
Description	The Mutton Cove mangrove inlet is east of the southern onshore Strategic Assessment Area and provides an estuarine habitat with samphire, mangrove and saltmarsh vegetation which is tidally inundated providing diverse substrates to support foraging habitat for migratory shorebirds.
Photos	 *Image C5 Tidally inundated estuarine habitat at the inlet at Mutton Cove Conservation Reserve (Photo: GHD)*  *Image C6 Common sandpiper foraging at low tide at the inlet at Mutton Cove Conservation Reserve (Photo: GHD)*

Detail	Location and description
Bird Island Conservation Area (Shoreline and Estuary)	
Description	Bird Island is located approximately 2.5 km northwest of the onshore Strategic Assessment Survey Area. It provides both tidal flat habitat and estuarine habitat on different areas of the island. Coast saltbush and samphire have colonised the higher points (sand dunes) of the island, while mangroves have established within more protected areas.
Photos	 *Image C7 Shoreline and sand dunes on Bird Island (Photo: GHD)*  *Image C8 Sooty oystercatchers in the mangroves on Bird Island (Photo: GHD)*

Detail	Location and description
St. Kilda Beach (Shoreline)	
Description	St Kilda Beach is located approximately 4 km northeast of the Strategic Assessment Area and provides tidal flat habitat for migratory birds, particularly shorebirds, surrounded by mangroves and other coastal vegetation.
Photos	 *Plate C10 St Kilda Beach foreshore (Photo: GHD)*  *Plate C11 Masked lapwing, red-capped plovers, and red-necked stints at St Kilda Beach foreshore (Photo: GHD)*
Port Gawler Beach (Shoreline)	
Description	Port Gawler Beach is approximately 15 km north of the Strategic Assessment Area and provides tidal flat habitat, featuring mangrove forests that grow close to the shore and extend into the intertidal zone. Samphire, saltbush, and pigface are present around the shoreline. It provides a sheltered foraging area for shorebirds.
Photo	 *Plate C12 Caspian terns and a masked lapwing at Port Gawler Beach during low tide (Photo: GHD)*

Detail	Location and description
Port Gawler Swale Drain	
Description	The Port Gawler swale drain is located within salt evaporation ponds, not far from the Port Gawler Beach (approximately 14 km north of the Strategic Assessment Area). During the surveys, the swale drain was typically full or partially full of water and used mostly by shorebirds as foraging or resting habitat. There was minimal vegetation growing along the edge of the drain and some rubbish was present (old tyres).
Photo	 *Image C13 Port Gawler swale drain (Photo: GHD)*
Middle Beach Shoreline	
Description	Middle Beach is located approximately 20 km north of the Strategic Assessment Survey Area. It provides tidal flat habitat with a dense mangrove fringe that creates habitat for many migratory and non-migratory shorebirds. There is an expanse of samphire on the foreshore.
Photo	 *Image C14 Middle Beach foreshore (Photo: GHD)*
Thompson Beach (North and South)	

Detail	Location and description
Description	Thompson Beach is the northern gateway of the Adelaide International Bird Sanctuary and is located approximately 37–40 km north of the Strategic Assessment Area. The Adelaide International Bird Sanctuary is noted for its bird diversity, particularly shorebirds and coastal birds. It provides tidal habitat, creating foraging habitat for shorebirds. The beach is fringed by samphire and other coastal vegetation and further inland is an extensive saltpan.
Photo	 *Image C15 Thompson Beach shoreline (Photo: GHD)*

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Appendix C

Likelihood of occurrence assessment

Table C1 Likelihood of occurrence assessment for listed threatened plants, listed threatened animals, listed migratory species and listed marine species

Scientific name Common name Data source	EPBC Act			NP&W Act	Habitat and distribution	Strategic Assessment Area in species' known distribution	Likelihood of occurrence	Likelihood reason
	Threatened status	Migratory	Marine	Threatened status				
Plants								
Acacia dodonaeifolia Hop-leaved wattle NP&W	–	–	–	Rare	– Species is endemic to South Australia, scattered in coastal areas from the eastern Eyre Peninsula to Naracoorte and Keith (Maslin 2024a). – Found in coastal areas in eucalypt woodland and open forest, and grows in sand or loam (Maslin 2024a).	Within species distribution extent	Potential	– Species recorded within the last 10 years in the surrounding region. – Species known distribution could encompass the Strategic Assessment Area. – No suitable habitat present in the Strategic Assessment Area.
Acacia iteaphylla Flinders Ranges wattle NP&W	–	–	–	Rare	– Mainly found in southwest Western Australia and eastern South Australia, occurring from Gawler Range and Flinders Ranges as well as near Port Lincoln, Eyre Peninsula (Maslin 2024b). – Grows on hills among rocky outcrops or valleys along rocky creeks (Maslin 2024b).	Near species distribution extent	Unlikely	– Species recorded within the last 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Atriplex australasica Swollen spear-grass NP&W	–	–	–	Rare	– Species in Tasmania and southeastern Australia, mainly occurring around the Adelaide and Gawler areas (Wilson 2020). – Inhabits coastal areas in wet, brackish environments (Wilson 2020).	Within species distribution extent	Unlikely	– Historical records greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Bothriochloa macra Red-leg grass NP&W	–	–	–	Rare	– Species distributed across southeastern Australia. In South Australia it mainly occurs along the coast from Port Augusta to Mount Gambier (ALA 2024a). – Grows in grasslands and grassy woodland, that are often degraded (SASCC 2023a).	Within species distribution extent	Unlikely	– Historical records greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Caladenia tensa Greencomb spider-orchid, rigid spider-orchid PMST	Endangered	–	–	–	– Widespread within eastern South Australia and Victoria (TSSC 2016). – Occurs in cypress pine forest, yellow gum and broombush mallee on sandy soils (TSSC 2016). – Species has recovery plans (Recovery Plan for twelve threatened Spider-orchid Caladenia taxa (Orchidaceae: Caladeniinae) of Victoria and South Australia 2000-2004) (Todd 2000).	Within species distribution extent	Highly unlikely	– Strategic Assessment Area outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Calotis scapigera Tufted burr-daisy NP&W	–	–	–	Rare	– Distributed across southeast Australia. In South Australia it mainly occurs along the Murray River, with some records in the greater Adelaide region (ALA 2024b). – Occurs in flood-prone areas in saltbush and river red gum communities, on damp clay soils (SASCC 2023b).	Within species distribution extent	Highly unlikely	– Historical record greater than 10 years ago in the Strategic Assessment Area. – No suitable habitat present in the Strategic Assessment Area.
Centrolepis cephaloformis ssp. cephaloformis Cushion centrolepis NP&W	–	–	–	Rare	– Species found in Western Australia, Victoria and South Australia where it occurs throughout the Eyre Peninsula and the greater-Adelaide region (ALA 2024c). – Grows in mallee and disturbed communities, as well as the margins of clay pans and salt marshes, on sand and other infertile soils (ALA 2024c).	Within species distribution extent	Unlikely	– Historical record greater than 10 years ago in the Strategic Assessment Area. – Record most likely incorrectly transcribed data. – Suitable habitat present in the Strategic Assessment Area.
Centrolepis glabra Smooth centrolepis NP&W	–	–	–	Rare	– Species found across southern Australia, being distributed across the lower Eyre Peninsula, Yorke Peninsula, Kangaroo Island and southern Mount Lofty Ranges (SASCC 2023c). – Grows in mud around temporary freshwater pools and stream margins (SASCC 2023c).	Within species distribution extent	Unlikely	– Historical records greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.

Scientific name Common name Data source	EPBC Act			NP&W Act	Habitat and distribution	Strategic Assessment Area in species' known distribution	Likelihood of occurrence	Likelihood reason
	Threatened status	Migratory	Marine	Threatened status				
Crassula exserta Large-fruit crassula NP&W	–	–	–	Rare	– Species found throughout southern Australia. In South Australia the species occurs mainly on the Eyre Peninsula, as well as the Yorke Peninsula and Limestone Coast (ALA 2024e, DEW 2024b). – Inhabits granite outcrops, around swamps in depressions and saline mud flats (ALA 2024e).	Within species distribution extent	Unlikely	– Species record from greater than ten years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Eragrostis infecunda Barren cane-grass NP&W	–	–	–	Rare	– Species distributed across southern Australia. In South Australia the species mainly occurs in the Yorke Peninsula, Murray and Mallee region and Limestone Coast (ALA 2024f). – Inhabits the margins of marshes, levees, floodplains, watercourses and depressions subject to periodic inundation, on cracking clay or alluvial sandy loam soils (ALA 2024f).	Within species distribution extent	Unlikely	– Species records greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Euphrasia collina ssp. Osbornii Osborn's eyebright NP&W	–	–	–	Endangered	– Endemic to South Australia, mainly occurring in eastern Kangaroo Island, Eye Peninsula, Yorke Peninsula, throughout the Mount Lofty Ranges and Flinders Ranges (DCCEEW 2024a). – Grows in mallee scrubland, sclerophyll forest and woodland (DCCEEW 2024a).	Within species distribution extent	Highly unlikely	– Species records from greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Juncus radula Hoary rush NP&W	–	–	–	Vulnerable	– Found across southern Australia (ALA 2024g), occurring in the southern Flinders Ranges, Mount Lofty Ranges and the upper south-east (SASCC 2023d). – Inhabits in seasonally damp areas, in depressions and along drainage lines in woodland and open grassland (SASCC 2023d).	Within species distribution extent	Potential	– Species records from greater than 10 years in the surrounding region. – Vegetation communities in which the species is known to occur within the Strategic Assessment Area (*Bolboschoenus caldwellii* and *Cyperus gymnocaulos* sedgeland).
Leionema hillebrandii Mount Lofty phebalium NP&W	–	–	–	Rare	– Species endemic to South Australia, specifically the southern Mount Lofty Ranges (SASCC 2023e). – Grows in heathy woodlands and forest gullies, often in open rocky habitat along steep gullies (SASCC 2023e).	Near species distribution extent	Highly unlikely	– Species records from greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Mentha diemenica Slender mint NP&W	–	–	–	Rare	– Distributed throughout southern Australia, occurring mainly throughout the Yorke Peninsula (ALA 2024i). – Grows in damp locations in montane woodlands and grassland, in clay to sandy soils (ALA 2024i).	Near species distribution extent	Highly unlikely	– Species records from greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Myoporum parvifolium Creeping boobialla NP&W	–	–	–	Rare	– Species found in southern areas of Australia; in South Australia it occurs throughout the Eyre Peninsula (ALA 2024j). – Grows on limestone cliffs, along river flats and in woodlands in sandy soils (ALA 2024j).	Near species distribution extent	Highly unlikely	– Species record from greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Picris squarrosa squat picris NP&W	–	–	–	Rare	– Species found along the Murray River and on the Yorke Peninsula in South Australia, as well as in southwest Western Australia, Victoria and New South Wales (ALA 2024k). – Grows on coastal dunes, in alluvium along rivers and disturbed ground (SASCC 2023f).	Near species distribution extent	Highly unlikely	– Species record from greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Poa fax Scaly poa NP&W	–	–	–	Rare	– Species is distributed along the coastlines of the Eyre Peninsula, Yorke Peninsula and Kangaroo Island to the Victorian birder, as well as in Victoria and New South Wales (ALA 2024l, DEW 2024b). – Occurs in grasslands and meadows, both in the shade and open habitat (Simon 2010).	Within species distribution extent	Highly unlikely	– Species record from greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Potamogeton ochreatus Blunt pondweed NP&W	–	–	–	Rare	– Distributed across many parts of Australia. In South Australia it occurs mainly on the Fleurieu Peninsula and Kangaroo Island (ALA 2024m). – Inhabits in permanent and near-permanent waterbodies (Papassotiriou *et al.* 2020).	Within species distribution extent	Highly unlikely	– Species record from greater than 10 years in the surrounding region. – Historical record is most likely incorrectly transcribed data. – No suitable habitat present in the Strategic Assessment Area.
Prasophyllum pallidum Pale leek-orchid PMST	Vulnerable	–	–	Rare	– Distributed across in south-east South Australia from Flinders Ranges to the southern Lofty regions (DEWHA 2008a). – Orchids are found singly and in groups in well-grassed open forests (DEWHA 2008a).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Prasophyllum validum Sturdy leek-orchid, Mount Remarkable leek-orchid PMST	Vulnerable	–	–	Vulnerable	– Species is distributed across the Victorian and South Australian inland being dominant in the Mount Remarkable National Park (Duncan 2010). – The species inhabits open forests with a low understorey on loamy soils (Duncan 2010, DEW 2007). – Species has recovery plan (National Recovery Plan for the Sturdy Leek Orchid Prasophyllum pallidum) (Duncan 2010).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Prostanthera chlorantha Green mintbush NP&W	–	–	–	Rare	– Species is endemic to South Australia, found mainly on the Yorke Peninsula and Kangaroo Island (ALA 2024n). – Grows in mallee and shrubland on sandy and loamy soils (ALA 2024n, DEH 2008a).	Near species distribution extent	Highly unlikely	– Species record from greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Pterostylis arenicola Sandhill greenhood orchid PMST	Vulnerable	–	–	Vulnerable	– Species endemic to and distributed across south-east South Australia (DEWHA 2008b). – Species is found in mallee and native pine woodland with an understorey, located on undulating or sloping environments (Landscape South Australia Murraylands and Riverlands 2015).	Near species distribution extent	Unlikely	– Species recorded from the previous five to ten years within the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Rorippa laciniata Jagged bitter-cress NP&W	–	–	–	Rare	– Species occurs mainly on the Fleurieu Peninsula in South Australia (ALA 2024o). – Grows on river flats (YRC 2024a).	Within species distribution extent	Highly unlikely	– Species record greater than 10 years ago in the Strategic Assessment Area. – No suitable habitat present in the Strategic Assessment Area. – Historical record most likely incorrectly transcribed data.
Rytidosperma laeve Smooth wallaby-grass NP&W	–	–	–	Rare	– In South Australia the species mainly occurs throughout the greater Adelaide area and Fleurieu Peninsula (ALA 2024p). – Grows in lowland forests in moist soils (YRC 2024b).	Within species distribution extent	Unlikely	– Species recorded greater than ten years ago in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Sclerolaena muricata var. villosa Five-spine bindyi NP&W	–	–	–	Rare	– In South Australia, the species occurs in the Yorke Peninsula, Murray Mallee, and the greater-Adelaide area (ALA 2024q). – Found in coastal regions and overgrazed paddocks (DIT 2009).	Within species distribution extent	Unlikely	– Species recorded from the previous five to ten years within the surrounding region. – Species records from greater than ten years ago in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Senecio macrocarpus Large-fruit fireweed, large-fruit groundsel PMST	Vulnerable	–	–	Vulnerable	– Species is endemic to south-eastern South Australia (Sinclair 2010). – Species is found in grasslands, sedgelands, shrublands, and woodlands and generally on sparsely vegetated sites with sandy and clay soils in depressions that are waterlogged in winter (Sinclair 2010). – Species has recovery plan (National Recovery Plan for the Large-fruit Groundsel Senecio macrocarpus) (Sinclair 2010).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Swainsona pyrophila Yellow swainson-pea PMST	Vulnerable	–	–	Rare	– Species is distributed across south-east South Australia, predominately on the Eyre Peninsula (Tonkinson & Robertson 2010). – Inhabits mallee woodland and is associated with a range of soils including well-drained sands, sandy loams and heavier clay soils (Tonkinson & Robertson 2010). – Species has recovery plan (National Recovery Plan for Yellow Swainson-pea Swainsona pyrophila) (Tonkinson & Robertson 2010).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Tecticornia flabelliformis Bead glasswort, bead samphire PMST	Vulnerable	–	–	Endangered	– The bead glasswort is distributed across the coastal areas of South Australia (DEW 2024b, Carter 2010). – Occurs in saline environments such as salt flats, coastal tidal flats and coastal and sub-coastal salt pans and clay pans (DEH 2008). – Species has recovery plan (National Recovery Plan for the Bead Glasswort Tecticornia flabelliformis) (Carter 2010).	Within species distribution extent	Unlikely	– Species observed on Torrens Island (reference site). – Species record from greater than ten years ago in surrounding region. – No suitable habitat in the Strategic Assessment Area.
Triglochin minutissima Tiny arrowgrass NP&W	–	–	–	Rare	– Distributed across the Eyre Peninsula, Yorke Peninsula and Kangaroo Island in South Australia (ALA 2024r). – Grows near coastal saltmarshes and salt lakes in damp, saline soils (SASCC 2023g).	Within species distribution extent	Potential	– Species records greater than 10 years in the surrounding region. – Vegetation communities in which the species may occur within the Strategic Assessment Area.
Zieria veronicea ssp. veronicea Pink zieria NP&W	–	–	–	Rare	– The species is mainly distributed across the Yorke Peninsula, Murray and Mallee and Kangaroo Island in South Australia. It also occurs in Victoria and Tasmania (ALA 2024s). – Grows in heath or heathy woodland (ALA 2024s).	Within species distribution extent	Unlikely	– Species records greater than 10 years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Animals								
Birds								
Acanthiza iredalei rosinae Slender-billed thornbill (Gulf St Vincent) PMST	Vulnerable	–	–	Vulnerable	– Inhabiting samphire dominated shrublands located on saline mudflats (DoE 2015a). – Distributed across the northern shores of Gulf St Vincent (DEW 2024b).	Within species distribution extent	Likely	– Species recorded from previous five to ten years in the surrounding region. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that the species would be able to access the Strategic Assessment Area.
Actitis hypoleucos Common sandpiper NP&W PMST	–	Yes	Yes	Rare	– Mainly occur in the north and west of Australia, occurring along the coast in South Australia, more so in the east (DEW 2024b, Australian Museum 2020a). – Inhabits freshwater and saltwater wetlands inland and along Australia's coast, mostly found on rocky or muddy shorelines (Australian Museum 2020a).	Within species distribution extent	Known	– Recorded in the Strategic Assessment Area in field surveys. – Habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Anhinga novaehollandiae novaehollandiae Australasian darter NP&W	–	–	–	Rare	– Distributed across Australia, occurring along the Murray River, Adelaide region and inland east of South Australia (DEW 2024b, BirdLife Australia 2024a). – Inhabits saline and freshwater waterbodies with trunks, stumps and branches on their banks (BirdLife Australia 2024a).	Within species distribution extent	Unlikely	– Species records within and greater than ten years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Anthus australis Australasian pipit	–	–	Yes	–	– Widely distributed across Australia (Australian Museum 2022). – Species inhabits a range of habitat types including saltmarshes, dry shrublands and woodland clearings (Australian Museum 2022).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years within the surrounding region. – Suitable habitat within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Aphelocephala leucopsis Southern whiteface PMST	Vulnerable	–	–	–	– Inhabits open, dry woodland and shrublands that have a dense understorey with fallen trees and stumps (BirdLife Australia 2024b). – Distributed across all South Australia in drier woodlands (DEW 2024b, BirdLife Australia 2024b).	Near species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Apus pacificus Fork-tailed swift PMST	–	Yes	Yes	–	– Distributed across Asia and Australia, occasionally recorded in North America and New Zealand (BirdA 2024). – Inhabits mainly urban and coastal areas, across a variety of climatic zones and habitats (BirdA 2024).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years within the surrounding region. – Suitable habitat within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Ardea intermedia plumifera Plumed egret NP&W	–	–	Yes	Rare	– Distributed across Australasia, more prevalent in the north and east of Australia then in the south (BirdLife International 2024a). In South Australia, the species is distributed across the east, more prevalent toward the coast (DEW 2024b). – Species inhabits shallow water in intertidal zones and along the edges of freshwater wetlands (Simpson & Day 2013).	Within species distribution extent	Potential	– Species records within and greater than ten years in the surrounding region. – Suitable habitat within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Ardea modesta Eastern great egret Field survey	–	–	Yes	–	– Distributed across Australia, predominantly along the coastline and inland waterways (Australian Museum 2024b). – Inhabits shallow water, particularly flowing water, but may be found on any watered area including damp grasslands (Australian Museum 2024b).	Within species distribution extent	Known	– Species was recorded in the Strategic Assessment are in a field survey.
Ardenna carneipes Flesh-footed shearwater NP&W PMST	–	Yes	Yes	Rare	– The species is distributed throughout the Pacific and Indian oceans, breeding on islands off the of South Australia such as Smith Island (TSSC 2014). In South Australia, the species occurs along the southern coast and out to sea (DEW 2024b). – Inhabits pelagic environments, often found over continental shelves and slopes (BirdLife Australia 2024c).	Near species distribution extent	Unlikely	– Species records greater than ten years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Ardenna grisea Sooty shearwater PMST	Vulnerable	Yes	Yes	–	– Distributed in the coastal waters of southeast South Australia, mainly east of Adelaide (DEW 2024b). – Forages in open water and nests on forested and scrubbish islands and headlands (DCCEEW 2023c, BirdLife International 2024b). – Species breeds in South Australia (BirdLife International 2024b).	Near species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species distribution. – No suitable habitat present in the Strategic Assessment Area.
Arenaria interpres Ruddy turnstone PMST	Vulnerable	Yes	Yes	Rare	– Species is distributed along the coastline of the South Australia, predominately east of Ceduna (DEW 2024b). – The species prefers rockier coastlines in South Australia and are less likely to be found on large mudflats (DCCEEW 2024b).	Within species distribution extent	Potential	– Historical records greater than ten years in the surrounding region. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Biziura lobata menziesii Musk duck NP&W	–	–	Yes	Rare	– Endemic to Australia, the species is distributed all over the country. In South Australia, the species occurs inland, concentrated toward the coast in the east (Australian Museum 2020b). – Inhabits a variety of saline and freshwater environments including marshes, swamps, estuaries, coastal waters and saline lagoons (BirdLife International 2024c).	Within species distribution extent	Potential	– Species records within and greater than ten years in the surrounding region. – Suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Botaurus poiciloptilus Australasian bittern PMST	Endangered	–	–	–	– Distributed in the south east of South Australia, mainly around the Fleurieu Peninsula (DEW 2024b, BirdLife Australia 2024d). – The species mainly inhabits freshwater wetland environments dominated by sedges, rushes and reeds. Can inhabit saline environments but prefers freshwater (BirdLife Australia 2024d, TSSC 2019a). – Species has recovery plan (National Recovery Plan for the Australasian Bittern) (DCCEEW 2022a).	Within species distribution extent	Unlikely	– Species records from the previous five to ten years in the surrounding region. – Species mobility such that the species could access the Strategic Assessment Area. – Species habitat is not present within the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Bubulcus ibis coromandus Eastern cattle egret NP&W	–	–	–	Rare	– Distributed throughout coastal regions in Australia, with some of the population migrating to New Zealand (DCCEEW 2024c). In South Australia the species is found in the northern regions of Adelaide, around Lake Alexandrina and along the coast (DEW 2024b). – Species inhabits terrestrial wetlands, wooded areas and grasslands in both tropical and temperate regions. Is known to follow earthmoving equipment around (DCCEEW 2024c).	Within species distribution extent	Unlikely	– Species records within and greater than ten years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Burhinus grallarius Bush stone-curlew NP&W	–	–	–	Rare	– The species is distributed throughout mainland Australia, although now scarce in south-eastern states (BirdLife International 2024). – The species usually inhabits grassland and woodland environments (OEH 2017, Birdlife Australia 2024s).	Within species distribution extent	Likely	– Observed in reference site in recent surveys.
Calidris acuminata Sharp-tailed sandpiper PMST	Vulnerable	Yes	Yes	–	– Distributed throughout South Australia, predominately on the coast (DEW 2024b). – Species forages in coastal and freshwater wetlands and mudflats (DCCEEW 2024d, BirdLife International 2024d).	Within species distribution extent	Known	– The species was recorded in a field survey. – Habitat is present in the Strategic Assessment Area.
Calidris alba Sanderling NP&W PMST	–	Yes	Yes	Rare	– The species migrates to sandy beaches worldwide following breeding in the Arctic (Cornell University 2024). – Whilst wintering, the species commonly inhabits sandy beaches and less commonly mudflats, lakeshores and riversides (Cornell University 2024).	Within species distribution extent	Likely	– The species was recorded at a reference site in a field survey – Small pockets of habitat are present within the Strategic Assessment Area
Calidris canutus Red knot, knot PMST	Vulnerable	Yes	Yes	Endangered	– Inhabits coastal environments ranging from tidal sandflats and mudflats of estuaries, mangrove swamps and beaches (BirdLife International 2024e). – Migrate to Australia during austral summer, with the main population being recorded in north-west Australia (DCCEEW 2024e).	Not within species distribution extent	Unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – Species mobility such that the species could access the Strategic Assessment Area.
Calidris ferruginea Curlew sandpiper PMST	Critically Endangered	Yes	Yes	Endangered	– Distributed across southeast South Australia, predominately on the coast (DEW 2024b). – Inhabits inland wetland environments, intertidal mudflats and sandflats in sheltered areas such as bays, harbours and estuaries (BirdLife 2024, DCCEEW 2023d).	Within species distribution extent	Potential	– Species records greater than ten years ago in the Strategic Assessment Area. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that species could access the Strategic Assessment Area.
Calidris melanotos Pectoral sandpiper NP&W PMST	–	Yes	Yes	Rare	– Primarily distributed in the southeast of South Australia around the Murray River, west to the Yorke Peninsula and sporadically reported in northern South Australia (DCCEEW 2024f, DEW 2024b). – Inhabits saltmarshes, bays, estuaries, lakes, artificial wetlands, creeks and submerged grasslands (DCCEEW 2024f).	Within species distribution extent	Potential	– Species records within ten years in the surrounding region. – Species mobility such that the species could access the Strategic Assessment Area. – Suitable habitat present in the Strategic Assessment Area.
Calidris pugnax Ruff NP&W	–	Yes	Yes	Rare	– Recorded in every state in Australia, although rarely observed. Distributed along the coast from Whyalla, south to Lake Alexandrina, in the east of South Australia (DEW 2024b, DCCEEW 2024g) – Species inhabits saline wetlands with exposed mudflats, tidal rivers, marshy fields, sheltered coasts and harbours (DCCEEW 202g4).	Within species distribution extent	Potential	– Species records greater than ten years in the surrounding region. – Suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Calidris ruficollis Red-necked stint PMST	–	Yes	Yes	–	– Distributed throughout the East Asian-Australasian flyway and across the Australian coastline (BirdLife International 2024f) – When in South Australia, the red-necked stint inhabits mudflats in estuarine wetlands, sand flats and inland salt lakes (Government of South Australia 2013)	Within species distribution extent	Known	– Recorded in the Strategic Assessment Area in field surveys.

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	Threatened status	Migratory	Marine	Threatened status				
Calidris subminuta Long-toed stint PMST	–	Yes	Yes	Rare	– Distributed sparsely in coastal areas of Australia. In South Australia it has been recorded from Bool Lagoon, west to Big and Little Swamps, and on the southern end of the Eyre Peninsula—in The Coorong, Langhorne Creek, St Kilda and the Price Saltworks (DCCEEW 2024x). – Mainly inhabits shallow freshwater or brackish wetlands, including lakes, swamps, river floodplains, streams, lagoons and sewage ponds, as well as muddy shorelines (DCCEEW 2024x).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years within the surrounding region. – Suitable habitat within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Calidris tenuirostris Great knot PMST	Vulnerable	Yes	Yes	Endangered	– Distributed throughout South Australia, with higher density on the coast (DEW 2024b), the species is known to be more common in northern Australia (DCCEEW 2024h). – Inhabits intertidal mudflats and sandflats in sheltered coastal areas such as bays, harbours and estuaries (DCCEEW 2024h, BirdLife Australia 2024e).	Within species distribution extent	Potential	– Species records from greater than ten years ago in the surrounding region. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Cereopsis novaehollandiae novaehollandiae Cape barren goose NP&W	–	–	Yes	Rare	– Distributed across the south of Australia, occurring along and off the coast of South Australia from Ceduna to the Victorian border (DEW 202b4, Australian Museum 2024). – Inhabits pastures, tussock grass or low heathy scrub on offshore islands (Australian Museum 2024).	Within species distribution extent	Unlikely	– Species recorded greater than ten years ago in the surrounding region. – Species mobility such that the species could access the Strategic Assessment Area. – No suitable habitat in the Strategic Assessment Area.
Chalcites osculans Black-eared cuckoo PMST	–	–	Yes	–	– Distributed widely across mainland Australia (BirdLife Australia 2024v). – Inhabits open woodlands and shrublands containing mulga and mallee species, as well as in vegetation along creek beds (BirdLife Australia 2024v).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years within the surrounding region. – Suitable habitat within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Charadrius bicinctus Double-banded plover PMST	–	Yes	Yes	–	– Distributed across Australia and New Zealand, in coastal and marine areas. In Australia it is most common between the Tropic of Capricorn and western Eyre Peninsula (DCCEEW 2024y). – Inhabits littoral, estuarine and saline terrestrial wetlands, as well as saltmarsh, grasslands and on muddy, sandy or rocky beaches, bays and inlets, and harbours (DCCEEW 2024y).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years within the surrounding region. – Suitable habitat within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Charadrius leschenaultii Greater sand plover, large sand plover PMST	Vulnerable	Yes	Yes	Rare	– Distributed along the southeast coast of South Australia (DEW 2024b) although more commonly found in Northern Australia (OEH 2021). – Species inhabits intertidal mudflats, sandbanks, saltmarshes and estuaries (DCCEEW 2023e).	Within species distribution extent	Potential	– Species record from greater than ten years in the surrounding region. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Charadrius mongolus Lesser sand plover, Mongolian plover NP&W PMST	Endangered	Yes	Yes	Endangered	– Distributed throughout coastal areas in Australia, occurring in the eastern coastal areas of South Australia (DEW 2024b, DCCEEW 2024i). – Inhabits littoral shore zones and estuarine environments such as mudflats and intertidal sandflats in protected harbours, estuaries and bays (DCCEEW 2024i).	Within species distribution extent	Potential	– Species records from greater than ten years ago in the surrounding region. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Charadrius ruficapillus Red-capped plover PMST	–	–	Yes	–	– Distributed across Australia, mainly along the coast and inland rivers (ALA 2024w). – Inhabits open freshwater wetlands, coastal bays, beaches and inlets (ALA 2024w).	Within species distribution extent	Likely	– Observed at reference site in recent field surveys. – Habitat present in the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Charadrius veredus Oriental plover, oriental dotterel PMST	–	Yes	Yes	–	– Distributed mainly in northern Australia, in both coastal and inland areas, and is uncommon in South Australia (DCCEEW 2024z). – Inhabits estuarine mudflats and sandbanks, sandy and rocky ocean beaches and near-coastal grasslands (DCCEEW 2024z).	Within species distribution extent	Potential	– Species records from greater than ten years ago in the surrounding region. – Suitable habitat within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Chroicocephalus novaehollandiae Silver gull PMST	–	–	Yes	–	– Distributed throughout most coastal areas in Australia (ALA 2024x). – Inhabits coastal bays and further inland, near urban areas (ALA 2024x).	Within species distribution extent	Known	– Species was recorded in the Strategic Assessment are in a field survey.
Cladorhynchus leucocephalus Banded stilt NP&W	–	–	–	Vulnerable	– Endemic to Australia, primarily distributed in the south. In South Australia the species is mainly found along The Coorong and in the north of Gulf of Carpentaria with sparse recordings inland (DEW 2024b, BirdLife Australia 2024f). – Primarily inhabit large, open, shallow saline and hypersaline inland and coastal waters (BirdLife Australia 2024f).	Within species distribution extent	Likely	– Observed at reference site at recent field surveys. – Habitat present in the Strategic Assessment Area.
Corcorax melanorhamphos White-winged chough NP&W	–	–	–	Rare	– Found in most of eastern and southeastern Australia, with a concentrated distribution in the region east of Yatala and south of Port Augusta (DEW 2024b, BirdLife Australia 2024g). – Inhabits woods and open forests, favouring wetter areas with an abundance of leaf litter and mud for building nests (BirdLife Australia 2024g).	Within species distribution extent	Unlikely	– Species record from five to ten years ago within the Strategic Assessment Area. – No suitable habitat present in the Strategic Assessment Area.
Coturnix ypsilophora australis Brown quail NP&W	–	–	–	Vulnerable	– Occurs in southwestern, northern and eastern Australia. Distributed mostly in eastern South Australia, mostly in the south but also recorded inland (DEW 2024b). – Species inhabits irrigated pastures, dense crops, grasslands, sedgelands and areas that are dominated by native flora species (DEH 2008b).	Within species distribution extent	Potential	– Observed at reference site in recent field surveys. – No preferred habitat in Strategic Assessment Area.
Diomedea antipodensis Antipodean albatross PMST	Vulnerable	Yes	–	–	– This species mainly inhabits deep waters of the southern oceans, only coming to shore to breed (BirdLife International 2024g). – Endemic to New Zealand but forages near the shore of South Australia (BirdLife International 2024g). – Species has recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2022b).	Near species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species distribution. – No suitable habitat present in the Strategic Assessment Area.
Diomedea epomophora Southern royal albatross PMST	Vulnerable	Yes	Yes	Vulnerable	– Species distributed throughout the open oceans of the southern hemisphere (BirdLife International 2024h, LaGosh 2004). – Breeds on sub-Antarctic and Antarctic islands (LaGosh 2024). – Species has recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2022b).	Near species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Diomedea exulans Wandering albatross PMST	Vulnerable	Yes	Yes	Vulnerable	– Species is distributed throughout the southern oceans, breeding on Antarctic and sub-Antarctic islands (Australian Antarctic Program 2021). Present on the southeastern coast of South Australia (DEW 2024b). – Species has recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2022b).	Near species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species distribution. – No suitable habitat present in the Strategic Assessment Area.
Diomedea sanfordi Northern royal albatross PMST	Endangered	Yes	Yes	Endangered	– Distributed throughout the southern oceans (BirdLife International 2024i), breeding on Chatham Island, New Zealand (BirdLife International 2024i). – Species has recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2022b).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Falco hypoleucos Grey falcon PMST	Vulnerable	–	–	Rare	– Species inhabits timbered lowland plains, especially acacia shrublands in vicinity of watercourses (TSSC 2020a). – Distributed in northern South Australia, in arid and semi-arid environments (BirdLife International 2024j).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Falco subniger Black falcon NP&W	–	–	–	Rare	– Species is widely distributed throughout mainland Australia, being sparse in southeastern coastal regions. In South Australia, the species occurs throughout the state, mainly occurring around the Adelaide region (DEW 2024b, Debus & Davies 2012, Morcombe 2002). – Inhabits arid and semi-arid regions around wooded watercourses and agricultural land with sporadic remnant trees (NSW Scientific Committee 2013).	Within species distribution extent	Unlikely	– Species records within the last five to ten years within the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Falcunculus frontatus frontatus Eastern shrike-tit NP&W	–	–	–	Rare	– Distributed from Queensland to south-eastern South Australia, throughout the eastern coast of Australia. In South Australia, the species is concentrated in the Mount Lofty Ranges and around the Limestone coast (Australian Museum 2020c, Higgins & Peter 2002). – In drier regions the species is found near rivers, in wooded gullies and in eucalypt forests and woodlands. The species can also be found in gardens and farms (Higgins & Peter 2002, Australian Museum 2020c).	Within species distribution extent	Unlikely	– Species records from greater than ten years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Gallinago hardwickii Latham's snipe, Japanese snipe PMST	Vulnerable	Yes	Yes	Rare	– Inhabits small wetlands including urban water bodies, saltmarshes and creek edges. Mostly found in dense cover (DCCEEW 2024j). – The species is found in south-east South Australia, specifically the Adelaide Plains, Mt Lofty Ranges and the Eyre Peninsula during the non-breeding period (DCCEEW 2024j, BirdLife International 2024k).	Near species distribution extent	Unlikely	– Historical records greater than ten years in the surrounding region. – Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Gallinago megala Swinhoe's snipe PMST	–	Yes	Yes	–	– Distributed mainly across the northern coast of Australia, with no confirmed records in South Australia (DCCEEW 2024aa). – Inhabits the edges of wetlands, including paddy fields, swamps and freshwater streams, as well as grasslands, dry cultivated areas and market gardens (DCCEEW 2024aa).	Near species distribution extent	Unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – Species habitat present in the Strategic Assessment Area.
Gallinago stenura Pin-tailed snipe PMST	–	Yes	Yes	–	– Distributed mainly across the northern and western coast of Australia, with no confirmed records in South Australia (DCCEEW 2024ab). – Inhabits the edges of shallow freshwater swamps, ponds and lakes with emergent cover of grass or sedge (DCCEEW 2024ab).	Near species distribution extent	Unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – Species habitat present in the Strategic Assessment Area.
Grantiella picta Painted honeyeater PMST	Vulnerable	–	–	Rare	– Inhabits dry, open woodland with mature trees, and has been found to be strongly associated with mistletoe. Also present in urban parks (BirdLife Australia 2024h). – Endemic to Australia and distributed across the south-east (DoE 2015b, BirdLife Australia 2024h). – Species has recovery plan (National Recovery Plan for the Painted Honeyeater Grantiella picta) (DAWE 2021a).	Near species distribution extent	Highly unlikely	– Historical records greater than ten years in the surrounding region. – Strategic Assessment Area is outside of the documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Haematopus fuliginosus Sooty oystercatcher NP&W	–	–	–	Rare	– Occur in coastal areas up to 100 m from the ocean, specifically from the western extent of the Eyre Peninsula to the Victorian border (DEW 2024b). – The species inhabits beaches, muddy estuaries, exposed reefs, rocky shelves and headlands, breeding on offshore islands (DEW 2024b).	Within species distribution extent	Known	– Observed in the recent field surveys. – Species records greater than ten years ago in the surrounding region.
Haematopus longirostris Pied oystercatcher NP&W	–	–	–	Rare	– The species can be found along most of Australia's coasts, including in South Australia (DEW 202b4, BirdLife Australia 2024i). – Inhabits sandy ocean beaches, mudflats, sandbanks and occasionally rocky or shingle coasts (BirdLife Australia 2024i).	Within species distribution extent	Known	– Observed in recent field surveys. – Preferred habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Haliaeetus leucogaster White-bellied sea eagle NP&W PMST	–	–	Yes	Endangered	– Species is found inland along the river and associated wetlands of the Murray Darling Basin, as well as along the eastern coastline of South Australia and the rest of Australia (DEW 2024b). – Inland the species inhabits large, open water bodies like rivers, lakes, swamps, as well as along the coast in coastal dunes, tidal flats, saltmarsh, estuaries, bays and inlets (DEW 2024b).	Within species distribution extent	Potential	– Species recordings from less and greater than ten years in the surrounding region. – Suitable habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Halobaena caerulea Blue petrel PMST	Vulnerable	–	Yes	–	– Distributed throughout the southern oceans (TSSC 2015a), and on the eastern shores of Gulf St Vincent (DEW 2024b). – The species inhabits sub-Antarctic waters close to breeding islands such as Macquarie Island (TSSC 2015a).	Near species distribution extent	Unlikely	– Historical records greater than ten years within the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Hieraaetus morphnoides Little eagle NP&W	–	–	–	Vulnerable	– Little Eagles are endemic to Australia, in South Australia they are distributed throughout the whole state, being concentrated around the Mount Lofty Ranges (DEW 2024b, EPSDD 2024). – Typically inhabit woodland and open forests, building their nests in trees bordering watercourses (ACT Government 2024).	Within species distribution extent	Unlikely	– Species records greater than ten years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Himantopus himantopus Pied stilt, black-winged stilt PMST	–	–	Yes	–	– Distributed globally across North and South America, Africa, Eurasia and Australasia. In Australia it is widespread across the mainland, and is an uncommon visitor to Tasmania (BirdLife Australia 2024t). – Mostly inhabits freshwater and saltwater marshes, mudflats, and the shallow edges of lakes and rivers (BirdLife Australia 2024t).	Within species distribution extent	Known	– Species was recorded in the Strategic Assessment are in a field survey.
Hirundapus caudacutus White-throated needletail PMST	Vulnerable	Yes	Yes	Vulnerable	– Distributed across the south of Australia specifically along the eastern coast of Gulf St Vincent (TSSC 2019b). – The species is almost exclusively aerial, occurring over most types of habitats but more so over wooded areas (DoE 2024a).	Within species distribution extent	Unlikely	– Species record from greater than ten years ago in the surrounding region. – Species home range could encompass the Strategic Assessment. – Species mobility such that species could access the Strategic Assessment Area.
Hydroprogne caspia Caspian tern PMST	–	Yes	Yes	–	– Distributed globally throughout North America, Europe, Asia, Africa and Australasia (DEE 2019). In Australia, the Caspian tern is mainly distributed in southern Australia and western Australia with spotted distribution in the north and east (DCCEEW 2024k) – The species inhabits a variety of environments that contain water. It is mostly found in sheltered areas such as estuaries and harbours with sandy or muddy margins. The species also utilises saline and freshwater wetlands (DCCEEW 2024k)	Near species distribution extent	Known	– Species observed in Strategic Assessment Area during migratory bird survey. – Species mobility such that species could access the Strategic Assessment Area.
Larus dominicanus dominicanus Kelp gull NP&W PMST	–	–	Yes	Rare	– Distributed in the sub-Antarctic to sub-tropical zones, observed off the coasts and islands of New Zealand as well as the south coast of Australia (DCCEEW 2024l). – Inhabits beaches, grassy headlands, ledges, glacial moraines and offshore islets (DCCEEW 2024l).	Within species distribution extent	Unlikely	– Species records greater than ten years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Larus pacificus Pacific gull Field survey	–	–	Yes	–	– Distributed across the Australian coastline, mostly from Port Hedland in Western Australia, around the southern coast of the continent, up to Cairns in Queensland (ALA 2024y). – The species inhabits coastal areas and offshore islands (ALA 2024y).	Within species distribution extent	Known	– Species was recorded in the Strategic Assessment are in a field survey.
Lewin pectoralis pectoralis Lewin's rail NP&W	–	–	–	Vulnerable	– Distributed around the islands of and including Tasmania. In South Australia, the species is localised to the Fleurieu Peninsula, Kangaroo Island and south toward the Victorian border (DEW 2024b, TSSC 2015b). – Usually inhabits areas with a body of water and dense vegetation such as coastal or near coastal wetlands (TSSC 2015b).	Within species distribution extent	Unlikely	– Species records greater than ten years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Limicola falcinellus Broad-billed sandpiper PMST	–	Yes	Yes	–	– Distributed mainly across the north and north-west coasts of Australia. In South Australia they are occasionally recorded in St Kilda Saltworks Buckland Park, Mutton Cover, Le Fevre Peninsula, Clinton Conservation Park and Price Saltfields (DCCEEW 2024ac). – Inhabits sheltered coastal areas, particularly estuarine mudflats, saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, as well as large soft intertidal mudflats near shell or sandbanks (DCCEEW 2024ac).	Within species distribution extent	Potential	– Species records greater than ten years in the surrounding region. – Suitable habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Limosa lapponica Bar-tailed godwit PMST	–	Yes	Yes	–	– Distributed across coastal areas of all Australian states. In South Australia it is rarely recorded in the south-east and mostly recorded around coasts from Lake Alexandrina to Denial Bay (DCCEEW 2024af). – Inhabitats mainly coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays, often around beds of seagrass and, sometimes, in nearby saltmarsh (DCCEEW 2024af).	Within species distribution extent	Potential	– Species records greater than ten years in the surrounding region. – Suitable habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Limosa lapponica baueri Nunivak bar-tailed godwit, Western Alaskan bar-tailed godwit PMST	Endangered	Yes	–	Rare	– Sparsely distributed across the south-eastern coastline of South Australia (DCCEEW 2024m). – Species largely inhabits intertidal sandflats, spits and banks (DoE 2024b).	Within species distribution extent	Unlikely	– Strategic Assessment Area outside of documented extent of the species' distribution. – Species habitat present in the Strategic Assessment Area. – Species mobility such that species could access the Strategic Assessment Area.
Limosa limosa Black-tailed godwit NP&W PMST	Endangered	Yes	Yes	Rare	– Species is common in northern Australia, although occurs across South Australia, concentrated along the south-eastern coast (DCCEEW 2024n). – Distributed throughout southeast South Australia, predominately along the east coast of Gulf St Vincent (DEW 2024b). – Species inhabits coastal areas including sheltered bays, estuaries with large intertidal mudflats and sandflats (DoE 2024c).	Within species distribution extent	Potential	– Historical records from greater than ten years in the surrounding region. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that species could access the Strategic Assessment Area.
Macronectes giganteus Southern giant-petrel, southern giant petrel PMST	Endangered	Yes	Yes	Vulnerable	– It is distributed across the south-eastern coastline of South Australia and offshore in between Coffin Bay and Port MacDonnell (DEW 2024b), breeding on southern island oceans such as Macquarie Island (BirdLife International 2024m). – Species has a recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2022b).	Within species distribution extent	Unlikely	– Historical records from greater than ten years ago in the surrounding region. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that species could access the Strategic Assessment Area. – No suitable habitat present in the Strategic Assessment Area.
Macronectes halli Northern giant petrel PMST	Vulnerable	Yes	–	–	– Distributed across the south-eastern coastline of South Australia and offshore between Cape Jarvis and Port MacDonnell (DEW 2024b). – Species inhabits a wide circumpolar range across the Southern Ocean (DCCEEW 2022b). – Species has a recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2022b).	Near species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Melanodryas cucullata cucullata South-eastern hooded robin, hooded robin (south-eastern) PMST	Endangered	–	–	Rare	– Distributed across the south-eastern coastline of South Australia and further inland between Port Pirie and Beachport (DEW 2024b). – Species in habits dry eucalypt and acacia woodlands (DCCEEW 2023f).	Near species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species distribution. – No suitable habitat present in the Strategic Assessment Area.
Neophema chrysogaster Orange-bellied parrot PMST	Critically Endangered	–	Yes	Endangered	– Distributed along the eastern coast of South Australia from east Victoria to south-east South Australia along the coast, mostly populating Carpenter Rocks during non-breeding season (TSSC 2006). – Species inhabits coastal locations such as estuaries, saltmarshes and adjacent pastures (DELWP 2016). – Species has recovery plan (National Recovery Plan for the Orange-bellied Parrot Neophema chrysogaster) (DELWP 2016).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years in the surrounding region. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Neophema chrysostoma Blue-winged parrot PMST	Vulnerable	–	Yes	Vulnerable	– Species are partially distributed across the south-east of Southern Australia, being more common in Victoria and Tasmania (DCCEEW 2023g). – Species inhabits grassy areas near wetlands in coastal, sub-coastal and inland areas, through to semi-arid zones (DCCEEW 2023g).	Within species distribution extent	Unlikely	– Historical records greater than ten years in the surrounding region. – Species mobility such that species could access the Strategic Assessment Area. – Limited suitable habitat present within the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Neophema elegans elegans Elegant parrot NP&W	–	–	–	Rare	– Distributed throughout Western Australia and South Australia, predominately occurring in the south-east corner around the Fleurieu Peninsula (DEW 2024b, BirdLife Australia 2024j). – Inhabits open forests, mallee, acacia scrub and salt marsh (World Parrot Trust 2024, BirdLife Australia 2024j).	Within species distribution extent	Known	– Species observed in field surveys.
Neophema petrophila zietzi Rock parrot NP&W	–	–	Yes	Rare	– Distributed on the coast of South Australia, mainly between Ceduna and Kingston (BirdLife Australia 2024k, DEW 2024b). – Inhabits rocky coastlines, rocky offshore islands, mangroves and saline swamps (BirdLife Australia 2024k).	Within species distribution extent	Known	– Species observed in migratory bird survey. – Habitat conditions are located adjacent to Strategic Assessment Area (Mutton Cove, Torrens Island).
Numenius madagascariensis Eastern curlew, far eastern curlew PMST	Critically Endangered	Yes	Yes	Endangered	– Distributed across the coast of southeastern South Australia (DEW 2024b), as well as occupying most coastal areas of Australia (DCCEEW 2023h). – Species inhabits coastal areas including sheltered estuaries, mangrove swamps, saltmarshes and intertidal flats (DCCEEW 2023h).	Within species distribution extent	Likely	– One record between five to ten years within the surrounding region. – Historical records greater than ten years in the surrounding region. – Species home range could encompass the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Numenius minutus Little curlew, little whimbrel PMST	–	Yes	Yes	–	– Distributed widely across northern Australia, with scattered records in the south (BirdLife Australia 2024 – Inhabits coastal and inland grasslands near swamps and flooded areas (BirdLife Australia 2024	Within species distribution extent	Unlikely	– Species records from greater than ten years ago within the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Numenius phaeopus variegatus Whimbrel NP&W	–	Yes	Yes	Rare	– The species is distributed along the southeastern coastline of South Australia, although being more common in northern Australia (DEW 2024b, BirdLife Australia 2024l). – Inhabits the coast within tidal and estuarine mudflats near mangroves (BirdLife Australia 2024l).	Within species distribution extent	Potential	– Species records from greater than ten years ago in the surrounding region. – Species habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Oxyura australis Blue-billed duck NP&W	–	–	–	Rare	– Endemic to Australia, the species is distributed in the southeast and the southwest of the country. In South Australia, the species is found in the east of the state, although concentrated towards the coastline (Australian Museum 2020d, DEW 2024b). – Inhabit terrestrial, saline and freshwater wetlands, nesting in reeds and rushes (BirdLife International 2024n, Australian Museum 2020d).	Within species distribution extent	Unlikely	– Species records from greater than ten years ago in the surrounding region. – Species mobility such that the species could access the Strategic Assessment Area.
Pachycephala inornata Gilbert's whistler NP&W	–	–	–	Rare	– Distributed throughout southern mainland Australia and Tasmania, with a concentrated population in South Australia east of Adelaide and the Eyre Peninsula (DEW 2024b, DEH 2008). – Species prefers open eucalypt forests but will inhabit a wide range of environments, excluding rainforests (DEH 2008).	Within species distribution extent	Unlikely	– Species recorded from the previous five to ten years within the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Pachyptila turtur subantarctica Fairy prion (southern) PMST	Vulnerable	–	–	–	– Species largely inhabits open waters in circumpolar regions, rarely entering sheltered coastal waters (TSSC 2015c, Miskelly 2013).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Pandion haliaetus cristatus Eastern osprey NP&W	–	–	–	Endangered	– Distributed along the coast of South Australia, concentrated on the south of the Eyre Peninsula and Yorke Peninsula, as well as Kangaroo Island (DEW 2024b, Dennis *et al.* 2001). – Habitats include remote beaches and shallow bays, with breeding occurring on rocky coastal cliffs (Dennis *et al.* 2001).	Within species distribution extent	Unlikely	– Species records from greater than ten years ago in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.

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	Threatened status	Migratory	Marine	Threatened status				
Pedionomus torquatus Plains-wanderer PMST	Critically Endangered	–	–	Endangered	– Widely distributed throughout and coast and inland south-east South Australia (DEW 2024b). – Species occupies sparse, treeless, lowland native grasslands which usually occur on hard red-brown clay soils (DoE 2015c). – Species has recovery plan (National Recovery Plan for the Plains-wanderer Pedionomus torquatus) (DoE & DEWNR 2016).	Near species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of species distribution. – No suitable habitat present in the Strategic Assessment Area.
Pelecanus conspicillatus Australian pelican Field survey	–	–	Yes	–	– Distributed throughout Australia, Papua New Guinea and western Indonesia, and occasionally in New Zealand and western Pacific islands (Australian Museum 2024c). – Inhabits freshwater, estuarine and marine wetlands and waterways including lakes, swamps, rivers, coastal islands and shores (Australian Museum 2024c).	Within species distribution extent	Known	– Species was recorded in the Strategic Assessment are in a field survey.
Phalacrocorax fuscescens Black-faced cormorant PMST	–	–	Yes	–	– Distributed across the southern coastline of mainland Australia and Tasmania. It is common in the Bass Strait and Spencer Gulf in South Australia (BirdLife Australia 2024x). – Inhabits coastal waters in large bays, deep inlets, rocky headlands and islands (BirdLife Australia 2024x).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years within the surrounding region. – Species habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Phalaropus lobatus Red-necked phalarope PMST	–	Yes	Yes	–	– Distributed across the southern and western coastlines of Australia. It is regularly recorded at the Port Hedland Saltworks in Western Australia and the ICI Saltworks in South Australia (DCCEEW 2024ad). – Inhabits inland and coastal lakes and swamps, including highly saline waters, artificial wetlands and saltfields (DCCEEW 2024ad).	Within species distribution extent	Unlikely	– Species records greater than ten years ago in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Phoebetria fusca Sooty albatross PMST	Vulnerable	Yes	Yes	Endangered	– Sparsely distributed in the coastal waters in south-eastern South Australia, specifically in the waters south of Port MacDonnell (DEW 2024b). – Species usually inhabits open coastal waters, breeding on steep, vegetated cliffs (DoE 2024d). – Species has recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2022b).	Near species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of species distribution. – No suitable habitat present in the Strategic Assessment Area.
Plegadis falcinellus Glossy ibis NP&W	–	Yes	Yes	Rare	– Distributed across lakes and swamps throughout Australian mainland and is present across inland and coastal eastern South Australia (BirdLife Australia 2024m, DEW 2024b). – Species mainly inhabits freshwater lakes and wetlands, although can tolerate saline environments (BirdLife International 2024o, Taylor & Taylor 2015).	Within species distribution extent	Unlikely	– Species records greater than ten years ago in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Pluvialis fulva Pacific golden plover NP&W PMST	–	Yes	Yes	Rare	– Migrates to Australia for austral summer. Distributed along the coast of South Australia (BirdLife Australia 2024n, DEW 2024b). – Inhabits muddy, rocky and sandy wetlands as well as estuaries, saltmarsh and lagoons (BirdLife Australia 2024n).	Within species distribution extent	Potential	– Species records greater than ten years ago in the surrounding region. – Species habitat adjacent to Strategic Assessment Area (Mutton Cove, Torrens Island). – Species mobility such that the species could access the Strategic Assessment Area.
Pluvialis squatarola Grey plover PMST	Vulnerable	Yes	Yes	–	– Distributed across the coast of South Australia (DEW 2024b). – Species inhabits sandy areas such as unvegetated sandbanks, estuaries and lagoons (DCCEEW 2024o).	Within species distribution extent	Likely	– Species was recorded at a reference site in the surrounding region during the migratory bird survey.
Podiceps cristatus australis Great crested grebe NP&W	–	–	–	Rare	– Migrates to Australia during austral summer – the species is distributed in the east of South Australia although more common in northern states (Hope 2024, DEW 2024b). – Inhabits sheltered coastal areas and exposed lakes and reservoirs with vegetated banks for nesting (BirdsSA 2024a, Hope 2014).	Near species distribution extent	Likely	– Species recorded at a reference site during the migratory bird survey. – Limited suitable habitat in Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.

Scientific name Common name Data source	EPBC Act			NP&W Act	Habitat and distribution	Strategic Assessment Area in species' known distribution	Likelihood of occurrence	Likelihood reason
	Threatened status	Migratory	Marine	Threatened status				
Pterodroma mollis Soft-plumaged petrel PMST	Vulnerable	–	Yes	–	– Distributed in ocean waters off the coast of South Australia, specifically recorded south of Port MacDonnell and Beachport (DEW 2024b, TSSC 2015d). – Species inhabits sub-Antarctic waters and breeds on the vegetated slopes of Macquarie and Maatsuyker Islands (DoE 2024e).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Recurvirostra novaehollandiae Red-necked avocet PMST	–	–	Yes	–	– Distributed across mainland Australia, mainly in the south-west (BirdLife Australia 2024y). – Inhabits large shallow freshwater and saline wetlands, and estuarine mudflats (BirdLife Australia 2024y).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years within the surrounding region. – Species habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Rostratula australis Australian painted snipe PMST	Endangered	–	Yes	Endangered	– Distributed across the coast of south-east South Australia, east of the Yorke Peninsula, and sparsely inland (DEW 2024b). – The species inhabits shallow freshwater wetlands, lakes, swamps and inundated or waterlogged grassland / saltmarsh, with a good vegetative cover (DCCEEW 2022c). – Species has recovery plan (National Recovery Plan for the Australian Painted Snipe Rostratula australis) (DoE 2024f).	Near species distribution extent	Unlikely	– Species record from greater than ten years in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Spatula rhynchotis Australasian shoveler NP&W	–	–	–	Rare	– Distributed across eastern South Australia, with a concentrated population towards the coast, south of Adelaide (DEW 2024b) – Inhabits shallow freshwater and brackish wetlands with emergent vegetation, also on inland ephemeral lakes and wetlands (BirdsSA 2024b).	Within species distribution extent	Unlikely	– Species records from less than ten years ago in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Stagonopleura guttata Diamond firetail PMST	Vulnerable	–	–	Vulnerable	– Distributed throughout inland south-east South Australia, from the Eyre Peninsula to the Fleurieu Peninsula and scattered further east (DEW 2024b). – Species inhabits open eucalypt, acacia or casuarina woodlands, additionally farmland and grassland with scattered trees (DCCEEW 2023i).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Stercorarius antarcticus lonnbergi Brown skua NP&W	–	–	Yes	Vulnerable	– Predominately distributed throughout circumpolar environments, in South Australia it is found on the eastern coastline of South Australia from the Eyre Peninsula to the Victorian border (DCCEEW 2024p, ALA 2024t). – Inhabits over coastal waters or oceanic zones, rarely seen inshore (DCCEEW 2024p).	Near species distribution extent	Unlikely	– Species records greater than ten years ago in the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Sterna hirundo longipennis Common tern NP&W PMST	–	Yes	Yes	Rare	– Species is distributed globally migrating to Australia. In South Australia the species is found in the southeast, mainly on the Fleurieu Peninsula and the Coorong River (Birdfact 2024, ALA 2024u). – Found mainly near coastal waters on ocean beaches, platforms and headlands in sheltered waters with muddy, sandy or rocky shores (DCCEEW 2024q).	Within species distribution extent	Potential	– Species records from greater than ten years ago in the surrounding region. – Suitable habitat present within the Strategic Assessment Area (Assembly and testing area), and adjacent (Mutton Cove). – Species mobility such that the species could access the Strategic Assessment Area.
Sterna striata White-fronted tern PMST	–	–	Yes	–	– Distributed across the south-east coast of Australia and in New Zealand. It has been recorded along The Coorong and Kangaroo Island in South Australia (BirdLife Australia 2024z). – Inhabits coastal areas on exposed rocky shorelines and sandy beaches of sheltered coasts, including bays, harbours and lagoons (BirdLife Australia 2024z).	Within species distribution extent	Potential	– Species records from greater than ten years ago in the surrounding region. – Suitable habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.

Scientific name Common name Data source	EPBC Act			NP&W Act	Habitat and distribution	Strategic Assessment Area in species' known distribution	Likelihood of occurrence	Likelihood reason
	Threatened status	Migratory	Marine	Threatened status				
Sternula albifrons sinensis Little tern NP&W	–	–	–	Endangered	– Species is distributed across the southeast of South Australia (DCCEEW 2021b, DEW 2024b). – Occurs in coastal environments such as beaches, sheltered inlets, estuaries, lakes and river mouths (Birdlife Australia 2024o).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years in the surrounding region. – Suitable habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Sternula nereis nereis Australian fairy tern PMST	Vulnerable	–	Yes	Endangered	– Distributed along the coast of South Australia. New South Wales, Tasmania and Western Australia (DEW 2024b). – Inhabits a variety of coastal habits including offshore, estuarine, wetlands, beaches and spits (DSEWPC 2011). – Species has recovery plan (National Recovery Plan for the Australian Fairy Tern Sternula nereis nereis) (DAWE 2020a).	Within species distribution extent	Known	– Species was recorded in the Strategic Assessment are in a field survey.
Stictonetta naevosa Freckled duck NP&W	–	–	–	Vulnerable	– Primarily found in the southeast and west of Australia, distributed in eastern South Australia, concentrated around the Adelaide region, Fleurieu Peninsula and Kangaroo Island (DEW 2024b, BirdLife Australia 2024p). – Inhabits freshwater swamps and creeks with heavy growth of bullrushes, lignum or tea-tree (Australian Museum 2020e).	Within species distribution extent	Unlikely	– Species record within the last five years within the surrounding region. – Species mobility such that the species could access the Strategic Assessment Area. – No suitable habitat present in the Strategic Assessment Area.
Thalassarche carteri Indian yellow-nosed albatross PMST	Vulnerable	Yes	Yes	Endangered	– Distributed throughout the offshore waters of the South Australian coast, with a greater population in the south-east of the state (DEW 2024b). – Species inhabits inshore and offshore subtropical and warmer sub-Antarctic waters, where there are calmer seas and light winds (DoE 2024g).	Near species distribution extent	Unlikely	– Species record from greater than ten years ago in the surrounding region. – No suitable habitat present in the Strategic Assessment Area.
Thalassarche cauta Shy albatross PMST	Endangered	Yes	Yes	Vulnerable	– Distributed across the south-eastern South Australian coast (DEW 2024b). – Species is endemic to Australia, predominately occurring in waters adjacent to mainland Tasmania and South Australia (TSSC 2020b). – Species has recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2020).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Thalassarche impavida Campbell albatross, Campbell black-browed albatross PMST	Vulnerable	Yes	Yes	Vulnerable	– Distributed in the southern offshore waters of South Australia, east of Kangaroo Island (DEW 2024b). – Species commonly inhabits the area over the oceanic continental slopes off the southern coast of Australia during its non-breeding season (DoE 2024h). – Species has recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2022b).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Thalassarche melanophris Black-browed albatross PMST	Vulnerable	Yes	Yes	–	– Distributed throughout the south-eastern offshore waters of South Australia, predominately east of Elliston (DEW 2024b). – Species commonly inhabits the coastal waters off South Australia during non-breeding season (TSSC 2005). – Species has recovery plan (National Recovery Plan for albatrosses and petrels) (DCCEEW 2022b).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Thalassarche steadi White-capped albatross PMST	Vulnerable	Yes	Yes	–	– Distributed through the sub-Antarctic waters south of Australia. Common on the coastline of Tasmania (DEW 2024b, BirdLife International 2024). – Inhabits onshore and offshore environments, entering harbours and bays (Marchant 1977). The species is scarce in open waters (Jehl 1973).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Thalasseus bergii Greater crested tern PMST	–	Yes	Yes	–	– The greater crested tern is a migratory species, distributed throughout southern and eastern Africa, Asia and Australia (BirdLife International 2024q). – The species inhabits coastal environments foraging in shallow water. Estuaries, bays and harbours on sandy, rocky or muddy shores are of preference, with breeding occurring on offshore islands (BirdLife International 2024q).	Near species distribution extent	Known	– Observed in Strategic Assessment Area in migratory bird survey. – Species mobility such that the species could access the Strategic Assessment Area.

Scientific name Common name Data source	EPBC Act			NP&W Act	Habitat and distribution	Strategic Assessment Area in species' known distribution	Likelihood of occurrence	Likelihood reason
	Threatened status	Migratory	Marine	Threatened status				
Thinornis cucullatus cucullatus Eastern hooded plover PMST	Vulnerable	–	Yes	Vulnerable	– Distributed along the whole coastline of South Australia and concentrated on the Yorke Peninsula and Kangaroo Island (DCCEEW 2023k, DoE 2014). – Largely inhabits wide beaches backed by sand dunes and inlet entrances. Nests are found above the high-water mark on flat beaches, stony terraces and sparsely vegetated dunes (DoE 2014).	Within species distribution extent	Likely	– Observed in Strategic Assessment Area reference sites in migratory bird survey. – Species mobility such that the species could access the Strategic Assessment Area.
Threskiornis moluccus Australian white ibis Field survey	–	–	Yes	–	– Distributed across mainland Australia, where it is widespread in the north and east (Birdlife Australia 2024u). – Species prefers swamps, lagoons, floodplains and grasslands, also inhabiting urban parks, gardens and tidal mudflats (Birdlife Australia 2024u).	Within species distribution extent	Known	– Species recorded in Strategic Assessment Area during field survey.
Tringa brevipes Grey-tailed tattler NP&W PMST	–	Yes	Yes	Rare	– Within Australia, the species mainly occurs on northern coastal environments, sparsely recorded in South Australia west of Tourville Bay (DEW 2024b, DoE 2024i). – Inhabits sheltered coasts with intertidal mudflats, rocky platforms revealed at low tide as well as estuaries and coastal lagoons with mangroves (BirdLife Australia 2024q, DoE 2024i).	Within species distribution extent	Potential	– Records from greater than ten years ago within the surrounding region. – Suitable habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Tringa glareola Wood Sandpiper PMST	–	Yes	Yes	Rare	– Distributed across coastal areas in Australia, mainly in the north-west (DCCEEW 2024ae). – Inhabits well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes (DCCEEW 2024ae).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years within the surrounding region. – Suitable habitat present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Tringa nebularia Common greenshank, greenshank PMST	Endangered	Yes	Yes	–	– Distributed along the entire shoreline of Gulf St Vincent (Higgins & Davies 1996). – Species inhabits wide variety of inland wetlands and sheltered coastal habitats including mangroves, saltmarsh and other fringing vegetation in areas of varying salinity (DCCEEW 2024r).	Within species distribution extent	Known	– Species recorded in Strategic Assessment Area during field survey.
Tringa stagnatilis Marsh sandpiper, little greenshank PMST	–	Yes	Yes	–	– Distributed along the East Asian-Australasian Flyway. In Australia the species is common in the far north, east and south-east of Australia (BirdLife Australia 2024r). – Inhabits brackish wetlands such as estuarine rivers, water meadows, drains and lagoons and swamps (BirdLife Australia 2024r).	Within species distribution extent	Likely	– Species observed at reference site during field surveys. – Suitable habitat present in the Strategic Assessment Area. – Species mobility such that the species could enter the Strategic Assessment Area.
Xenus cinereus Terek sandpiper PMST	Vulnerable	Yes	Yes	Rare	– Distributed throughout the northern shores of Gulf St Vincent from Ardrossan to Torrens Island (DEW 2024b). – Species inhabit sheltered coastal mudflats, mangrove swamps, sandflats, estuaries and mouths of rivers (Weller *et al.* 2020).	Within species distribution extent	Potential	– Species record from greater than ten years ago within the surrounding region. – Species habitat present in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Zanda funerea whiteae Yellow-tailed black cockatoo NP&W	–	–	–	Vulnerable	– Distributed in the southeast of South Australia in the Murray-Darling basin, the southern gulfs and along the coast (DCCEEW 2021c). – Inhabits coastal heath, woodland and forest, and more recently found in pine plantations and patches of pine in urban and rural areas (BirdsSA 2024c).	Within species distribution extent	Unlikely	– Species records from within five years ago within the surrounding region. – No suitable habitat within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Zapornia tabuensis Spotless crake NP&W	–	–	Yes	Rare	– Species distributed throughout Australia. In South Australia it is concentrated on the Fleurieu Peninsula and sparsely occurring in the northeast of the state (DEW 2024b, ALA 2024). – Inhabits coastal regions in well-vegetated freshwater wetlands with rushes, reeds and cumbungi, occasionally inhabiting muddy areas, reedbeds and wetlands (DEH 2008c).	Within species distribution extent	Potential	– Species records greater than ten years ago within the surrounding region. – Suitable habitat in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.

Scientific name Common name Data source	EPBC Act			NP&W Act	Habitat and distribution	Strategic Assessment Area in species' known distribution	Likelihood of occurrence	Likelihood reason
	Threatened status	Migratory	Marine	Threatened status				
Mammals								
Eubalaena australis Southern right whale PMST	Endangered	Yes	Yes	Endangered	– Distributed along the coastline of South Australia, predominately in the west of the state (DEW 2024b). – Species mainly inhabits offshore, deep sub-Antarctic waters (DoE 2024j). – Prefers near-shore, shallow water depths whilst calving in Australian waters (DoE 2024j).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – No suitable habitat present in the Strategic Assessment Area.
Neophoca cinerea Australian sea lion PMST	Endangered	–	Yes	Vulnerable	– Distributed across the South Australian coastline, with known breeding colonies in South Australia (DEW 2024b). – Species inhabit sheltered sides of islands and reefs, rocky terrain, sandy beaches and vegetated fore dunes and swales (DoE 2024k). – Species has recovery plan (Recovery Plan for the Australian Sea Lion) (DSEWPC 2013).	Within species distribution extent	Potential	– Species records from the previous five to ten years from the surrounding region. – Habitat connectivity across landscape or species mobility such that species could access the Strategic Assessment Area. – Limited suitable habitat in the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area.
Pteropus poliocephalus Grey-headed flying-fox PMST	Vulnerable	–	–	Rare	– Distributed in south-east South Australia, predominately on the Fleurieu Peninsula (DEW 2024b). – Species commonly inhabits forests and woodlands in coastal lowlands (DAWE 2021b). – Species has recovery pan (Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus) (DAWE 2021b).	Near species distribution extent	Unlikely	– Species records from five to ten years within the surrounding region. – No suitable habitat present in the Strategic Assessment Area. – Limited habitat connectivity across landscape such that the species would not be able to access the Strategic Assessment Area.
Reptiles								
Aprasia pseudopulchella Flinders Ranges worm-lizard PMST	Vulnerable	–	–	–	– Distributed across inland south-east South Australia between Port Augusta and Adelaide (DEW 2024b). – Species inhabits open woodland, native tussock grassland, riparian habitats and rocky isolates (DEWHA 2008c).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – Species habitat is not present within the Strategic Assessment Area.
Caretta caretta Loggerhead turtle PMST	Endangered	Yes	Yes	Endangered	– Distributed sparsely along the western shore of Spencer Gulf and eastern shore of Gulf St Vincent, inclusive of Kangaroo Island (DEW 2024b). Breeding mainly occurs in Western Australia and Queensland (DEE 2017). – Inhabits the waters of coral and rocky reefs, seagrass meadows and muddy bays (DoE 2024l). – Species has recovery plan (Recovery Plan for Marine Turtles in Australia) (DEE 2017).	Within species distribution extent	Potential	– No species records within the surrounding region. – Species foraging habitat is present within the Strategic Assessment Area. – Species mobility such that the species would be able to access the Strategic Assessment Area (marine).
Chelonia mydas Green turtle PMST	Vulnerable	Yes	Yes	–	– Distributed sparsely along the coastline of South Australia between Ceduna and Adelaide (DEW 2024b). – Inhabits shallow, benthic environments for foraging such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass meadows (DoE 2024m). – Species has recovery plan (Recovery Plan for Marine Turtles in Australia) (DEE 2017).	Within species distribution extent	Potential	– Species recorded from the previous five to ten years within the surrounding region. – Species foraging habitat is present within the Strategic Assessment Area. – Species mobility such that the species could access the Strategic Assessment Area (marine).
Dermochelys coriacea Leatherback turtle, leathery turtle PMST	Endangered	Yes	Yes	Vulnerable	– Distributed across the southern coastline of South Australia, east of Ceduna, and predominately on both coastlines of the Yorke Peninsula and in Gulf St Vincent (DEW 2024b). – The species inhabits tropical, subtropical and temperate pelagic waters, requiring coarse sand beaches to nest (DoE 2024n). – Species has recovery plan (Recovery Plan for Marine Turtles in Australia) (DEE 2017).	Within species distribution extent	Potential	– Species records from greater than ten years ago within the surrounding region. – Species mobility such that species would be able to access the Strategic Assessment Area. – Species foraging habitat is present within the Strategic Assessment Area.
Tiliqua adelaidensis Pygmy blue-tongue lizard, Adelaide blue-tongue lizard PMST	Endangered	–	–	Endangered	– Distributed through the mid-north region of South Australia (DCCEEW 2023j). – Species inhabits remnant native grassland or grassy woodland with a sparse over-storey of trees (Duffy *et al.* 2012). – Species has recovery plan (Recovery Plan for the Pygmy Bluetongue lizard Tiliqua adelaidensis) (Duffy *et al.* 2012).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of the species' distribution. – Species habitat is not present within the Strategic Assessment Area.

Scientific name Common name Data source	EPBC Act			NP&W Act	Habitat and distribution	Strategic Assessment Area in species' known distribution	Likelihood of occurrence	Likelihood reason
	Threatened status	Migratory	Marine	Threatened status				
Sharks								
Carcharodon carcharias White shark, great white shark PMST	Vulnerable	Yes	–	–	– Distributed off the coast of Port Lincoln and around Kangaroo Island in temperate and sub-tropical waters (DEW 2024b, DSEWPC 2013b). – Species inhabits the waters of the continental shelf and the open ocean (Bray 2023). – Species has recovery plan (Recovery Plan for the White Shark Carcharodon carcharias) (DSEWPC 2013b).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of species' distribution. – Species habitat is not present within the Strategic Assessment Area. – Species mobility such that species would be able to access the Strategic Assessment Area.
Galeorhinus galeus School shark, eastern school shark, snapper shark, tope, soupfin shark PMST	Conservation Dependent	–	–	–	– Distributed throughout temperate waters, moving heavily off the coast of South Australia (DCCEEW 2009). – Species inhabits waters of the continental shelf and slope. Female and juveniles inhabit shallower, sheltered waters (DCCEEW 2009).	Not within species distribution extent	Highly unlikely	– Strategic Assessment Area is outside of documented extent of species' distribution. – Species habitat is not present within the Strategic Assessment Area. – Species mobility such that species would be able to access the Strategic Assessment Area.
Fish								
Seriolella brama Blue warehou PMST	Conservation Dependent	–	–	–	– Distributed throughout the coastal waters of south-eastern Australia from central NSW to the South Australian border, including Tasmania (Bray 2021). – Largely inhabits shallower waters, above 200 m within the coastal and upper continental shelf (Bray 2021).	Near species distribution extent	Potential	– Species record from greater than ten years within the surrounding region. – Species home range could encompass the Strategic Assessment Area (marine). – Species mobility such that the species could access the Strategic Assessment Area.

Appendix D

Flora species recorded

Table E1 Compiled list of flora species observed from surveys

Scientific name	Common name	Origin
Acacia cyclops	Western coastal wattle	Native
Acacia ligulata	Dune wattle	Native (Indigenous to Adelaide region)
Acacia longifolia ssp. sophorae	Coastal wattle	Native
Acacia pycnantha	Golden wattle	Native (Indigenous to Adelaide region)
Aizoon pubescens	Coastal galenia	Introduced
Asparagus asparagoides	Bridal creeper	Introduced
Asphodelus fistulosus	Onion weed	Introduced
Atriplex cinerea	Coast saltbush	Native and planted individuals
Atriplex nummularia ssp. nummularia	Old-man saltbush	Native
Atriplex paludosa ssp. cordata	Marsh saltbush	Native
Atriplex semibaccata	Berry saltbush	Native
Austrostipa scabra ssp. falcata	Slender spear-grass	Native
Austrostipa sp.	Spear-grass	Native (Indigenous to Adelaide region)
Avena barbata	Bearded oat	Introduced
Avena sp.	Wild oats	Introduced
Bolboschoenus caldwellii	Salt club-rush	Native
Cakile edentula	Karkalla	Introduced
Callitris gracilis	Southern cypress pine	Native (Indigenous to Adelaide region)
Carpobrotus rossii	Native pigface	Native
Casuarina glauca	Swamp oak	Introduced
Chloris truncata	Windmill grass	Native
Chondrilla juncea	Skeleton weed	Introduced
Chrysanthemoides monilifera ssp. monilifera	Boneseed	Introduced
Cyperus gymnocaulos	Spiny flat-sedge	Native
Dianella brevicaulis	Short-stem flax-lily	Native
Disphyma crassifolium spp. clavulatum	Rounded pig-face	Native (indigenous to Adelaide region)
Dodonaea viscosa ssp. spatulata	Sticky hop-bush	Native
Dodonaea viscosa spp. angustissima	Narrow leaf hop bush	Native (Indigenous to Adelaide region)
Eleocharis acuta	Common spike-rush	Native
Enchylaena tomentosa var. tomentosa	Ruby saltbush	Native (Indigenous to Adelaide region)
Enneapogon nigricans	Black heads	Native (Indigenous to Adelaide region)
Epilobium hirtigerum	Hairy willow-herb	Native
Eucalyptus sp.	Gum tree	Native
Euphorbia drummondii	Flat spurge	Native
Ficinia nodosa	Knobby club-rush	Native
Frankenia pauciflora var. gunnii	Southern sea-heath	Native (Indigenous to Adelaide region)
Gahnia filum	Thatching grass	Native
Juncus kraussii	Sea rush	Native

Scientific name	Common name	Origin
Lobelia anceps	Angled lobelia	Native
Maireana brevifolia	Short-leaf bluebush	Native
Maireana enchylaenoides	Wingless fissure-plant	Native
Maireana erioclada	Rosy bluebush	Native
Maireana oppositifolia	Salt bluebush	Native
Melaleuca acuminata ssp. acuminata	Mallee honey-myrtle	Native
Melaleuca lanceolata	Black paperbark	Native (Indigenous to Adelaide region)
Myoporum insulare	Common boobialla, native juniper	Native and planted individuals
Myoporum parvifolium	Creeping boobialla	Native
Nitraria billardierei	Nitre-bush	Native
Olearia axillaris	Coast daisy-bush	Native
Oxalis perennans	Native oxalis	Native (Indigenous to Adelaide region)
Pittosporum angustifolium	Native apricot	Native (Indigenous to Adelaide region)
Puccinellia stricta	Australian saltmarsh-grass	Native
Rhagodia candolleana ssp. candolleana	Sea-berry saltbush	Native (Indigenous to Adelaide region)
Rytidosperma caespitosum	Common wallaby-grass	Native (Indigenous to Adelaide region)
Salsola australis	Tumbleweed	Native (Indigenous to Adelaide region)
Sarcocornia quinqueflora	Beaded samphire	Native (Indigenous to Adelaide region)
Senna artemisioides spp. petiolaris	Woody cassia	Native (Indigenous to Adelaide region)
Suaeda australis	Austral sea-blite	Native (Indigenous to Adelaide region)
Tecticornia arbuscula	Shrubby samphire	Native
Tecticornia halocnemoides ssp.	Grey samphire / glasswort	Native (Indigenous to Adelaide region)
Tecticornia indica ssp.	Brown-head samphire	Native (Indigenous to Adelaide region)
Tecticornia pergranulata ssp. pergranulata	Black-seed samphire	Native
Tetragonia eremaea	Annual spinach	Native (Indigenous to Adelaide region)
Threlkeldia diffusa	Cast bonefruit	Native (Indigenous to Adelaide region)
Typha domingensis	Narrow-leaf bulrush	Native
Vittadinia sp.	New holland daisy	Native (Indigenous to Adelaide region)
Crocosmia crocosmiiflora	Montbretia	Introduced
Cynara cardunculus ssp. flavescens	Artichoke thistle	Introduced
Dittrichia graveolens	Stinkweed	Introduced
Erigeron bonariensis	Flaxleaf fleabane	Introduced
Euphorbia terracina	False caper	Introduced
Gazania linearis	Gazania	Introduced
Gomphocarpus cancellatus	Broad-leaved cotton bush	Introduced
Hordeum marinum	Sea barley-grass	Introduced
Juncus acutus	Sharp rush	Introduced
Lactuca sp.	Lettuce	Introduced
Lagurus ovatus	Hare's tail grass	Introduced
Lolium sp.	Rye-grass	Introduced

Scientific name	Common name	Origin
Limonium hyblaeum	Sicilian sea lavender	Introduced
Limonium companyonis	Sea-lavender	Introduced
Lycium ferocissimum	African boxthorn	Introduced
Malva parviflora	Small-flower marshmallow	Introduced
Mesembryanthemum crystallinum	Common iceplant	Introduced
Mesembryanthemum nodiflorum	Slenderleaf iceplant	Introduced
Nicotiana glauca	Tree tobacco	Introduced
Oenothera stricta ssp. stricta	Common evening primrose	Introduced
Olea europaea ssp. europaea	European olive	Introduced
Oxalis pes-caprae	Soursob	Introduced
Oxalis purpurea	Purple woodsorrel	Introduced
Pennisetum clandestinum	Kikuyu	Introduced
Phoenix dactylifera	Date palm	Introduced
Piptatherum miliaceum	Rice millet	Introduced
Reichardia tingitana	False sowthistle	Introduced
Retama raetam	White weeping broom	Introduced
Thinopyrum elongatum	Tall wheat-grass	Introduced
Ulex europaeus L. (Fabaceae)	Gorse	Introduced

Appendix E

Fauna species recorded

Table E1 Compiled list of fauna species observed from surveys

Scientific name	Common name	Status		Origin	Survey recorded in
		EPBC Act	NP&W Act		
Birds					
Acanthiza pusilla	Brown thornbill	–	–	Native	Migratory bird survey
Acrocephalus australis	Australian reed warbler	–	–	Native	Baseline ecological assessment
Actitis hypoleucos	Common sandpiper	Mi, Ma	R	Migratory	Migratory bird survey
Anas castanea	Chestnut teal	–	–	Native	Migratory bird survey
Anas gracilis	Grey teal	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Anas platyrhynchos	Mallard	–	–	Introduced	Environmental risks survey
Anas superciliosa	Pacific black duck	–	–	Introduced	Migratory bird survey
Anthochaera carunculata	Red wattlebird	–	–	Native	Baseline ecological assessment
Anthochaera chrysoptera	Little wattlebird	–	–	Native	Baseline ecological assessment
Anthus australis	Australasian pipit	Ma	–	Native	Baseline ecological assessment
Ardea intermedia	Plumed egret	Ma	R	Native	Baseline ecological assessment
Ardea modesta	Eastern great egret	Ma	–	Native	Migratory bird survey
Burhinus grallarius	Bush stone-curlew	–	R	Native	Migratory bird survey
Cacatua roseicapilla	Galah	–	–	Native	Baseline ecological assessment
Cacatua sanguinea	Little corella	–	–	Native	Environmental risks survey
Calidris acuminata	Sharp-tailed sandpiper	Ma, Mi, V	–	Migratory	Baseline ecological assessment, Migratory bird survey
Calidris alba	Sanderling	Ma, Mi	R	Migratory	Migratory bird survey
Calidris ruficollis	Red-necked stint	Ma, Mi	–	Migratory	Migratory bird survey
Charadrius ruficapillus	Red-capped plover	Ma	–	Native	Migratory bird survey
Chenonetta jubata	Australian wood duck	–	–	Native	Migratory bird survey
Chlidonias hybrida	Whiskered tern	–	–	Migratory	Environmental risks survey
Chroicocephalus novaehollandiae	Silver gull	Ma	–	Native	Baseline ecological assessment, Environmental risks survey , Migratory bird survey
Cincloramphus cruralis	Brown songlark	–	–	Native	Baseline ecological assessment, Migratory bird survey

Scientific name	Common name	Status		Origin	Survey recorded in
		EPBC Act	NP&W Act		
Cladorhynchus leucocephalus	Banded stilt	–	V	Native	Migratory bird survey
Colluricincla harmonica	Grey shrike-thrush	–	–	Native	Baseline ecological assessment
Columba livia	Feral pigeon	–	–	Introduced	Baseline ecological assessment
Corvus mellori	Little raven	–	–	Native	Baseline ecological assessment, Environmental risks survey
Coturnix ypsilophora australis	Brown quail	–	–	Native	Environmental risks survey
Cracticus tibicen	Australian magpie	–	–	Native	Baseline ecological assessment
Cygnus atratus	Black swan	–	–	Native	Baseline ecological assessment, Migratory bird survey
Egretta novaehollandiae	White-faced heron	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Elseyornis melanops	Black-fronted dotterel	–	–	Native	Baseline ecological assessment
Epthianura albifrons	White-fronted chat	–	–	Native	Migratory bird survey
Erythrogonys cinctus	Red-kneed dotterel	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Fulica atra	Eurasian coot	–	–	Native	Migratory bird survey
Gallinula tenebrosa	Dusky moorhen	–	–	Native	Baseline ecological assessment, Environmental risks survey
Glossopsitta concinna	Musk lorikeet	–	–	Native	Baseline ecological assessment
Grallina cyanoleuca	Magpie-lark	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Haematopus fuliginosus	Sooty oystercatcher	–	R	Native	Baseline ecological assessment
Haematopus longirostris	Pied oystercatcher	–	R	Native	Baseline ecological assessment, Migratory bird survey
Himantopus himantopus	Pied stilt	Ma	–	Native	Baseline ecological assessment, Migratory bird survey
Hirundo neoxena	Welcome swallow	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Hydroprogne caspia	Caspian tern	Ma, Mi	–	Migratory	Migratory bird survey
Larus pacificus	Pacific gull	Ma	–	Native	Migratory bird survey
Lichenostomus virescens	Singing honeyeater	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Lichmera indistincta	Brown honeyeater	–	–	Native	Migratory bird survey
Manorina melanocephala	Noisy miner	–	–	Native	Environmental risks survey
Microcarbo melanoleucos	Little pied cormorant	–	–	Native	Baseline ecological assessment, Migratory bird survey

Scientific name	Common name	Status		Origin	Survey recorded in
		EPBC Act	NP&W Act		
Neophema elegans	Elegant parrot	–	R	Native	Baseline ecological assessment
Neophema petrophila zietzi	Rock parrot	–	R	Native	Migratory bird survey
Ocyphaps lophotes	Crested pigeon	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Passer domesticus	House sparrow	–	–	Introduced	Baseline ecological assessment
Pelecanus conspicillatus	Australian pelican	Ma	–	Native	Baseline ecological assessment, Migratory bird survey
Petrochelidon ariel	Fairy martin	–	–	Native	Baseline ecological assessment, Migratory bird survey
Phalacrocorax carbo	Great cormorant	–	–	Native	Baseline ecological assessment
Phalacrocorax sulcirostris	Little black cormorant	–	–	Native	Migratory bird survey
Phalacrocorax varius	Pied cormorant	–	–	Native	Migratory bird survey
Phylidonyris novaehollandiae	New holland honeyeater	–	–	Native	Baseline ecological assessment, Environmental risks survey
Platalea regia	Royal spoonbill	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Pluvialis squatarola	Grey plover	Mi, Ma, V	–	Migratory	Migratory bird survey
Podiceps cristatus australis	Great crested grebe	–	R	Native	Migratory bird survey
Poliocephalus poliocephalus	Hoary-headed grebe	–	–	Native	Environmental risks survey, Migratory bird survey
Porzana fluminea	Australian spotted crake	–	–	Native	Baseline ecological assessment
Rhipidura albiscapa	Grey fantail	–	–	Native	Migratory bird survey
Rhipidura leucophrys	Willie wagtail	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Sternula nereis nereis	Australian fairy tern	Ma, V	E	Native	Migratory bird survey
Streptopelia chinensis	Spotted dove	–	–	Introduced	Baseline ecological assessment
Sturnus vulgaris	Common starling	–	–	Introduced	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Thalasseus bergii	Greater crested tern	Ma, Mi	–	Migratory	Baseline ecological assessment, Migratory bird survey
Thinornis cucullatus cucullatus	Eastern hooded plover	Ma, V	V	Native	Migratory bird survey
Threskiornis moluccus	Australian white ibis	Ma	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey

Scientific name	Common name	Status		Origin	Survey recorded in
		EPBC Act	NP&W Act		
Todiramphus sanctus	Sacred kingfisher	–	–	Native	Environmental risks survey
Tringa nebularia	Common greenshank	Ma, Mi, E	–	Migratory	Baseline ecological assessment, Migratory bird survey
Tringa stagnatilis	Marsh sandpiper	Ma, Mi	–	Migratory	Migratory bird survey
Turdus merula	Common blackbird	–	–	Introduced	Environmental risks survey
Vanellus miles	Masked lapwing	–	–	Native	Baseline ecological assessment, Environmental risks survey, Migratory bird survey
Vanellus tricolor	Banded lapwing	–	–	Native	Migratory bird survey
Zosterops lateralis	Silvereye	–	–	Native	Baseline ecological assessment
Frogs					
Limnodynastes tasmaniensis	Spotted marsh frog	–	–	Native	Baseline ecological assessment
Mammals					
Hydromys chrysogaster	Water rat	–	–	Native	Baseline ecological assessment
Oryctolagus cuniculus	Rabbit	–	–	Introduced	Baseline ecological assessment
Vulpes vulpes	Fox	–	–	Introduced	Baseline ecological assessment
Reptiles					
Pseudonaja textilis	Eastern brown snake	–	–	Native	Baseline ecological assessment
Tiliqua rugosa	Shingleback	–	–	Native	Baseline ecological assessment

Key to table:

EPBC Act: E = Endangered, V = Vulnerable, Mi = Migratory, Ma = Marine.

NP&W Act: R = Rare, V= Vulnerable, E = Endangered.

Appendix F

Species and community information

Table F1 Threatened ecological communities within or relevant to the Strategic Assessment Area

Description	
Name	Subtropical and temperate coastal saltmarsh (Coastal Saltmarsh)
Description	This threatened ecological community is in coastal areas under tidal influence and is dominated by salt-tolerant vegetation, mainly succulents but also grasses, herbs, reeds, sedges and shrubs. It is found in most coastal regions of sub-tropical and temperate zones of Australia. Significant ecological species of the threatened ecological community include salt couch (*Sporobolus virginicus*), bead glasswort (*Sarcocornia quinqueflora*), rush (*Juncus kraussii*) and sea-blite (*Suaeda australis*) (DCCEEW 2013b).
Relevance to the Strategic Assessment Area	Subtropical and temperate coastal saltmarsh is present in Mutton Cove, directly adjacent to the Strategic Assessment Area. It is also present on Torrens Island across the Port Adelaide River from the Strategic Assessment Area.
Known or potential extents within the Strategic Assessment Area	The threatened ecological community is assessed unlikely to be present in the Strategic Assessment Area due to the areas where the vegetation is present being cut off from the tidal regime from previous landscape alterations on the Lefevre Peninsula. There is no relevant vegetation in the tidal areas of the Strategic Assessment Area that could be the threatened ecological community.
Known or potential extent within the surrounding region	The threatened ecological community is present in Mutton Cove Conservation Reserve and Torrens Island.
Area (ha)	Not present within the Strategic Assessment Area, 547.96 ha present in Mutton Cove and Torrens Island.
Condition	Poor
Listing status	Vulnerable
Threatening processes	Clearing and fragmentation, infilling of land (complete clearance of land to repurpose), altered hydrology and tidal restriction, invasive species, climate change, mangrove creep, recreation, pollution and litter, eutrophication, Acid Sulfate Soils, grazing, insect control, evaporative salt production and other mining, inappropriate fire regimes.
Habitat quality	The threatened ecological community provides important habitat for benthic invertebrate such as snails, bivalves, slugs and crabs as well as providing a nursery habitat for juvenile fishes and prawn species. Insects are abundant and are a food source for other inhabiting fauna such as water birds (DCCEEW 2013b).
Landscape context	Coastal Saltmarsh is critically dependent on an ongoing connection to a tidal regime, regular or irregular. It is a component of the complex coastal and estuarine vegetation communities and may abut seagrass meadows or intertidal flats or intergrade with mangroves, coastal forests and shrubland. Alteration of hydrological processes by structures like seawalls, or artificial barriers may strand the threatened ecological community from tidal influence (DCCEEW 2013b).

EPBC THREATENED ECOLOGICAL COMMUNITIES

Legend

- Railway
- Strategic assessment area
- Subtropical and temperate coastal saltmarsh

Australian Government
Australian Submarine Agency

GHD

FIGURE F1
Rev 0
12/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_009_ThreatenedEcologicalCommunities

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area (2023). DEW - Ecological communities (2024). nearmap.com:

Table F2 Key threatening processes for EPBC Act and NP&W Act listed species assessed as known, likely or having the potential to occur within the Strategic Assessment Area

Scientific name	Common name	Competition and land degradation by rabbits	Incidental catch (or bycatch) of seabirds during oceanic longline fishing operations	Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris	Land clearance	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases	Novel biota and their impact on biodiversity (invasive species)	Predation by European red fox	Predation by feral cats	Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine (parrot) species
Birds											
Acanthiza iredalei rosinae	Slender-billed thornbill (Gulf St Vincent)	●			●		●		●	●	
Actitis hypoleucos	Common sandpiper		●					●	●		
Anthus australis	Australasian pipit								●		
Apus pacificus	Fork-tailed swift									●	
Ardea intermedia plumifera	Plumed egret				●		●	●			
Ardea alba modesta	Eastern great egret				●		●	●			
Arenaria interpres	Ruddy turnstone		●	●			●	●			
Biziura lobata menziesii	Musk duck						●				
Burhinus grallarius	Bush stone-curlew				●				●	●	
Calidris acuminata	Sharp-tailed sandpiper		●		●		●	●			
Calidris alba	Sanderling		●				●	●			
Calidris ferruginea	Curlew sandpiper				●		●	●			
Calidris melanotos	Pectoral sandpiper		●		●		●	●			
Calidris pugnax	Ruff		●				●	●			
Calidris ruficollis	Red-necked stint		●		●			●			
Calidris subminuta	Long-toed stint		●				●	●			
Calidris tenuirostris	Great knot		●		●		●	●			
Chalcites osculans	Black-eared cuckoo				●		●				
Charadrius bicinctus	Double-banded plover		●					●		●	
Charadrius leschenaultii	Greater sand plover		●		●		●	●			
Charadrius mongolus	Lesser sand plover		●		●		●	●	●	●	
Charadrius ruficapillus	Red-capped plover				●		●		●		
Charadrius veredus	Oriental plover		●					●			
Chroicocephalus novaehollandiae	Silver gull			●				●		●	
Cladorhynchus leucocephalus	Banded stilt				●		●				
Coturnix ypsilophora australis	Brown quail										
Haematopus fuliginosus	Sooty oystercatcher				●		●		●		
Haematopus longirostris	Pied oystercatcher				●						
Haliaeetus leucogaster	White-bellied sea eagle				●				●		
Himantopus himantopus	Pied stilt				●		●		●		
Hydroprogne caspia	Caspian tern		●				●	●			
Larus pacificus	Pacific gull						●	●			
Limicola falcinellus	Broad-billed sandpiper		●				●	●			
Limosa lapponica	Bar-tailed godwit				●		●	●			
Limosa limosa	Black-tailed godwit		●	●	●		●	●			

Scientific name	Common name	Competition and land degradation by rabbits	Incidental catch (or bycatch) of seabirds during oceanic longline fishing operations	Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris	Land clearance	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases	Novel biota and their impact on biodiversity (invasive species)	Predation by European red fox	Predation by feral cats	Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine (parrot) species
Neophema chrysogaster	Orange-bellied parrot	●			●		●	●	●	●	●
Neophema elegans elegans	Elegant parrot						●				
Neophema petrophila zietzi	Rock parrot				●			●	●		
Numenius madagascariensis	Eastern curlew			●	●		●				
Numenius phaeopus variegatus	Whimbrel		●		●		●	●			
Pelecanus conspicillatus	Australian pelican			●			●				
Phalacrocorax fuscescens	Black-faced cormorant								●		
Pluvialis fulva	Pacific golden plover		●				●	●			
Pluvialis squatarola	Grey plover		●	●	●		●	●			
Podiceps cristatus australis	Great crested grebe				●			●		●	
Recurvirostra novaehollandiae	Red-necked avocet				●		●		●		
Sterna hirundo longipennis	Common tern	●	●	●	●		●	●	●	●	
Sterna striata	White-fronted tern							●		●	
Sternula albifrons sinensis	Little tern				●				●	●	
Sternula nereis nereis	Australian fairy tern							●	●	●	
Thalasseus bergii	Greater crested tern				●						
Thinornis cucullatus cucullatus	Eastern hooded plover			●		●	●	●	●		
Threskiornis moluccus	Australian white ibis				●		●				
Tringa brevipes	Grey-tailed tattler		●		●		●	●	●	●	
Tringa glareola	Wood sandpiper		●				●	●	●		
Tringa nebularia	Common greenshank		●		●		●	●			
Tringa stagnatilis	Marsh sandpiper		●		●		●	●			
Xenus cinereus	Terek sandpiper		●		●		●	●			
Zapornia tabuensis	Spotless crake				●					●	
Mammals											
Neophoca cinerea	Australian sea lion		●	●	●		●				
Reptiles											
Caretta caretta	Loggerhead turtle			●				●	●		
Chelonia mydas	Green turtle			●				●	●		
Dermochelys coriacea	Leatherback turtle			●				●	●		

Table F3 Strategic Assessment Area fauna habitat quality assessment

Habitat type	Lower quality habitat							Higher quality habitat						
				Habitat does not adequately provide:							Habitat adequately provides:			
	Patch size <25ha	Fragmented habitat	Non-remnant vegetation	Sheltering attributes	Foraging attributes	Resting attributes	High weed cover	Patch size >25 ha	Intact habitat	Remnant vegetation	Sheltering attributes	Foraging attributes	Resting attributes	Low weed cover
Low open shrubland	●	●	●	●	●	●	●							
Mangrove shrubland	●	●	●	●	●	●								●
Constructed wetland	●	●	●	●	●	●	●							
Seagrass meadow	●	●	●	●	●	●	●							
Tidal flat	●	●	●	●	●	●								●
Estuarine river			●			●		●	●		●	●		●

Table F4 Summary of fauna habitat within the Strategic Assessment Area

Scientific name Common name	Functional group	EPBC Act			NP&W Act threatened status	Potential habitat							Total suitable habitat area (ha)	Presence in Strategic Assessment Area	Literature estimated population size	Number observed (total count)	Landscape context
		Threatened status	Migratory	Marine		Low open shrubland	Mangrove shrubland	Constructed wetland	Seagrass meadow	Tidal flat	Estuarine river	Quality					
Birds																	
Acanthiza iredalei rosinae Slender-billed thornbill (Gulf St Vincent)	Woodland	Vulnerable	–	–	Vulnerable	●	●	●		●		Lower	47.17	Likely	4,600 in Australia (DoE 2015a)	N/A	Could be present at: – Manufacturing and fabricating area – Falie Reserve
Actitis hypoleucos Common sandpiper	Shoreline	–	Yes	Yes	Rare			●		●		Lower	5.12	Known	3,100,000–3,500,00 globally (Australian Museum 2020a)	22	Observed at: – Strategic Assessment Area Swale Drain – Strategic Assessment Area Shoreline Could be present at: – Manufacturing and fabricating area
Anthus australis Australasian pipit	Woodland	–	–	Yes	–	●						Lower	41.70	Potential	Unknown, but with a stable trend (IUCN 2018a)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area
Apus pacificus Fork-tailed swift	Marine	–	Yes	Yes	–	●						Lower	41.70	Potential	Unknown, but with a stable trend (IUCN 2016a)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area
Ardea intermedia plumifera Plumed egret	Wetland	–	–	Yes	Rare			●		●		Lower	5.12	Potential	Unknown, but with a decreasing trend (IUCN 2020a)	N/A	Could be present at: – Manufacturing and fabricating area – Assembly and testing area
Ardea alba modesta Eastern great egret	Shoreline	–	–	Yes	–					●		Lower	2.58	Known	590,000–2,200,000 globally (IUCN 2016b)	4	Observed at: – Strategic Assessment Area Shoreline
Arenaria interpres Ruddy turnstone	Shoreline	Vulnerable	Yes	Yes	Rare					●		Lower	2.58	Potential	16,900–22,200 (approx. 18,700) (DCCEEW 2024b)	N/A	Could be present at: – Assembly and testing area
Biziura lobata menziesii Musk duck	Wetland	–	–	Yes	Rare	●		●		●		Lower	46.82	Potential	130,000–330,000, with a decreasing trend (BirdLife International 2016)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Burhinus grallarius Bush stone-curlew	Woodland	–	–	–	Rare	●						Lower	41.70	Likely	10,000–15,000 globally (IUCN 2016c)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area
Calidris acuminata Sharp-tailed sandpiper	Shoreline	Vulnerable	Yes	Yes	–	●	●			●		Lower	47.17	Known	9,500–268,900 (approx. 71,000) (DCCEEW 2024d)	300	Observed at: – Strategic Assessment Area Swale Drain Could be present at: – Manufacturing and fabricating area – Assembly and testing area
Calidris alba Sanderling	Shoreline	–	Yes	Yes	Rare		●			●		Lower	2.93	Likely	620,000–700,000 globally (IUCN 2016d)	N/A	Could be present at: – Assembly and testing area

Scientific name Common name	Functional group	EPBC Act			NP&W Act threatened status	Potential habitat							Total suitable habitat area (ha)	Presence in Strategic Assessment Area	Literature estimated population size	Number observed (total count)	Landscape context
		Threatened status	Migratory	Marine		Low open shrubland	Mangrove shrubland	Constructed wetland	Seagrass meadow	Tidal flat	Estuarine river	Quality					
Calidris ferruginea Curlew sandpiper	Shoreline	Critically Endangered	Yes	Yes	Endangered					●		Lower	2.58	Potential	1,850,000 globally (DCCEEW 2023d)	N/A	Could be present at: – Assembly and testing area
Calidris melanotos Pectoral sandpiper	Shoreline	–	Yes	Yes	Rare	●		●		●		Lower	46.82	Potential	25,000–100,000 globally (TSSC 2015c)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Calidris pugnax Ruff	Shoreline	–	–	Yes	Rare	●		●		●		Lower	46.82	Potential	797,000–4,970,000 globally (BirdLife International 2024)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Calidris ruficollis Red-necked stint	Shoreline	–	Yes	Yes	–					●		Lower	2.58	Known	315,000 globally 270,000 in Australia (BirdLife International 2024)	4	Observed at – Strategic Assessment Area Swale Drain
Calidris subminuta Long-toed stint	Shoreline	–	Yes	Yes	Rare		●	●		●		Lower	5.47	Potential	>25,000 globally (IUCN 2016e)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Calidris tenuirostris Great knot	Shoreline	Vulnerable	Yes	Yes	Endangered					●		Lower	2.58	Potential	380,000, with a decreasing trend (BirdLife Australia 2024e, DCCEEW 2024h)	N/A	Could be present at: – Assembly and testing area
Chalcites osculans Black-eared cuckoo	Woodland	–	–	Yes	–	●						Lower	41.70	Potential	Unknown, but with a stable trend (IUCN 2016f)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area
Charadrius bicinctus Double-banded plover	Shoreline	–	Yes	Yes	–		●	●		●		Lower	5.47	Potential	8,000–14,000 globally (IUCN 2020b)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Charadrius leschenaultii Greater sand plover, large sand plover	Shoreline	Vulnerable	Yes		Endangered	●				●		Lower	44.28	Potential	180,000–360,000 globally (DCCEEW 2023e)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Charadrius mongolus Lesser sand plover, Mongolian plover	Shoreline	Endangered	Yes		Endangered					●		Lower	2.58	Potential	130,000 globally (DCCEEW 2024i)	N/A	Could be present at: – Assembly and testing area
Charadrius ruficapillus Red-capped plover	Shoreline	–	–	Yes	–					●		Lower	2.58	Likely	Not reported in the literature reviewed.	N/A	Could be present at: – Assembly and testing area
Charadrius veredus Oriental plover	Shoreline	–	Yes	Yes	–		●			●		Lower	2.93	Potential	160,000 globally (IUCN 2016g)	N/A	Could be present at: – Assembly and testing area
Chroicocephalus novaehollandiae Silver gull	Marine	–	–	Yes	–					●		Lower	2.58	Known	Unknown, but with an increasing trend (IUCN 2018b)	506	Observed at – Strategic Assessment Area Swale Drain

Scientific name Common name	Functional group	EPBC Act			NP&W Act threatened status	Potential habitat							Total suitable habitat area (ha)	Presence in Strategic Assessment Area	Literature estimated population size	Number observed (total count)	Landscape context
		Threatened status	Migratory	Marine		Low open shrubland	Mangrove shrubland	Constructed wetland	Seagrass meadow	Tidal flat	Estuarine river	Quality					
Cladorhynchus leucocephalus Banded stilt	Wetland	–	–	–	Vulnerable					●		Lower	2.58	Likely	Not reported in the literature reviewed.	N/A	Could be present at: – Assembly and testing area
Coturnix ypsilophora australis Brown quail	Woodland	–	–	–	Vulnerable			●				Lower	2.54	Potential	Not reported in the literature reviewed.	N/A	Could be present at: – Manufacturing and fabricating area
Haematopus fuliginosus Sooty oystercatcher	Shoreline	–	–	–	Rare		●			●		Lower	2.93	Known	4,000 in Australia (NSW Scientific Committee 2008)	189	Observed at: – Strategic Assessment Area Shoreline
Haematopus longirostris Pied oystercatcher	Shoreline	–	–	–	Rare					●		Lower	2.58	Potential	Not reported in the literature reviewed.	N/A	Could be present at: – Assembly and testing area
Haliaeetus leucogaster White-bellied sea eagle	Marine	–	–	Yes	Endangered	●				●		Lower	44.28	Potential	2,600–41,000, with a decreasing trend (Dennis *et al.* 2001)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Himantopus himantopus Pied stilt	Shoreline	–	–	Yes	–					●		Lower	2.58	Known	450,000–780,000 globally (IUCN 2016h)	69	Observed at – Strategic Assessment Area Swale Drain – Faile Reserve Swale Drain
Hydroprogne caspia Caspian tern	Marine	–	Yes	Yes	–					●		Lower	2.58	Known	250,000–470,000 globally (DEE 2019)	41	Observed at: – Strategic Assessment Area Shoreline
Larus pacificus Pacific gull	Marine	–	–	Yes	–					●		Lower	2.58	Known	11,000 globally (IUCN 2018c)	1	Observed at: – Strategic Assessment Area Shoreline
Limicola falcinellus Broad-billed sandpiper	Shoreline	–	Yes	Yes	–					●		Lower	2.58	Potential	86,000–89,000 globally (IUCN 2016i)	N/A	Could be present at: – Assembly and testing area
Limosa lapponica Bar-tailed godwit	Shoreline	–	Yes	Yes	–					●		Lower	2.58	Potential	1,099,000–1,149,000 globally (IUCN 2016j)	N/A	Could be present at: – Assembly and testing area
Limosa limosa Black-tailed godwit	Shoreline	Endangered	Yes	Yes	Rare					●		Lower	2.58	Potential	108,400–172,400 (approx. 126,300) (DoE 2024c)	N/A	Could be present at: – Assembly and testing area
Neophema chrysogaster Orange-bellied parrot	Woodland	Critically Endangered	–	Yes	Endangered	●						Lower	41.70	Potential	50 in the wild 320 in captivity (DELWP 2016)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area
Neophema elegans elegans Elegant parrot	Woodland	–	–	–	Rare	●						Lower	41.70	Known	Not reported in the literature reviewed.	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Neophema petrophila zietzi Rock parrot	Woodland	–	–	Yes	Rare		●					Lower	0.35	Known	Not reported in the literature reviewed.	24	Observed at: – Strategic Assessment Area Shoreline – Strategic Assessment Area Swale Drain – Falie Reserve Swale Drain

Scientific name Common name	Functional group	EPBC Act			NP&W Act threatened status	Potential habitat							Total suitable habitat area (ha)	Presence in Strategic Assessment Area	Literature estimated population size	Number observed (total count)	Landscape context
		Threatened status	Migratory	Marine		Low open shrubland	Mangrove shrubland	Constructed wetland	Seagrass meadow	Tidal flat	Estuarine river	Quality					
Numenius madagascariensis Eastern curlew, far eastern curlew	Shoreline	Critically Endangered	Yes	Yes	Endangered		●	●		●		Lower	5.47	Likely	22,000–24,100 (approx. 22,500) (DCCEEW 2023h)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Numenius phaeopus variegatus Whimbrel	Shoreline	–	–	Yes	Rare		●			●		Lower	2.93	Potential	797,000 globally (DCCEEW 2023h)	N/A	Could be present at: – Assembly and testing area
Pelecanus conspicillatus Australian pelican	Shoreline	–	–	Yes	–					●		Lower	2.58	Known	Unknown, but with a stable trend (IUCN 2016k)	42	Observed at: – Strategic Assessment Area Shoreline – Strategic Assessment Area Swale Drain
Phalacrocorax fuscescens Black-faced cormorant	Marine	–	–	Yes	–					●		Lower	2.58	Potential	Not reported in the literature reviewed.	N/A	Could be present at: – Assembly and testing area
Pluvialis fulva Pacific golden plover	Shoreline	–	Yes	Yes	Rare	●		●				Lower	44.24	Potential	190,000–250,000 globally (BirdLife Australia 2024n)	N/A	Could be present at: – Falie Reserve – Manufacturing and fabricating area – Assembly and testing area
Pluvialis squatarola Grey plover	Shoreline	Vulnerable	Yes	Yes	–					●		Lower	2.58	Likely	9,800–14,200 (approx. 11,300) (DCCEEW 2024o)	N/A	Could be present at: – Assembly and testing area
Podiceps cristatus australis Great crested grebe	Wetland	–	–	–	Rare		●					Lower	0.35	Likely	915,000–1,400,000 globally (BirdsSA 2024b)	N/A	Could be present at: – Assembly and testing area
Recurvirostra novaehollandiae Red-necked avocet	Wetland	–	–	Yes	–					●		Lower	2.58	Potential	Unknown, but with a stable trend (IUCN 2016l)	N/A	Could be present at: – Assembly and testing area
Sterna hirundo longipennis Common tern	Marine	–	Yes	Yes	Rare					●		Lower	2.58	Potential	1,600,000–3,600,000 globally (Birdfact 2024)	N/A	Could be present at: – Assembly and testing area
Sterna striata White-fronted tern	Shoreline	–	–	Yes	–					●		Lower	2.58	Potential	6,120–25,120 globally (IUCN 2018d)	N/A	Could be present at: – Assembly and testing area
Sternula albifrons sinensis Little tern	Shoreline	–	–	–	Endangered		●			●		Lower	2.93	Potential	3,000 breeding individuals in Australia (DCCEEW 2021b)	N/A	Could be present at: – Assembly and testing area
Sternula nereis nereis Australian fairy tern	Marine	Vulnerable	–	Yes	Endangered			●		●		Lower	5.12	Known	<5,000 (DSEWPC 2011)	54	Observed at: – Strategic Assessment Area Shoreline
Thalasseus bergii Greater crested tern	Wetland	–	Yes	Yes	–			●		●		Lower	5.12	Known	150,000–1,100,000 globally (Birdlife International 2024q)	41	Observed at: – Strategic Assessment Area Shoreline
Thinornis cucullatus cucullatus Eastern hooded plover	Shoreline	Vulnerable	–	Yes	Vulnerable					●		Lower	2.58	Likely	620 in South Australia (DoE 2014)	N/A	Could be present at: – Assembly and testing area

Scientific name Common name	Functional group	EPBC Act			NP&W Act threatened status	Potential habitat							Total suitable habitat area (ha)	Presence in Strategic Assessment Area	Literature estimated population size	Number observed (total count)	Landscape context
		Threatened status	Migratory	Marine		Low open shrubland	Mangrove shrubland	Constructed wetland	Seagrass meadow	Tidal flat	Estuarine river	Quality					
Threskiornis moluccus Australian white ibis	Shoreline	–	–	Yes	–	●	●	●		●		Lower	47.17	Known	Unknown, but with a stable trend (IUCN 2016m)	52	Observed at: – Strategic Assessment Area Shoreline – Strategic Assessment Area Swale Drain – Faile Reserve Swale Drain
Tringa brevipes Grey-tailed tattler	Shoreline	–	Yes	Yes	Rare		●			●		Lower	2.93	Potential	44,000 (DoE 2024i)	N/A	Could be present at: – Assembly and testing area
Tringa glareola Wood sandpiper	Wetland	–	Yes	Yes	Rare			●				Lower	2.54	Potential	3,100,000–3,500,000 globally (IUCN 2016n)	N/A	Could be present at: – Assembly and testing area – Manufacturing and fabricating area
Tringa nebularia Common greenshank, greenshank	Shoreline	Endangered	Yes	Yes	–	●	●	●		●		Lower	47.17	Known	16,300–33,400 (approx. 23,700) (DCCEEW 2024r)	8	Observed at: – Strategic Assessment Area Swale Drain Could be present at: – Manufacturing and fabricating area – Assembly and testing area
Tringa stagnatilis Marsh sandpiper	Shoreline	–	Yes	Yes	–			●		●		Lower	5.12	Likely	130,000 in the East Asian-Australasian Flyway (Hansen *et al.* 2016)	N/A	Could be present at: – Falie Reserve – Assembly and testing area
Xenus cinereus Terek sandpiper	Shoreline	Vulnerable	Yes	Yes	Rare					●		Lower	2.58	Potential	12,000–21,000 (approx. 16,000) (DCCEEW 2024s)	N/A	Could be present at: – Assembly and testing area
Zapornia tabuensis Spotless crake	Wetland	–	–	Yes	Rare			●				Lower	2.54	Potential	Unknown, but thought to be increasing (DEH 2008c)	N/A	Could be present at: – Assembly and testing area – Manufacturing and fabricating area
Mammals																	
Neophoca cinerea Australian sea lion	Marine	Endangered	–	Yes	Vulnerable						●	Higher	186	Potential	14,700 (DSEWPC 2013a)	N/A	Could be present at: – Port Adelaide River
Reptiles																	
Caretta caretta Loggerhead turtle	Marine	Endangered	Yes	Yes	Endangered				●		●	Lower	186	Potential	500 (NOAA 2024)	N/A	Could be present at: – Port Adelaide River
Chelonia mydas Green turtle	Marine	Vulnerable	Yes	Yes	–				●		●	Lower	186	Potential	70,000 (DoE 2024l)	N/A	Could be present at: – Port Adelaide River
Dermochelys coriacea Leatherback turtle, leathery turtle	Marine	Endangered	Yes	Yes	Vulnerable				●		●	Lower	186	Potential	35,800 (DoE 2024n)	N/A	Could be present at: – Port Adelaide River

Appendix G

Species profiles

G-1 Common bottlenose dolphin (*Tursiops truncatus*) & Indo Pacific bottlenose dolphin (*Tursiops aduncus*)

Photo of Indo-Pacific Bottlenose Dolphin (The Society for Marine Mammalogy 2024)

Listing

The bottlenose dolphin is listed as cetacean under the EPBC Act.

Habitat

The bottlenose dolphin is a marine species and can be found in temperate and tropical waters preferring lagoons, fjords and estuaries, and nearshore (open coast) and offshore environments, including the coast of oceanic islands (DCCEEW 2024w).

Distribution

The bottlenose dolphin can be found across the globe. In South Australia there is a resident group of dolphins in the Adelaide Dolphin Sanctuary (NPWS 2024).

Strategic Assessment Area

Suitable habitat is present in Port Adelaide River.

Existing threatening processes

Threats to Australian bottlenose dolphin populations include indirect catches in trawl, gillnet, purse-seine and trap fisheries, entanglements in debris, intentional killing and overfishing (DCCEEW 2024w).

Identified important areas for Protected Matters

No critical habitat is defined under section 207A of the EPBC Act.

G-2 Bitter-bush blue butterfly (*Theclinesthes albicincta*)

Photo of bitterbush blue butterfly (Green Adelaide 2023)

Listing

The bitterbush blue butterfly is not listed under the EPBC Act.

Habitat

The bitterbush blue butterfly inhabits coastal and inland dune areas where the flora species rare bitterbush (*Adriana quadripartita*) is present, as the larvae solely feed on this plant.

Distribution

In South Australia, the bitterbush blue butterfly is distributed throughout coastal regions of the south-east near coastal dune systems (Grund 2010). The species has confirmed presence at Torrens Island and Biodiversity Park (Glatz *et al.* 2017).

Strategic Assessment Area

Suitable habitat is present in Falie Reserve.

Existing threatening processes

Threats to bitterbush blue butterfly populations include clearance of habitat due to development in coastal areas and sea-level rise from global warming (Grund 2010).

Identified important areas for Protected Matters

No critical habitat is defined under section 207A of the EPBC Act.

G-3 Yellow sedge skipper butterfly (*Hesperilla flavescens*)

Photo of yellow sedge skipper butterfly (Green Adelaide 2021)

Listing

The yellow sedge skipper butterfly is not listed under the EPBC Act.

Habitat

The yellow sedge skipper inhabits Gahnia (*Gahnia filum*) sedgelands in marsh or swamp coastal areas (Geyle *et al.* 2021)

Distribution

The yellow sedge skipper butterfly is distributed from western Victoria to south-eastern South Australia (Field 2023).

Strategic Assessment Area

Suitable habitat is present in Falie Reserve.

Existing threatening processes

Threats to yellow sedge skipper butterfly populations include clearance of habitat for urban and horticultural development purposed, particularly the *Gahnia* species (Green Adelaide 2021).

Identified important areas for Protected Matters

No critical habitat is defined under section 207A of the EPBC Act.

Australian Government

Australian Submarine Agency

ASA

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Appendix H

Significance of Impact Assessments

Australian Government
Australian Submarine Agency

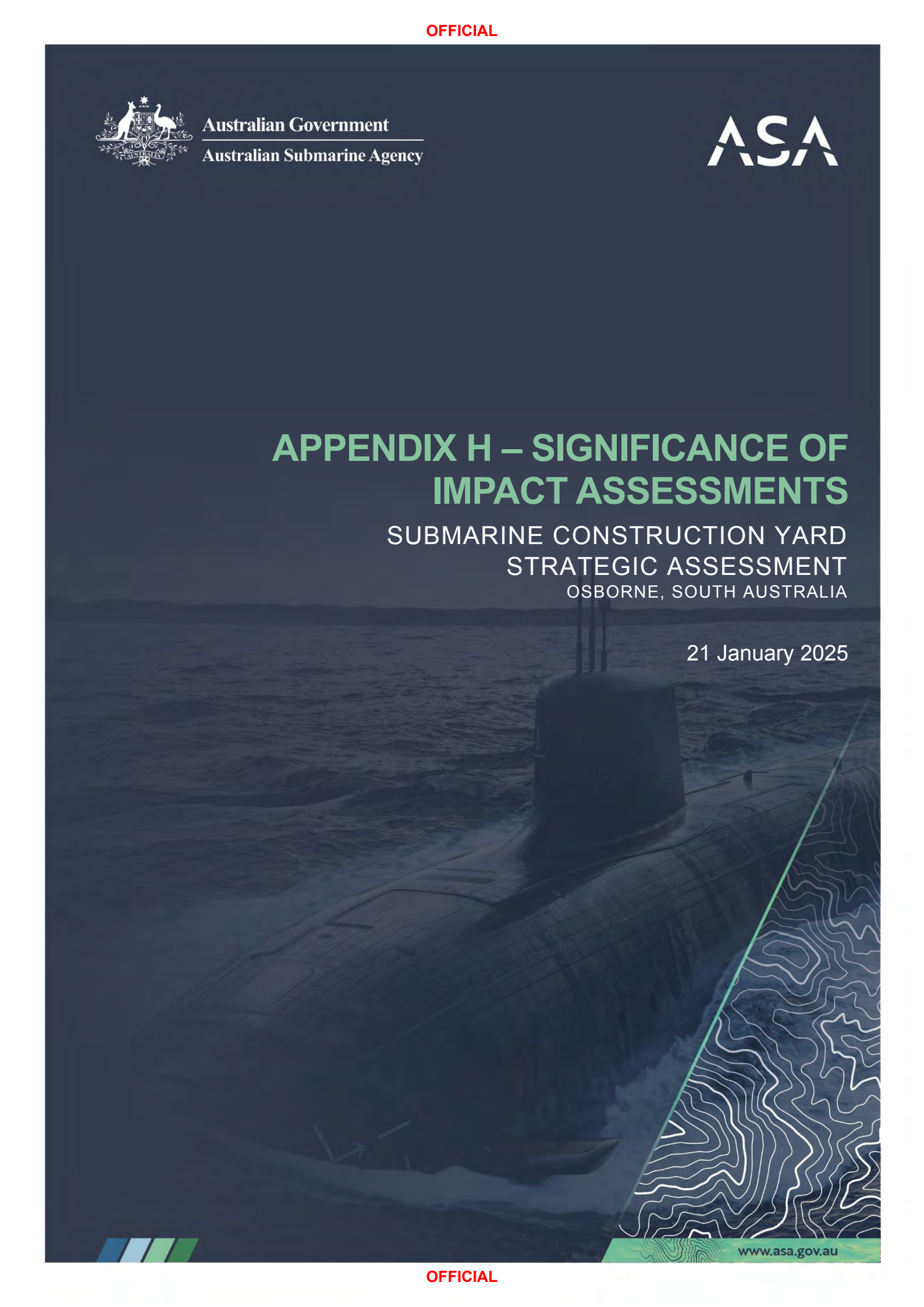
ASA

APPENDIX H – SIGNIFICANCE OF IMPACT ASSESSMENTS

SUBMARINE CONSTRUCTION YARD STRATEGIC ASSESSMENT

OSBORNE, SOUTH AUSTRALIA

21 January 2025



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Project name	Submarine Construction Yard Strategic Assessment, Osborne, South Australia
Document title	Significance of Impact Assessment Report
This document has been prepared by GHD Pty Ltd for the Australian Submarine Agency	

Acknowledgement of Country

The Australian Submarine Agency acknowledges the Kaurna Meyunna people of Kaurna Country, the Traditional Custodians on whose land the Submarine Construction Yard is sited. We recognise their continuing connection to traditional lands and waters and would like to pay respect to their Elders both past and present.

Contents

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Document navigation

This report is an appendix to the Submarine Construction Yard Strategic Assessment Impact Assessment Report ('The Report'), which provides assessments of the significance of potential impacts associated with the Actions and Classes of Actions proposed under the Strategic Assessment Plan ('The Plan'), on relevant matters protected under the EPBC Act. A complete discussion of the potential impacts of the construction and operation of the Submarine Construction Yard on these matters is provided in The Report.

Acronyms and abbreviations

Acronym / abbreviation	Meaning
CAMBA	China-Australia Migratory Bird Agreement
DCCEEW	The Department of Climate Change, Energy, the Environment and Water
EPA	South Australian Environmental Protection Agency
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
IUCN	International Union for Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
PFAS	Per- and Polyfluoroalkyl Substance
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SMART	Smart, Measurable, Achievable, Relevant and Timebound

Glossary

Term or phrase	Meaning
Actions	An activity or series of activities, proposed to be undertaken during the construction and operation of the Submarine Construction Yard, that are subject to approval by the Minister.
Activities	Discrete activities or works undertaken during the construction or operation of the Submarine Construction Yard, that may form part of a broader 'Action' or 'Class of Actions'. For example, site clearing is an activity.
Approval Holder(s)	Means the person or entity responsible for implementing the endorsed Plan identified and granted such status by an approval decision and ensuring the conditions attached to the Strategic Assessment approval are met, including the delivery of commitments for the protection of the Protected Matters.
Assembly and testing area	The area within the onshore area of the Strategic Assessment Area north of Pelican Point Road and east of Mersey Road North.
AUKUS	Trilateral security partnership between Australia, the United Kingdom, and the United States of America.
Biodiversity	The variety of life on earth, including within and between groups of plants, animals, microorganisms and their ecosystems.
Bonn Convention	The Convention on the Conservation of Migratory Species of Wild Animals.
Class of Actions	A 'Class of Actions' is a grouping of similar 'Actions' subject to approval by the Minister.
Clearing	The cutting down, felling, thinning, logging, removing, killing, destroying, ringbarking, uprooting of vegetation.
Construction	Construction means: – The erection of a building or structure that is, or is to be, fixed to the ground and wholly or partially fabricated on-site – The alteration, maintenance, repair or demolition of any building or structure – Any work which involves breaking of the ground (including pile driving) or bulk earthworks – The laying of pipes and other prefabricated materials in the ground – Any associated excavation work
Ecological communities	A group of native plants, animals and other organisms that naturally occur together and interact in a unique habitat. The structure of an ecological community, composition and distribution are determined by environmental factors such as soil type, position within the landscape / seascape (for example, altitude / depth), climate, and water availability, chemistry and movement (for example, oceanic currents). Species within each ecological community interact with and depend on each other—for example, for food or shelter.
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.
the Environment	Means 'environment' as defined in section 528 of the EPBC Act. It includes: a. Ecosystems and their constituent parts including people and communities ('ecosystem' is defined in the EPBC Act as 'a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functioning unit') and b. Natural and physical resources and c. The qualities and characteristics of locations, places and areas and d. Heritage values of places ('heritage value' is defined in the EPBC Act as including 'the place's natural and cultural environment having aesthetic, historic, scientific or social significance, or other significance, for current and future generations of Australians.' 'Indigenous heritage value' is defined as meaning 'a heritage value of the place that is of significance to Indigenous persons in accordance with their practices, observances, customs, traditions, beliefs or history') and e. The social, economic and cultural aspects of a thing mentioned in paragraph a), b), c) or d).
Manufacturing and fabricating area	The area within the onshore area of the Strategic Assessment Area south of Pelican Point Road and west of Mersey Road North.
Marine area	A portion of the Strategic Assessment Area located within the Port Adelaide River.

Term or phrase	Meaning
the Minister	The Commonwealth Minister who is responsible for the administration of the EPBC Act. As per the Terms of Reference, this may include a person to whom that Minister's power, under section 146(1) of the EPBC Act, has been delegated.
Mitigation measures	Measures that can be taken to effectively reduce any significant impact that an activity has, or will have, on a protected matter.
Onshore area	Any area of land within the shore area that is not included in the territorial sea or within the Port Adelaide River.
Osborne Naval Shipyard	Refers to the Osborne Naval Shipyard facilities currently under operation and in construction on property administered by Australian Naval Infrastructure.
The Plan	The Strategic Assessment Plan which describes: – The Actions and Classes of Actions that are to be undertaken to construct and operate the Submarine Construction Yard in the Strategic Assessment Area – The outcomes that will be achieved for Protected Matters, to which Actions proposed under The Plan relate, in accordance with the requirements of the EPBC Act
Protected Matter	Means a matter protected by a provision of part 3 of the EPBC Act. The specific matter protected by each provision is set out in section 34 of the EPBC Act.
The Report	The Impact Assessment Report assesses the potential environmental impacts associated with the development of the Submarine Construction Yard, and includes: – A description of the environment to which Actions proposed under The Plan relate – An assessment of the potential impacts of implementing The Plan on Protected Matters – Details of how likely or potential impacts will be avoided, mitigated and offset (where necessary or appropriate) to make sure that Protected Matters are protected and managed in the long-term.
Strategic Assessment	A process where the Minister may approve taking an Action or Class of Actions in accordance with an endorsed policy, plan or program. A Strategic Assessment Agreement provides for this kind of assessment. It is often used for landscape-scale assessments of developments and programs.
Strategic Assessment Area	Means the area displayed within the Strategic Assessment Area in Attachment 1 of the Agreement.
Surrounding region	The Strategic Assessment Area is surrounded by a variety of natural and manmade infrastructure. It sits in the greater context of the Lefevre Peninsula in Adelaide, South Australia. For the purposes of this report, the 'surrounding region' is inclusive of the following: – North: natural reserves and ecosystems line the coast. This includes the Adelaide International Bird Sanctuary National Park, and Torrens Island – South: The Osborne Naval Shipyard and residential areas – East: Torrens Island, Barker Inlet and St Kilda – West: industrial zoning, and Gulf St Vincent

1. Introduction

1.1 Overview

This document provides assessments of significance for the potential impacts associated with the Actions and Classes of Actions proposed under The Plan, to be undertaken during the construction and operation of the Submarine Construction Yard at Osborne, on relevant matters protected by a provision of part 3 of the *Environment Protection and Biodiversity Conservation Act 1999* ('Protected Matters').

Protected Matters relevant to the Strategic Assessment Area are included in Table 1-1.

Table 1-1 Relevant Protected Matters summary

Protected Matter	Provision of EPBC Act
Listed threatened species and communities	Subsection 18(2) A listed threatened species in the critically endangered category
	Subsection 18(3) A listed threatened species in the endangered category
	Subsection 18(4) A listed threatened species in the vulnerable category
	Subsection 18(6) A listed threatened ecological community in the endangered category
	Subsection 18A(1) or (2) A listed threatened species (except a species included in the extinct category of the list referred to in section 178, or a conservation dependent species), and a listed threatened ecological community (except an ecological community included in the vulnerable category of the list referred to in section 181)
Listed migratory species	Section 20 and section 20A A listed migratory species
Protection of the environment from Commonwealth actions	Section 28 The environment

Listed threatened species and ecological communities, and listed migratory species are (for the most part), matters of national environmental significance under Part 3, division 1 of the EPBC Act. Criteria for the assessment of significance for matters of national environmental significance, are included in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* ('Significant impact guidelines 1.1') (Commonwealth of Australia 2013a).

Although the protection of the environment from nuclear actions is a matter of national environmental significance (part 3, division 1, subdivision E), no specific criteria for the assessment of a nuclear action are provided under the *Significant impact guidelines 1.1*. The Actions or Classes of Actions are not a nuclear action, therefore the Plan does not include the consideration of a nuclear action.

'The environment' is the matter protected in relation to section 28 – actions undertaken by a Commonwealth Agency. As such, potential impacts to 'the environment' have been addressed in this assessment of significance. This assessment was undertaken in accordance with the approach described in the *Significant impact guidelines 1.2: Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* ('Significant impact guidelines 1.2') (Commonwealth of Australia 2013b).

1.2 Assessment approach

Assessments of significance were undertaken with respect to Protected Matters using relevant significant impact criteria within:

– *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a)

– *Significant impact guidelines 1.2: Actions on, or impacting upon, Commonwealth land and actions by Commonwealth agencies* (Commonwealth of Australia 2013b)

The assessments of significance were conducted in accordance with the above policy documents, and considered:

- Characteristics of the Protected Matter, including habitat, distribution, life cycle, migration patterns and other relevant attributes
- Other EPBC Act statutory documents, including (as relevant):
  - Conservation advice
  - Recovery plans
  - Threat abatement plans
  - Wildlife conservation plans
  - Other EPBC Act policy documents (as stated)
- Existing environmental values within the Strategic Assessment Area and surrounding region
- Potential impacts associated with the Actions and Classes of Actions, in consideration of likely approaches to construction and operation
- Potential cumulative impacts associated with other known or potential projects in the surrounding area
- Future climate risks
- EPBC Act Environmental Offsets Policy 2012

Figure 1 outlines the impact assessment methodology from the identification of Actions, describing the existing environment, identification and assessment of potential impacts, understanding mitigation measures, and the likely acceptability of residual impacts from the construction and operation of the Submarine Construction Yard.

If unmitigated impacts were assessed to be likely to have a significant impact on a Protected Matter without mitigation measures in place, the potential impact was reassessed with respect to the application of committed mitigation measures. This enabled the consideration of whether, with controls, the potential impacts could be reduced to a level that was not significant. Where the impacts were able to be reduced to an acceptable level, it was assessed these potential impacts would be likely to be acceptable.

1.3 Risk assessment summary

The risk assessment identified a risk rating of high for unmitigated risks related to:

- Clearing of vegetation
- Mobilisation of sediment
- Changes to landscape and visual amenity
- Hydrological changes
- Geomorphological changes
- Vibration
- Noise generation
- Dust generation
- Increased demand for resources and facilities

The Plan would not proceed without mitigation measures in place. Mitigation measures to be implemented are included in Table 1-3. The residual risk assessment conducted in consideration of the mitigation measures identified that a risk rating of high remained for:

- Increased demand for resources and facilities
- Clearing of vegetation

All other unmitigated risks that were rated high, were assessed to be medium or low with mitigation measures in place. This demonstrates that risks would be likely to be reduced following implementation of mitigations

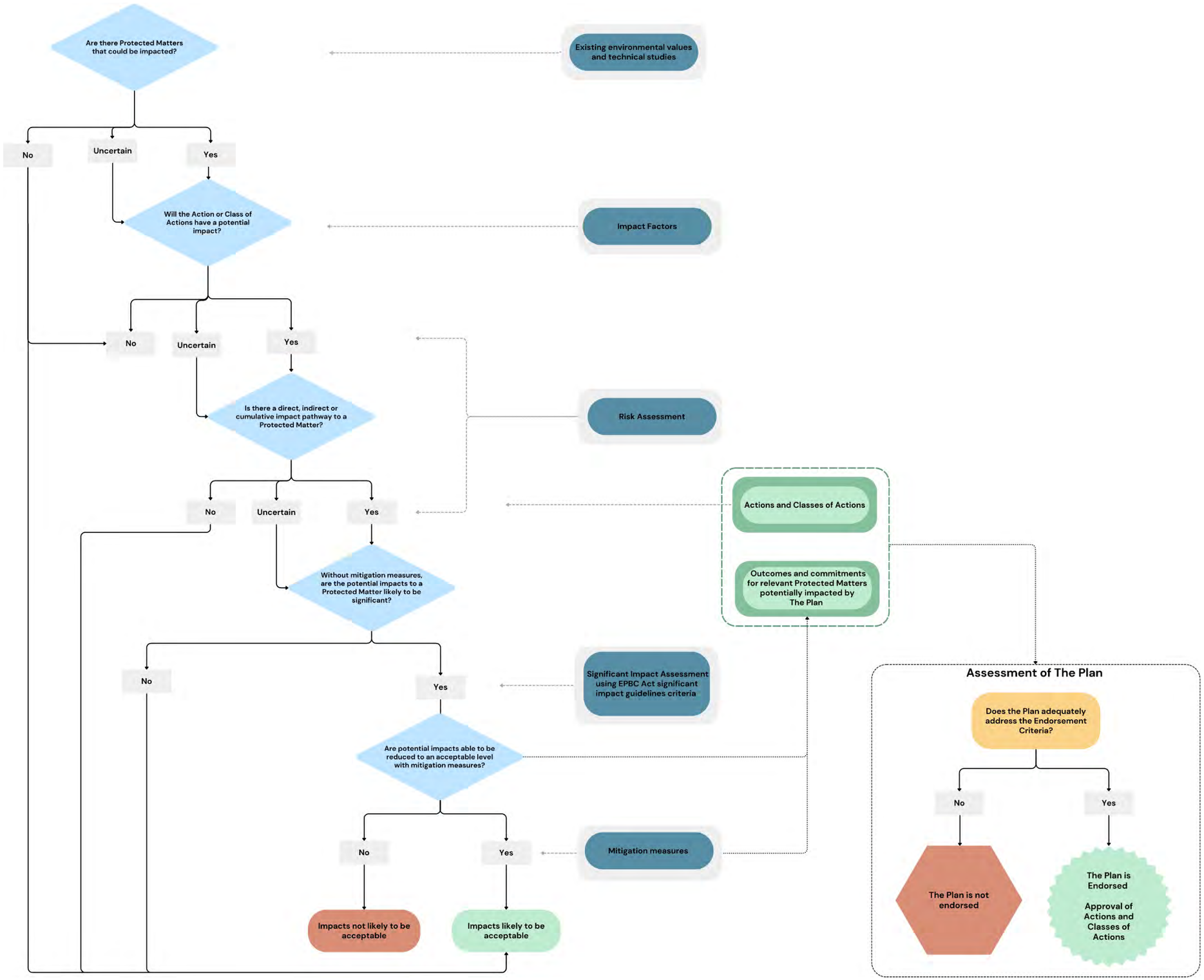


Figure 1 *Impact assessment methodology*

1.4 Potential impacts

1.4.1 Summary

Potential impacts that could occur if the intended mitigation measures and controls were not implemented are included in **Section 7.2** of the main body of **The Report**. A summary is included in Table 1-2. Impact factors that relate to the potential impacts are included in **Chapter 6** of the main body of **The Report.**

Table 1-2 Direct and indirect impact summary

<table>
<tr><th>Potential impact</th><th colspan="3">Summary of impact</th></tr>
<tr><td colspan="4">Direct</td></tr>
<tr><td rowspan="6">Clearing of vegetation / habitat loss</td><td colspan="3">Estimated clearing extent</td></tr>
<tr><td>Location</td><td>Habitat type</td><td>Area (ha)</td></tr>
<tr><td rowspan="2">Onshore area</td><td>Constructed wetland</td><td>2.54</td></tr>
<tr><td>Low open shrubland</td><td>24.33</td></tr>
<tr><td rowspan="3">Marine area</td><td>Mangrove shrubland</td><td>0.35</td></tr>
<tr><td>Tidal flat</td><td>2.58 ha (inclusive of mangrove shrubland)</td></tr>
<tr><td>Seagrass meadow</td><td>3.49</td></tr>
<tr><td>Mortality or injury of fauna</td><td colspan="3">Could be caused by a range of factors, including by vehicle strike, unanticipated pollutant release or as a result of noise and vibration in the marine environment.</td></tr>
<tr><td>Altered behaviour of a species</td><td colspan="3">Could occur predominantly as a result of individuals avoiding areas where impact factors such as noise, vibration, odour or light are being generated, or as a startle response.</td></tr>
<tr><td>Changes to landforms and landscapes</td><td colspan="3">Excavations for construction of a launch facility as well as changes to surface levels.</td></tr>
<tr><td>Mobilisation of pollutants</td><td colspan="3">Unconsolidated material exposed to rainfall or wind cause waterborne (sedimentation), or windborne (dust) deposition in water and air. The extent of these would be subject to conditions.
Dredging is expected to generate sedimentation and cause increased turbidity.
Releases from sampling and waste management would not be likely (see Section 3.3.3 of The Report).</td></tr>
<tr><td>Interaction with a heritage place or heritage values</td><td colspan="3">Vibration in proximity to Excelsior could accelerate its degradation.</td></tr>
<tr><td>Changes to environmental amenity</td><td colspan="3">Temporary and permanent changes to the environment of the Strategic Assessment Area and adjacent areas as a result of noise, vibration, dust, odour and light generated during construction and operation.</td></tr>
<tr><td colspan="4">Indirect</td></tr>
<tr><td>Habitat degradation</td><td colspan="3">Changes to the environment could affect species habitat, such as noise, dust, light, pest species and underwater noise.</td></tr>
</table>

1.4.2 Uncertainties

While some details relating to the development of the Submarine Construction Yard are in the process of being finalised, there is a high level of certainty with respect to the following:

– The entire onshore extent of the Strategic Assessment Area will be developed
– Part of the marine extent of the Strategic Assessment area will be developed. This will include:
  - Construction of maritime infrastructure at the interface between the onshore area and the marine area along the Port Adelaide River bank

- Capital dredging between the Port Adelaide River bank and existing shipping channel to support the development of maritime infrastructure, and for 'turning circles' within the existing shipping channel

There is a lower level of certainty with respect to:

– Design
– Timing / duration of activities
– Frequency of activities
– Scale and extent, including:
  - The need for capital dredging within the existing shipping channel to allow for the movement of submarines
  - The need for and frequency of maintenance dredging within the existing shipping channel

1.4.3 Cumulative impacts

Successive cumulative impacts

Actions and Classes of Actions will take place over the 50-year timescale of The Plan with some activities occurring consecutively over time. The following impact factors could have a successive effect over time:

– Vibration
– Noise
– Mobilisation of sediment
– Mobilisation of contaminants
– Mobilisation of gross pollutants

Incremental cumulative impacts

Reasonably foreseeable future actions that may have an incremental cumulative effect include those actions excluded from the Strategic Assessment, as well as other planned works on the Lefevre Peninsula such as road upgrades by the Department of Infrastructure and Transport that are likely to coincide with work related to the Submarine Construction Yard.

The following impact factors could have an incremental effect over time:

– Vibration
– Noise
– Mobilisation of sediment
– Mobilisation of gross pollutants
– Clearing of vegetation / habitat loss
– Light generation
– Changes to landscape and visual amenity
– Interaction with a heritage place or heritage values
– Increased resource demand

Actions and impacts that have been undertaken in the past that are cumulative considerations include filling and levelling of the Lefevre Peninsula, industrial developments, including port, grain terminal, power station, Osborne Naval Shipyard and other industrial infrastructure and projects currently in progress such as maintenance dredging at Osborne Naval Shipyard.

1.5 SMART mitigation measures

Table 1-3 provides a summary of specific, measurable, achievable, relevant and timebound (SMART) mitigation measures that are to be implemented, for relevant impact factors and associated Actions or Classes of Actions.

Table 1-3 SMART mitigation measures

Impact factor	Associated Actions	Specific What are the specific measures that should be implemented?	Measurable How will this be measured?	Achievable Is this a realistically achievable and well-established approach?	Relevant How is this relevant to The Plan (i.e. relevant Protected Matters)?	Timebound When will this be implemented?
Vibration	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Manufacturing – Submarine assembly – Routine maintenance dredging	– Prepare a Construction Noise and Vibration Framework, so that the Contractor can prepare a Construction Noise and Vibration Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: • Noise level targets • Noise and vibration monitoring plan (including locations, timing, methodology and reporting) • Mitigation measures • Notification requirements – Prepare a Night Works Management Plan, as needed – Where practicable, conduct vibration producing work during standard construction hours of the EPA, or as approved, where works are within 50 m of sensitive receivers – The Contractor is responsible for appropriate vibration management, including making sure that construction and maintenance activities do not cause vibration-induced damage to structures, buildings or services – Conduct all relevant works in consideration of the procedures included in section 5.4, page 13 of the *Environment and Heritage Technical Manual – Attachment 7D* (DIT 2021b)	– Conduct building condition (dilapidation) assessments, as required, including: • Visual inspection of buildings and structures • Photographs and records of cracks / defects • Close-out surveys that record changes from initial survey conditions – Implement a monitoring regime in accordance with *DIN4150-3 Structural Vibration Part 3 – Effects of vibration on structures* to enable post-construction verification that vibration levels at potentially affected structures did not exceed the relevant guideline values – Maintain records of vibration related non-compliance	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 7D* (DIT 2021b)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Animals – People and communities	**During construction:** – For works within 50 m of sensitive receivers – For night works **During operation:** – For works within 50 m of sensitive receivers – For night works
		Prepare an Underwater Noise Management Framework, so that the Contractor can prepare an Underwater Noise Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: – Performance outcomes – Standards – Measurement criteria – Adaptive management approach	– Measure against performance outcomes, including avoidance of injury or impact to marine life (including dolphins)	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 7E* (DIT 2023)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Ocean forms, ocean processes and ocean life	**During construction:** – For works in the marine environment – For works involving piling at the onshore area, near the marine environment
		Prepare a Dredge Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Scope, methodology, environmental management, contingency and incident response – Potential impacts on the environment, public health and amenity – Mitigation measures – Water quality monitoring plan – Community consultation / communication	– Measured by the EPA when acquiring a dredge licence – Conduct mandatory water quality monitoring	– Standard established mitigation measure – State government requirement: • *Dredge guideline* (EPA SA 2020)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Ocean forms, ocean processes and ocean life – Animals	**During construction:** – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Impact factor	Associated Actions	Specific What are the specific measures that should be implemented?	Measurable How will this be measured?	Achievable Is this a realistically achievable and well-established approach?	Relevant How is this relevant to The Plan (i.e. relevant Protected Matters)?	Timebound When will this be implemented?
Noise	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Manufacturing – Submarine assembly – Routine maintenance dredging – Sustainment of the Submarine Construction Yard	– Prepare a Construction Noise and Vibration Framework, so that the Contractor can prepare a Construction Noise and Vibration Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: • Noise level targets • Noise and vibration monitoring plan (including locations, timing, methodology and reporting) • Mitigation measures • Notification requirements – Prepare a Stakeholder and Community Engagement Plan for construction activities – Prepare a Night Works Management Plan, as needed	– Monitor against planned noise levels, as required	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 7D* (DIT 2021b)	**The environment:** – People and communities	**During construction:** – For works within the evaluation distance of sensitive receivers for the activity – For night works **During operation:** – For works involving submarine assembly – For works involving the sustainment of the Submarine Construction Yard
		Prepare an Underwater Noise Management Framework, so that the Contractor can prepare an Underwater Noise Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: – Performance outcomes – Standards – Measurement criteria – Adaptive management approach	– Measure against performance outcomes, including avoidance of injury or impact to marine life (including dolphins)	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 7E* (DIT 2023)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Ocean forms, ocean processes and ocean life	**During construction:** – For works in the marine environment – For works involving piling at the onshore area, near the marine environment
		Prepare a Dredge Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Scope, methodology, environmental management, contingency and incident response – Potential impacts on the environment, public health and amenity – Mitigation measures – Water quality monitoring plan – Community consultation / communication	– Measured by the EPA when acquiring a dredge licence – Conduct mandatory water quality monitoring	– Standard established mitigation measure – State government requirement: • *Dredge guideline* (EPA SA 2020)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Ocean forms, ocean processes and ocean life – Animals	**During construction:** – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Impact factor	Associated Actions	Specific What are the specific measures that should be implemented?	Measurable How will this be measured?	Achievable Is this a realistically achievable and well-established approach?	Relevant How is this relevant to The Plan (i.e. relevant Protected Matters)?	Timebound When will this be implemented?
Mobilisation of sediment	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Routine maintenance dredging	Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 6A* (DIT 2021a)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Landscapes and soils – Coastal landscapes and processes – Ocean forms, ocean processes and ocean life – Water resources – Plants – Animals – People and communities – Natural heritage	**During construction:** – For works involving bulk earthworks below imported fill level – For works involving piling – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
		Prepare a Dredge Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Scope, methodology, environmental management, contingency and incident response – Potential impacts on the environment, public health and amenity – Mitigation measures – Water quality monitoring plan – Community consultation / communication	– Measured by the EPA when acquiring a dredge licence – Conduct mandatory water quality monitoring	– Standard established mitigation measure – State government requirement: • *Dredge guideline* (EPA SA 2020)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Ocean forms, ocean processes and ocean life – Water resources – Plants – Animals	**During construction:** – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Mobilisation of contaminants	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Routine maintenance dredging	Prepare a Dewatering Management Plan, which is be included in the Construction Environmental Management Plan. This plan will detail: – Dewatering techniques – Anticipated dewatering flow rate, duration and total volume – Assessment of water quality – Water collection, storage, treatment and disposal options – Acid Sulfate Soils Management Plan – Investigation waste management hierarchy – Contingency plans – Equipment maintenance plans – Requirements of the EPA Licence for earthworks drainage – Monitoring and reporting requirements	– Implement an inspection and monitoring program – Measure against performance indicators, to assess the quality and quantity of water being discharged	– Standard established mitigation measure – State government requirement: • *Environmental management of dewatering during construction activities* (EPA SA 2021)	**The environment:** – Landscapes and soils – Water resources	**During construction:** – For works involving dewatering

Impact factor	Associated Actions	Specific What are the specific measures that should be implemented?	Measurable How will this be measured?	Achievable Is this a realistically achievable and well-established approach?	Relevant How is this relevant to The Plan (i.e. relevant Protected Matters)?	Timebound When will this be implemented?
		Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement: • *Stormwater pollution prevention: code of practice for local, state and federal government* (EPA SA 1998)	**The environment:** – Landscapes and soils – Water resources	**During construction:** – For works involving bulk earthworks below imported fill level – For works involving piling – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
		Prepare a Site Contamination Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will include: – Remediation goals, objectives and endpoints – Acid Sulfate Soil Management Plan	– Implement an inspection and monitoring program – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement: • *Construction environmental management plan (CEMP)* (EPA SA 2024)	**The environment:** – Landscapes and soils – Water resources	**During construction:** – For works involving bulk earthworks below imported fill – For works involving piling methodologies where spoil is generated – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Mobilisation of gross pollutants	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Manufacturing – Submarine assembly – Submarine fit-out – Non-Nuclear Steam Raising Plant – Submarine fit-out – Nuclear Steam Raising Plant – Workforce ancillary support – Routine maintenance dredging – Routine maintenance of the Submarine Construction Yard	Prepare a Waste Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Identification of waste types – Collection and storage procedures – Disposal methods – Reuse of waste-derived fill processes outlined in the *Standard for the production and use of Waste Derived Fill* (EPA SA 2013) – Roles and responsibilities – Timelines – Reporting and documentation requirements	– Monitor compliance – Report any pollution events	– Standard established mitigation measure – State government requirement: • *Handbook for Pollution Avoidance on Commercial and Residential Building Sites* (EPA SA 2004)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Ocean forms, ocean processes and ocean life – Pollutants, chemicals and toxic substances – Plants – Animals – People and communities	**During construction:** – For works involving the use and disposal of gross pollutants **During operation:** – For works involving the use and disposal of gross pollutants

Impact factor	Associated Actions	Specific What are the specific measures that should be implemented?	Measurable How will this be measured?	Achievable Is this a realistically achievable and well-established approach?	Relevant How is this relevant to The Plan (i.e. relevant Protected Matters)?	Timebound When will this be implemented?
Changes to soil chemistry	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Routine maintenance dredging	Prepare a Remediation Strategy to address source areas of contamination. This strategy will detail: – Remediation options assessment – Key endpoints for remediation – Timeframes	– Monitor compliance – Report remediation status	– Standard established mitigation measure – State government requirement: • *Guidelines for the assessment and remediation of site contamination* (EPA SA 2018)	**The environment:** – Landscapes and soils – Pollutants, chemicals and toxic substances	**During construction:** – For works involving remediation activities **During operation:** – For works involving remediation activities
		Prepare an Acid Sulfate Soil Management Plan (if acid sulfate soil is found to be present), which is to be included in the Construction Environmental Management Plan. This plan will detail: – Mitigation measures for excavation and disturbance of acid sulfate soil materials – Mitigation measures for oxidation – Treatment plans – Disposal procedures (to an appropriate facility) – Stockpile management measures	– Implement an inspection and monitoring program – Measure against performance indicators	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 9B* (DIT 2021)	**The environment:** – Landscapes and soils – Water resources – Pollutants, chemicals and toxic substances – Plants	**During construction:** – For works involving bulk earthworks below imported fill – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Dust generation	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure **Operation of the Submarine Construction Yard:** – Manufacturing – Submarine assembly	Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement: • *Ambient air quality assessment* (EPA SA 2016)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Plants – Animals – People and communities	**During construction:** – For works involving bulk earthworks – For works involving piling at the onshore area, near the marine environment **During operation:** – For works involving manufacturing and assembly
Odour	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure **Operation of the Submarine Construction Yard:** – Manufacturing – Submarine assembly	Prepare an Air Quality Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Sensitive receivers – Assessment of ambient odour concentrations – Estimated odour emission rates – Mitigation measures for odour creation – Reporting methodology	– Implement a monitoring and reporting program – Maintain records of air quality related non-compliance	– Standard established mitigation measure – State government requirement: • *Ambient air quality assessment* (EPA SA 2016)	**The environment:** – People and communities	**During construction:** – For works involving bulk earth works **During operation:** – For works involving manufacturing and assembly

Impact factor	Associated Actions	Specific What are the specific measures that should be implemented?	Measurable How will this be measured?	Achievable Is this a realistically achievable and well-established approach?	Relevant How is this relevant to The Plan (i.e. relevant Protected Matters)?	Timebound When will this be implemented?
Mortality or injury of native animals	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Manufacturing – Submarine assembly – Submarine fit-out – Non-nuclear Steam Raising Plant – Submarine fit-out – Nuclear Steam Raising Plant – Workforce ancillary support – Routine maintenance dredging – Routine maintenance of the Submarine Construction Yard – Sustainment of the Submarine Construction Yard	– Implement all reasonable and practicable measures to minimise disturbance and prevent injury to fauna (including marine mammals and other marine fauna) – Prior to the removal of vegetation / other activities identified to have the potential to impact fauna, the area to be affected should be checked for fauna species by a suitably qualified person – Under the supervision of a suitably qualified specialist, relocate any native fauna to a similar habitat if that species' habitat will be destroyed – Implement work practices which allow avian and marine fauna that are sensitive to noise, to depart without the risk of harm – Implement any conditions of environmental approvals relevant to the protection of fauna during all Project works	– Measure against performance outcomes, including avoidance of injury or impact to fauna (including birds)	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 5A* (DIT 2021)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Ocean forms, ocean processes and ocean life – Animals	**During construction:** – For all works **During operation:** – For all works
		– Prepare an Underwater Noise Management Framework, so that the Contractor can prepare an Underwater Noise Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: • Performance outcomes • Standards • Measurement criteria • Adaptive management approach	– Measure against performance outcomes, including avoidance of injury or impact to marine life (including dolphins)	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 7E* (DIT 2023)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Ocean forms, ocean processes and ocean life	**During construction:** – For works in the marine environment – For works involving piling at the onshore area, near the marine environment
Clearing of vegetation	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Routine maintenance dredging	Prepare a Biosecurity Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: – Identified Weeds of National and State Significance relevant to the Strategic Assessment Area – Identified Marine Pests of National Significance relevant to the Strategic Assessment Area – Performance indicators – Mitigation measures – Roles and responsibilities – Potential impacts on the environment – Monitoring plan	– Implement an inspection and monitoring program – Measure against performance indicators	– Standard established mitigation measure – State and federal government requirement: • *Weed Control Handbook: For declared plants in South Australia* (PIRSA 2024) • *Marine Pest Plan 2018–2023 – National Strategic Plan for Marine Pest Biosecurity* (DAWR 2018)	**The environment:** – Coastal landscapes and processes – Ocean forms, ocean processes and ocean life – Animals	**During construction:** – For works involving clearing of vegetation – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Impact factor	Associated Actions	Specific What are the specific measures that should be implemented?	Measurable How will this be measured?	Achievable Is this a realistically achievable and well-established approach?	Relevant How is this relevant to The Plan (i.e. relevant Protected Matters)?	Timebound When will this be implemented?
Light generation	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Manufacturing – Submarine assembly – Submarine fit-out – Non-Nuclear Steam Raising Plant – Submarine fit-out – Nuclear Steam Raising Plant – Workforce ancillary support – Routine maintenance dredging – Routine maintenance of the Submarine Construction Yard – Sustainment of the Submarine Construction Yard	Utilise best practice lighting design to reduce light pollution and minimise the effects on wildlife. This includes: – Only add light to natural darkness for specific purposes, where practical – Use adaptive light controls to manage light timing, intensity and colour – Direct light to cover only the object or area required – Use the lowest intensity lighting appropriate for the task	– Measure against performance indicators	– Standard established mitigation measure – Federal government requirement: • *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023c)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Animals – People and communities	**During construction:** – For works involving temporary or permanent light generation **During operation:** – For works involving temporary or permanent light generation
Changes to landscape and visual amenity	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure	Buildings and structures are to be designed and constructed with a similar aesthetic and materials to the existing Osborne Naval Shipyard, to minimise additional visual disturbance	– Measure against existing building design	– Standard established mitigation measure	**The environment:** – People and communities	– During the design phase – Prior to construction
Interaction with a heritage place or heritage values	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Routine maintenance dredging	– Works must cease immediately in the event of a potential discovery of Aboriginal sites, objects or ancestral remains – Works must not recommence in the affected area until clearance has been provided by the relevant authority – Follow the discovery procedure flow charts, as relevant to authorisations, under the South Australian *Aboriginal Heritage Act 1988*	– Measure against performance requirements, including avoiding and minimising impacts to heritage values and heritage sites – Maintain records of heritage related non-compliance	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 2A* (DIT 2021)	**The environment:** – Indigenous heritage	**During construction:** – For works involving bulk earthworks – For works involving piling methodologies where spoil is generated – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
		– Where interaction with a registered heritage place or item cannot be avoided, consultation with the relevant authority should be undertaken to confirm any permits or approvals that may be required – Where a heritage impact statement is required, this is to be prepared by a suitably qualified heritage specialist, in accordance with any guidance provided by the Department of Environment and Water – Prepare a Conservation Management Plan (as required) for each non-Aboriginal heritage item or place that has been identified as being potentially impacted by The Plan – Where unexpected archaeological artefacts are identified during construction activities, the South Australian Heritage Council is to be notified	– Measure against performance requirements, including avoiding and minimising impacts to heritage values and heritage sites – Maintain records of heritage related non-compliance	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 8A* (DIT 2021)	**The environment:** – Historic heritage	**During construction:** – For works involving bulk earthworks – For works involving piling – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Impact factor	Associated Actions	Specific What are the specific measures that should be implemented?	Measurable How will this be measured?	Achievable Is this a realistically achievable and well-established approach?	Relevant How is this relevant to The Plan (i.e. relevant Protected Matters)?	Timebound When will this be implemented?
Increased demand for resources and facilities	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Manufacturing – Submarine assembly – Submarine fit-out – Non-Nuclear Steam Raising Plant – Submarine fit-out – Nuclear Steam Raising Plant – Workforce ancillary support – Routine maintenance dredging – Routine maintenance of the Submarine Construction Yard – Sustainment of the Submarine Construction Yard	Prepare a Traffic Management Plan, which is to be included in the Construction Environmental Management Plan.	– Measure against performance outcomes, including compliance records	– Standard established mitigation measure – State government requirement: • *Construction environmental management plan (CEMP)* (EPA SA 2024)	**The environment:** – People and communities	**During construction:** – For all works **During operation:** – For all works
Hydrological changes	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Construction – onshore area – Construction – maritime infrastructure – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Routine maintenance dredging	Prepare a Water Quality Risk Assessment, in accordance with the *Environment and Heritage Technical Manual – Attachment 6A* (DIT 2021a).	– Measure against legislative compliance requirements – Measure against water quality objectives or strategic directions for the catchment	– Standard established mitigation measure – State government requirement: • *Environment and Heritage Technical Manual – Attachment 6A* (DIT 2021a)	**The environment:** – Water resources	– During the design phase – Prior to construction
		Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement: • *Stormwater pollution prevention: code of practice for local, state and federal government* (EPA SA 1998)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Landscapes and soils – Water resources – Plants – Animals	**During construction:** – For works involving bulk earthworks – For works involving piling at the onshore area, near the marine environment – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Impact factor	Associated Actions	Specific What are the specific measures that should be implemented?	Measurable How will this be measured?	Achievable Is this a realistically achievable and well-established approach?	Relevant How is this relevant to The Plan (i.e. relevant Protected Matters)?	Timebound When will this be implemented?
Geomorphological changes	**Construction of the Submarine Construction Yard:** – Site establishment and preparation – Capital dredging – maritime infrastructure – Capital dredging – Port Adelaide River channel **Operation of the Submarine Construction Yard:** – Routine maintenance dredging	Prepare a Dredge Management Plan to be to be included in the Construction Environmental Management Plan. The plan will detail: – Scope, methodology, environmental management, contingency and incident response – Potential impacts on the environment, public health and amenity – Mitigation measures – Water quality monitoring plan – Community consultation / communication	– Measured by the EPA when acquiring a dredge licence – Conduct mandatory water quality monitoring	– Standard established mitigation measure – State government requirement: • *Dredge guideline* (EPA SA 2020)	**Matters of national environmental significance:** – Listed threatened fauna species – Listed migratory species **The environment:** – Coastal landscapes and processes – Plants – Animals	**During construction:** – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

2. Listed threatened species and ecological communities

2.1 Threatened species assessed

A desktop assessment and field surveys were undertaken to inform a likelihood of occurrence assessment. The likelihood of occurrence assessment is included in full as **Appendix C** of the **Biodiversity Values Report** (**Appendix G** of **The Report**). Species or communities known, likely or with potential to occur were assessed.

Species assessed for significance are listed in Table 2-1 (ordered alphabetically within their assessed likelihood of occurrence). Assessments of significance for each of the species as relevant to the listing status criteria of *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a) have been conducted. These are included within Sections 2.2 to 2.20.

Table 2-1 Listed threatened fauna species assessed by likelihood of occurrence

Scientific name	Common name	EPBC Act threatened category
Known to occur		
Calidris acuminata	Sharp-tailed sandpiper	Vulnerable
Tringa nebularia	Common greenshank	Endangered
Sternula nereis nereis	Australian fairy tern	Vulnerable
Likely to occur		
Acanthiza iredalei rosinae	Slender-billed thornbill (Gulf St Vincent)	Vulnerable
Numenius madagascariensis	Eastern curlew	Critically endangered
Pluvialis squatarola	Grey plover	Vulnerable
Thinornis cucullatus cucullatus	Eastern hooded plover	Vulnerable
Potential to occur		
Arenaria interpres	Ruddy turnstone	Vulnerable
Calidris ferruginea	Curlew sandpiper	Critically endangered
Calidris tenuirostris	Great knot	Vulnerable
Caretta caretta	Loggerhead turtle	Endangered
Charadrius leschenaultii	Greater sand plover	Vulnerable
Charadrius mongolus	Lesser sand plover	Endangered
Chelonia mydas	Green turtle	Vulnerable
Dermochelys coriacea	Leatherback turtle	Endangered
Limosa limosa	Black-tailed godwit	Endangered
Neophema chrysogaster	Orange-bellied parrot	Critically endangered
Neophoca cinerea	Australian sea lion	Endangered
Xenus cinereus	Terek sandpiper	Vulnerable

2.2 Sharp-tailed sandpiper (*Calidris acuminata*)

2.2.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the sharp-tailed sandpiper (*Calidris acuminata*) is provided in Table 2-2.

Table 2-2 Sharp-tailed sandpiper listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice for Calidris acuminata (sharp-tailed sandpiper)* (DCCEEW 2024a), in effect from 5 January 2024
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Plan no longer in effect following preparation of specific conservation advice (formerly *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a))
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The species inhabits a variety of habitats including sandy beaches, mudflats, coastal and inland wetlands, sewage ponds and other areas with flooded grass, saltmarsh, mangroves, or low vegetation (DCCEEW 2024a). During its non-breeding migration to the Southern Hemisphere, a large proportion of the population of the species disperses across the south-eastern region of Australia. In South Australia, the species is widespread in both inland and coastal locations in the eastern half of the state (DCCEEW 2024a). The Strategic Assessment Area is located within the range of the species' known distribution (DCCEEW 2024h).

It has been estimated that approximately 85,000 sharp-tailed sandpipers traverse the East Asian-Australasian Flyway with 91 percent of this population migrating to Australia and New Zealand during the non-breeding season (DCCEEW 2024a). This species does not breed in Australia, it breeds in the Northern Hemisphere during the northern summer.

Species occurrence

Strategic Assessment Area

The sharp-tailed sandpiper was observed within the Strategic Assessment Area during the field surveys conducted during the 2023–2024 migration period as well as in previous surveys. It was observed within the Eastern Detention Basin north of Mutton Cove with a maximum count of 37 individuals as well as at three survey reference sites in the surrounding region (Thompson Beach Shoreline, Thompson Beach Estuary, Bird Island Estuary).

No sharp-tailed sandpipers were observed at the Strategic Assessment Area shoreline during the 2023–2024 field surveys.

Regional occurrence

The species was observed at three survey reference sites in the surrounding region (Thompson Beach Shoreline, Thompson Beach Estuary, Bird Island Estuary) (Figure 2). The sharp-tailed sandpiper is a regular visitor to the Adelaide International Bird Sanctuary, with local sites (such as Mutton Cove and St Kilda) receiving regular sightings, and Bird Island with occasional sightings.

The species is regularly observed at many sites further inland within the Adelaide International Bird Sanctuary (Dry Creek salt fields, Whicker Road wetlands, Magazine Road wetlands, Port Gawler, Light Beach, Thompson Beach, Webb Beach and Port Prime), as well as regional habitats in Bald Hills north of Fleurieu Peninsula and Port Clinton, Clinton Conservation Park, Price salt fields and Mac Beach on the Yorke Peninsula (Lees *et al.* 2020).

Habitat presence

Foraging or roosting habitat within the Strategic Assessment Area includes:

– Tidal flats (2.58 ha) – including 0.35 ha of mangrove shrubland
– Constructed wetland (2.54 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the sharp-tailed sandpiper' is provided in the conservation advice for the species (DCCEEW 2024a). This defines habitat critical to the survival of the species to be:

Areas that are necessary:

– *For activities such as foraging, breeding, roosting, or dispersal,*
– *For the long-term maintenance for the species (including the maintenance of species essential to the survival of the sharp-tailed sandpiper, such as macrobenthos),*
– *To maintain genetic diversity and long-term evolutionary development, or*
– *For the re-introduction of populations or recovery of the species.*

The tidal flats and constructed wetlands located within the Strategic Assessment Area comprise a proportionally small extent (less than one percent) of available foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may contribute occasionally to the species' wider habitat area. Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area form part of broader areas of high quality habitat and could meet the definition for habitat critical to the survival of the sharp-tailed sandpiper. There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the sharp-tailed sandpiper.

Important habitat

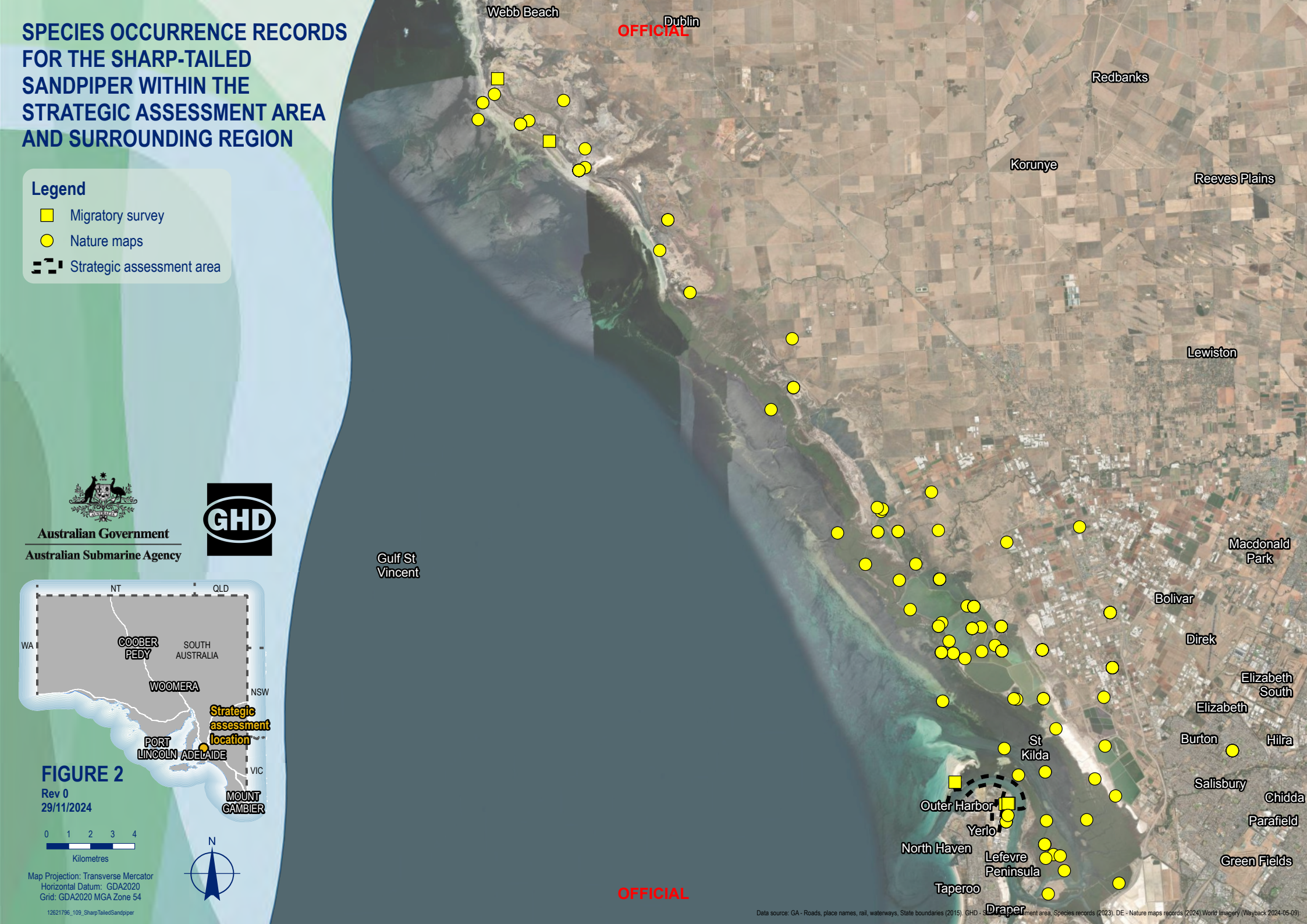
Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

– *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
– *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

– *0.1 percent of the flyway population of a single species of migratory shorebird, or*
– *2,000 migratory shorebirds, or*
– *15 migratory shorebird species*

SPECIES OCCURRENCE RECORDS FOR THE SHARP-TAILED SANDPIPER WITHIN THE STRATEGIC ASSESSMENT AREA AND SURROUNDING REGION



Legend

- Migratory survey
- Nature maps
- Strategic assessment area

Australian Government
Australian Submarine Agency

GHD

FIGURE 2
Rev 0
29/11/2024

0 1 2 3 4
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_109_SharpTailedSandpiper

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area, Species records (2023). DE - Nature maps records (2024).World Imagery (Wayback 2024-05-09).

Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of international importance for the sharp-tailed sandpiper and has been documented to support an internationally ecologically significant proportion of the species (Table 2-3).

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the sharp-tailed sandpiper, are included in Table 2-3. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the sharp-tailed sandpiper.

Table 2-3 Ecologically significant proportions and flyway information for the sharp-tailed sandpiper

Detail	Estimate
Flyway population estimate	85,000
1% flyway population (internationally significant)	850
0.1% flyway population (nationally significant)	85
Maximum count (within the Strategic Assessment Area) during migratory bird survey	37
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	3,000

2.2.2 Nature and extent of impacts

Relevant Actions

Actions of The Plan, that may cause impacts to the sharp-tailed sandpiper include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the sharp-tailed sandpiper, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-4.

Table 2-4 Potential impacts of The Plan on the sharp-tailed sandpiper

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds

Impact	Description
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.2.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the sharp-tailed sandpiper, with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-5.

Table 2-5 Significant impact assessment for the sharp-tailed sandpiper

Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The East Asian-Australasian Flyway population of the sharp-tailed sandpiper is estimated to be 85,000, with a nationally important proportion of 85 individuals (Hansen *et al.* 2016). A maximum count of 37 birds was recorded in the Strategic Assessment Area during field surveys. This maximum count observed within the Strategic Assessment Area during field surveys does not constitute an important population. The population of sharp-tailed sandpipers within the Strategic Assessment Area, likely form part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of international importance for the sharp-tailed sandpiper and has been documented to support an internationally ecologically significant proportion of the species. The potential for direct mortality or injury to individual sharp-tailed sandpipers, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore not likely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered ‘necessary’ to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the sharp-tailed sandpiper.

Criteria	Assessment
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The estimated area of occupancy of the sharp-tailed sandpiper in Australia is between 13,000 km^2 and 20,000 km^2, with a wider extent of occurrence estimated between 10,900,000 km^2 and 11,400,000 km^2 (DCCEEW 2024a). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.54 ha (0.0254 km^2) of constructed wetlands and 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 13,000 km^2 extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the sharp-tailed sandpiper.
Fragment an existing important population into two or more populations	The sharp-tailed sandpiper is a highly mobile shorebird that flies each year from the Northern Hemisphere to coastal areas in Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the sharp-tailed sandpiper, as the habitat within the Strategic Assessment Area likely forms part of the wider habitat critical to the survival of the species within Gulf St Vincent. This area includes the Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, which extends approximately 60 km along the coastline of Gulf St Vincent to the north of the Strategic Assessment Area. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of international importance for the sharp-tailed sandpiper and has been documented to support an internationally ecologically significant proportion of the species. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.54 ha of constructed wetlands and 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat considered critical to the survival of the species is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the sharp-tailed sandpiper to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of an important population	The sharp-tailed sandpiper breeds in northern Siberia from June to August (DCCEEW 2024a). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline	The sharp-tailed sandpiper occupies an extensive global distribution, visiting Australia during its non-breeding season (September to May) where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the sharp-tailed sandpiper population.

Criteria	Assessment
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the sharp-tailed sandpiper becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the sharp-tailed sandpiper does not identify disease as a key threat to the species (DCCEEW 2024a). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.
Interfere substantially with the recovery of the species	There is no recovery plan for the sharp-tailed sandpiper, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the sharp-tailed sandpiper (DCCEEW 2024a), indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation outcomes stated in the conservation advice are to minimise the loss of habitat critical to the survival of the sharp-tailed sandpiper throughout Australia, and prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.2.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, to Protected Matters are summarised in Table 1-3.

2.2.5 Conclusion – sharp-tailed sandpiper

Based upon the assessment in Section 2.2.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the sharp-tailed sandpiper. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, potential impacts on this Protected Matter are likely to be acceptable.

2.3 Common greenshank (*Tringa nebularia*)

2.3.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the common greenshank (*Tringa nebularia*) is provided in Table 2-6.

Table 2-6 Common greenshank listing summary

Listing information	Details
Threatened category	Endangered
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice* for *Tringa nebularia (common greenshank)* (DCCEEW 2024j), in effect from 5 January 2024
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Plan no longer in effect following preparation of specific conservation advice (formerly *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a))
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b), in effect from 27 Aug 2012
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The common greenshank migrates to Australia via the East Asian-Australasian Flyway during the non-breeding season, from July to March (DCCEEW 2024j). Breeding only occurs in the Northern Hemisphere. During the non-breeding season the species can be found along much of the Australian coastline and in inland wetlands when conditions are suitable. This species inhabits all types of wetlands, mudflats and mangrove shrubland in coastal regions, and has one of the widest distributions of any shorebird found in Australia (DCCEEW 2024b). In South Australia, the species can be found along most of the eastern coast and west to Streaky Bay, with scattered records elsewhere along the coast and in the Flinders Ranges (DCCEEW 2024b).

The East Asian-Australasian Flyway population of the common greenshank was estimated in 2008 to consist of approximately 110,000 individuals, of which between 18,000 and 19,000 spend the non-breeding season in Australia (DCCEEW 2024j). The most recent estimate of the Australian population of this species (2024) is 23,700 mature individuals (DCCEEW 2024j).

Species occurrence

Strategic Assessment Area

The common greenshank was observed within the Strategic Assessment Area during surveys conducted between December 2023 and March 2024 (during the 2023–2024 migration period). The species was observed within the Eastern Detention Basin, north of Mutton Cove, with the maximum count for the species within the Strategic Assessment Area being two individuals.

Regional occurrence

The species was also observed at four survey reference sites in the surrounding region: St Kilda, Thompson Beach, Middle Beach and Bird Island. These records, as well as historical records for the species, are displayed in Figure 3.

The common greenshank is a regular visitor to the Adelaide International Bird Sanctuary, with local sites (including Mutton Cove and St Kilda) receiving regular sightings, and occasional sightings on Bird Island. The species is regularly observed at a number of sites further inland within the Adelaide International Bird Sanctuary, including Dry Creek salt fields, Whicker Road wetlands, Light Beach and Thompson Beach as well as regional habitats at Port Clinton and Port Wakefield (Lees *et al.* 2020).

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Constructed wetlands (2.54 ha)
– Tidal flats (2.58 ha) – including 0.35 ha of mangrove shrubland

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the common greenshank' is provided in the conservation advice for the species (DCCEEW 2024j). This defines habitat critical to the survival of the species as:

Areas that are necessary:

– *For activities such as foraging, breeding, roosting, or dispersal*
– *For the long-term maintenance for the species (including the maintenance of species essential to the survival of the common greenshank, such as macrobenthos)*
– *To maintain genetic diversity and long-term evolutionary development, or*
– *For the re-introduction of populations or recovery of the species.*

The tidal flats and constructed wetlands located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may contribute occasionally to the species' wider habitat area. Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area form part of broader areas of high quality habitat and could meet the definition for habitat critical to the survival of the common greenshank.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the common greenshank.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

– *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
– *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

– *0.1 percent of the flyway population of a single species of migratory shorebird, or*
– *2,000 migratory shorebirds, or*
– *15 migratory shorebird species*

Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the common greenshank, and has been documented to support a nationally ecologically significant proportion of the species (Table 2-7).

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the common greenshank, are included in Table 2-7. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the common greenshank.

Table 2-7 Ecologically significant proportions and flyway information for the common greenshank

Detail	Estimate
Flyway population estimate	110,000
1% flyway population (internationally significant)	1,100
0.1% flyway population (nationally significant)	110
Maximum count (within the Strategic Assessment Area) during migratory bird survey	2
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	500

SPECIES OCCURRENCE RECORDS FOR THE COMMON GREENSHANK WITHIN THE STRATEGIC ASSESSMENT AREA AND SURROUNDING REGION

Legend

- Migratory survey
- Nature maps
- Strategic assessment area

Webb Beach
Dublin
Redbanks
Korunye
Reeves Plains
Lewiston
Gulf St Vincent
Macdonald Park
Bolivar
Direk
Elizabeth South
Elizabeth
Burton
Hilra
St Kilda
Salisbury
Chidda
Parafield
Outer Harbor
Yerlo
North Haven
Midlunga
Taperoo
Green Fields
Draper

Australian Government
Australian Submarine Agency

GHD

FIGURE 3
Rev 0
29/11/2024

0 1 2 3 4
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_111_CommonGreenshank

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area, Species records (2023). DE - Nature maps (2024).World Imagery (Wayback 2024-05-09): Esri, Maxar, Earthstar Geographics, and the GIS User Community

2.3.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the common greenshank include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the common greenshank, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-8.

Table 2-8 Potential impacts of The Plan on the common greenshank

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.3.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the common greenshank, with respect to the significant impact criteria for an endangered species, is provided in Table 2-9.

Table 2-9 Significant impact assessment for the common greenshank

Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of a population	The East Asian-Australasian Flyway population of the common greenshank is estimated to be 110,000, with a nationally important proportion of 110 individuals (Hansen *et al.* 2016). A maximum count of two birds was recorded in the Strategic Assessment Area during field surveys. This maximum count observed within the Strategic Assessment Area during field surveys does not constitute an important population. The population of common greenshanks within the Strategic Assessment Area, likely form part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the common greenshank, and has been documented to support an ecologically significant proportion of the species. The potential for direct mortality or injury to individual common greenshank, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (as the species does not breed in Australia, all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment. Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the common greenshank.
Reduce the area of occupancy of the species	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The estimated area of occupancy for the common greenshank is between 13,000 km^2 and 20,000 km^2, with a wider estimated extent of occurrence between 9,700,000 km^2 and 10,700,000 km^2 (DCCEEW 2024j). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.54 ha (0.0254 km^2) of constructed wetlands and 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 13,000 km^2 extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the common greenshank.

Criteria	Assessment
Fragment an existing population into two or more populations	The common greenshank is migratory, and flies from the Northern Hemisphere to coastal and inland areas in south-east Australia, including numerous sites in the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the common greenshank, as the habitat within the Strategic Assessment Area, likely forms part of the wider habitat critical to the survival of the species within Gulf St Vincent. This area includes the Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, which extends approximately 60 km along the coastline of Gulf St Vincent to the north of the Strategic Assessment Area. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the common greenshank and has been documented to support an ecologically significant proportion of the species. While in Australia, the common greenshank relies on a range of inland and coastal wetlands and shallows situated near mangroves or saltmarshes for foraging, roosting and sheltering. The species does not breed in the Strategic Assessment Area or anywhere else in Australia. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.54 ha of constructed wetlands and 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat considered critical to the survival of the species is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the common greenshank.
Disrupt the breeding cycle of a population	The common greenshank breeds in Asia and Europe, from late April to June (DCCEEW 2024j). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The common greenshank occupies an extensive global distribution, visiting Australia during its non-breeding season (September to May) where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the common greenshank population.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. In addition, pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the common greenshanks becoming established in its habitat.

Criteria	Assessment
Introduce disease that may cause the species to decline	The conservation advice for the common greenshank does not identify disease as a key threat to the species (DCCEEW 2024j). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.
Interfere with the recovery of the species	There is no recovery plan for the common greenshank, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the common greenshank (DCCEEW 2024j) indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The reduction in potential foraging and roosting habitat (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.3.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.3.5 Conclusion – common greenshank

Based upon the assessment in Section 2.3.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the common greenshank. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.4 Australian fairy tern (*Sternula nereis nereis*)

2.4.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the Australian fairy tern (*Sternula nereis nereis*) is provided in Table 2-10.

Table 2-10 Australian fairy tern listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Not listed
Marine status	Not listed
Conservation advice	*Conservation Advice for Sternula nereis nereis (Australian fairy tern)* (DSEWPC 2011), in effect from 3 March 2011
Recovery plan	*National Recovery Plan for the Australian Fairy Tern (Sternula nereis nereis)* (DAWE 2020a), in effect from 5 May 2022
Relevant threat abatement plan(s)	*Threat abatement plan for predation by feral cats* (DoE 2015b)
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b) *Marine bioregional plan for the South-west Marine Region* (DSEWPC 2012c)
Other Commonwealth documents	*South-east marine region profile: A description of the ecosystems, conservation values and uses of the South-east Marine Region* (DoE 2015g)

Habitat and distribution

The species occurs along the southern Australian coast from the Dampier Archipelago in Western Australia to Botany Bay in New South Wales, including Tasmania (DCCEEW 2024i). It is found in various habitats, including offshore islands, estuaries, wetlands, and mainland coastlines (DCCEEW 2024i). During June and March, the species nests on sheltered sandy beaches, spits, and banks above the high tide line and below vegetation and forages in coastal and marine waters nearby. Nests typically consist of a shallow scrape in the sand, often lined with small shells and vegetation (DAWE 2020a). While the species can migrate between habitats in other regions of Australia, it tends to be more sedentary in South Australia (DSEWPC 2011).

The eastern population of the Australian fairy tern, located across South Australia, Victoria, New South Wales and Tasmania, has decreased significantly over the last 20 years. There is a population estimate of 7,450 mature individuals observed foraging and nesting on beaches and inshore waters (DAWE 2020). A population of Australian fairy terns at Bird Island, approximately 1.5 km north-west of the Strategic Assessment Area, has been monitored since 2001 (DAWE 2020a).

Bird Island had approximately 10 to 35 breeding pairs in the early 2000s, approximately 60 to 80 pairs between 2015 and 2018, and 50 to 60 pairs between 2018 and 2019 (DAWE 2020a). The most recent estimate indicates approximately 23 mature individuals present on Bird Island in 2022, with 16 nests recorded (BirdLife 2022). Another population of about 350 mature, breeding individuals has been recorded at Coorong Beach, 85 km south of the Strategic Assessment Area (DAWE 2020a). Larger colonies can be found in the western populations of the species in Western Australia, where up to 700 pairs breed annually.

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution for the Australian fairy tern (DCCEEW 2024i). The Australian fairy tern was observed at one location (tidal flat survey site) in the Strategic Assessment Area and two reference sites during the 2023–2024 field surveys (Figure 4).

Within the Strategic Assessment Area, the maximum count for the species was eight individuals. All Australian fairy terns observed within the Strategic Assessment Area were roosting or sheltering on the tidal flats. No evidence of nesting has been observed. Foxes were observed denning in the Strategic Assessment Area and are regularly seen during morning surveys and on remote cameras. The presence of foxes in such a small beach location, constrained on multiple sides by industrial development, would make the area generally unsuitable for nesting.

Regional occurrence

The Australian fairy tern is known to breed on Bird Island, approximately 2.5 km north-west of the Strategic Assessment Area, with the nesting site subject to periodic monitoring (BirdLife 2022). During the 2023–2024 field surveys, the Australian fairy tern was observed with a maximum count of 90 individuals at Bird Island and one individual observed at Port Gawler.

The exotic black rat (*Rattus rattus*) was observed to be abundant on Bird Island, with extensive rodent tracks recorded, predominantly in the dunes and near pelican nests but also along the open beach on the western side of Bird Island, approximately 100 m from Australian fairy tern nests.

More broadly, the Australian fairy tern is known from 16 breeding sites and 19 colonies across South Australia. The Port Adelaide colony centred around Bird Island is the only location where the species is regularly observed on the Fleurieu Peninsula (DENR 2012).

Species habitat

Habitat presence

Habitats that would be suitable for roosting within the Strategic Assessment Area include:

– Tidal flats (2.58 ha)
– Constructed wetlands (2.54 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species.

Abundant tidal flat and remnant wetland habitat is present in the surrounding region including within the Adelaide International Bird Sanctuary, Bird Island and Torrens Island.

Definitions

Habitat critical to the survival of the species

A definition of ‘habitat critical to the survival of the Australian fairy tern’ is defined in the *National Recovery Plan for the Australian Fairy Tern – Sternula nereis nereis* (DAWE 2020a). This defines habitat critical to the survival of the species to be:

– *Suitable habitat where the species is known or likely to breed or forage, as shown in the indicative distribution map*
– *Any suitable habitat outside of the above area, which may be periodically occupied by non-breeding Australian fairy terns.*

The tidal flats and constructed wetlands located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may occasionally contribute to the species’ wider habitat area. Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the Australian fairy tern.

There is no habitat listed in the register of critical habitat (EBPC Act section 207A) for the Australian fairy tern.

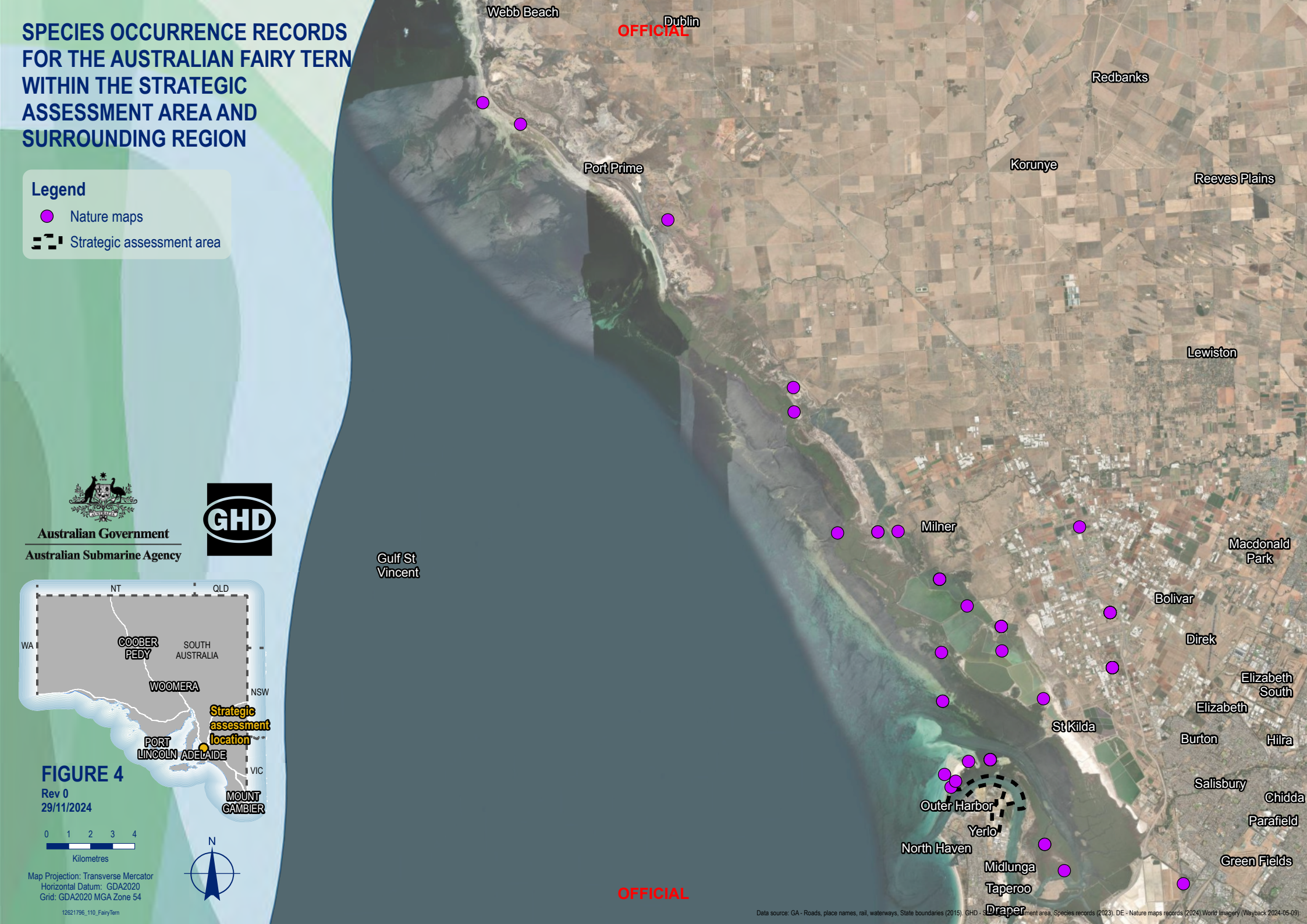
Important population

No individual important populations have been identified in the species’ conservation advice (DSEWPC 2011).

Two populations of the Australian fairy tern are recognised: western and eastern. The western population occurs in Western Australia and the eastern population occurs across South Australia, Victoria, New South Wales, and Tasmania (DAWE 2020a). The populations are separated by the Great Australian Bight. The population in the region of the Strategic Assessment Area constitutes a portion of the broader eastern population.

Given the low number of total individuals, all members of the eastern population would be considered important for the species as they contribute to genetic diversity and are part of a key breeding population.

SPECIES OCCURRENCE RECORDS FOR THE AUSTRALIAN FAIRY TERN WITHIN THE STRATEGIC ASSESSMENT AREA AND SURROUNDING REGION



Legend

- Nature maps
- Strategic assessment area

Australian Government
Australian Submarine Agency

GHD

FIGURE 4
Rev 0
29/11/2024

0 1 2 3 4
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_110_FairyTern

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area, Species records (2023). DE - Nature maps records (2024).World Imagery (Wayback 2024-05-09).

2.4.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the Australian fairy tern include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the Australian fairy tern, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-11.

Table 2-11 Potential impacts of The Plan on the Australian fairy tern

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.4.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the Australian fairy tern, with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-12.

Table 2-12 Significant impact assessment for the Australian fairy tern

Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The potential for direct mortality or injury to individual Australian fairy terns, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly to avoid collision – The species is not known to breed within the Strategic Assessment Area – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore not likely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan are unlikely to have a direct impact upon any habitat potentially necessary for breeding, as the species is not known to breed within the Strategic Assessment Area. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the Australian fairy tern.
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The estimated area of occupancy of the Australian fairy tern in Australia is 1,150 km^2, with a wider extent of occurrence of 380,000 km^2 (DAWE 2020a). Based on the species' distribution map (DAWE 2020a) the eastern population occupies little more than half of that area. The Actions and Classes of Actions proposed under The Plan would remove approximately 2.54 ha (0.0254 km^2) of constructed wetlands and 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. Bird Island, located 2.5 km north-east of the Strategic Assessment Area, provides a local stronghold for the Australian fairy tern, and supports regular nesting. The Actions and Classes of Actions proposed under The Plan will not impact nesting on Bird Island, and this population of the species would continue to forage and roost within habitats persisting along the Port Adelaide River, adjacent to Mutton Cove and on Bird Island. In consideration of the above, The Plan would not result in a 2 km x 2 km reduction in the area of occupancy of an important population of the Australian fairy tern.
Fragment an existing important population into two or more populations	The Australian fairy tern is a highly mobile species with a large extent of occurrence. Individuals that occur within and surrounding the Strategic Assessment Area form part of the eastern population of the species, which covers South Australia, Victoria, Tasmania and New South Wales (DAWE 2020a). There are no aspects of the Actions or Classes of Actions proposed under The Plan that would pose an impassible barrier to the species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet a conservative definition of habitat critical to the survival of the Australian fairy tern, given that it provides roosting and sheltering habitat near an area where the species is known to breed (on Bird Island) and forage (locally along the Port Adelaide River). No known nesting or foraging habitat is likely to be impacted by the Actions and Classes of Actions proposed under The Plan. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.54 ha of constructed wetlands and 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. These habitats are considered unlikely to support nesting given the small size of the beach and proximity to active fox dens. Indirect impacts associated with the Actions and Classes of Actions proposed under The Plan are unlikely to extend to other areas of habitat within the surrounding region (i.e., Adelaide International Bird Sanctuary, Bird Island). The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the Australian fairy tern to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of an important population	The Australian fairy tern breeds in Australia between June and March on sandy islands, beaches and in estuaries above the high-tide line (DAWE 2020a). The species is not known to breed or nest within the Strategic Assessment Area, and is considered unlikely to do so given the small size of beach available, proximity to active fox dens and lack of historical nesting records despite intensive local monitoring (DENR 2012, BirdLife 2022). The closest known breeding colony to the Strategic Assessment Area is located 2.5 km north-west on Bird Island (BirdLife 2022). The Actions and Classes of Actions proposed under The Plan are unlikely to impact this area. The expected loss of potential foraging and roosting habitat (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, and is therefore not considered likely to seriously impact on the breeding success of the colony located on Bird Island. As the species is not known to breed within the Strategic Assessment Area, and the Actions and Classes of Actions proposed under The Plan are not likely to affect nesting or fledging of the species, The Plan is not likely to disrupt the breeding cycle of an important population of the Australian fairy tern.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Australian fairy tern occurs along a large section of the coastline of Victoria, South Australia, Tasmania and Western Australia (DCCEEW 2024i). The area of potential foraging and roosting habitat to be removed as a result of the Actions and Classes of Actions proposed under The Plan (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) represent a relatively small proportion (less than 1%) of available habitat in the surrounding region. The nearby Adelaide International Bird Sanctuary, Torrens Island, Bird Island and Gulf St Vincent are unlikely to be impacted by The Plan, and would continue to provide extensive areas of habitat suitable for nesting, roosting and foraging. Given the proportionally small extent of habitat loss that would result from the Actions and Classes of Actions proposed under The Plan, The Plan is not likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the Australian fairy tern becoming established in its habitat.

Criteria	Assessment
Introduce disease that may cause the species to decline	The conservation advice and recovery plan for the Australian fairy tern do not identify disease as a key threat to the species (DSEWPC 2011, DAWE 2020a). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.
Interfere substantially with the recovery of the species	The *National Recovery plan for the Australian Fairy Tern (Sternula nereis nereis)* (DAWE 2020a) sets out the vision, objectives and strategies for the species' recovery. The primary threats to the species include: – Disturbance of breeding sites and habitat degradation as a result of human activities – Climate change and variability – Predation by introduced species and native birds The primary recovery objective is to sustain a positive population trend (compared to 2020 baseline counts), by 2030, in the number of mature individuals of the Australian Fairy Tern in both the eastern and western populations. The species is not known to breed or nest within the Strategic Assessment Area, with the closest known breeding colony located 2.5 km north-west on Bird Island (BirdLife 2022). The Actions and Classes of Actions proposed under The Plan are unlikely to impact this area. The reduction in potential foraging and roosting habitat (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, and is therefore not considered likely to seriously impact on the breeding success of the colony located on Bird Island. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.4.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.4.5 Conclusion – Australian fairy tern

Based upon the assessment in Section 2.4.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the Australian fairy tern. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.5 Slender-billed thornbill (Gulf St Vincent) (*Acanthiza iredalei rosinae*)

2.5.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the slender-billed thornbill (Gulf St Vincent) (*Acanthiza iredalei rosinae*) is provided in Table 2-13.

Table 2-13 Slender-billed thornbill (Gulf St Vincent) listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Not listed
Marine status	Not listed
Conservation advice	*Conservation Advice for Acanthiza iredalei rosinae (slender billed thornbill (Gulf St Vincent))* (DoE 2015c), in effect from 8 July 2015
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	Nil
Other Commonwealth documents	Nil

Habitat and distribution

The slender-billed thornbill (Gulf St Vincent) is one of three subspecies of slender-billed thornbill, and is endemic to southern Australia. This subspecies is restricted to shrublands, particularly samphire dominated by shrubby glasswort (*Sclerostegia arbuscula*) on coastal mudflats, foraging in samphire and grey mangroves (*Avicennia marina*) adjacent to samphire shrublands (DoE 2015c). Their nests are constructed in low shrubs, where they lay 2 to 4 eggs during the July-September breeding season. The subspecies is largely sedentary, occupying a home range of approximately 25 ha, occurring in three major subpopulations. They are only known to move distances of up to 650 m (DoE 2015c). While the subspecies is capable of crossing open areas of unsuitable habitat, it is believed to be incapable of crossing gaps between other subpopulations (DoE 2015c).

The total number of breeding individuals is estimated at 10,000, with the population between Port Prime and Torrens Island estimated to contain 4,600 mature individuals (DoE 2015c).

Species occurrence

Strategic Assessment Area

The slender-billed thornbill (Gulf St Vincent) was not observed during field surveys. This is despite surveys being undertaken over four weeks during the recommended survey period which coincided with the species' breeding season (DEWHA 2010, DEH 2008). The Strategic Assessment Area is located within the known distribution of one of the three local subpopulations (between Port Prime and Torrens Island) and within the potential foraging range of nearby historical records from Torrens Island (DEW 2020) (Figure 5).

Regional occurrence

The subspecies has a restricted distribution which has declined in recent decades due to threats from habitat loss, reclamation of salt flats, residential development and salt works (DoE 2015c). The subspecies is restricted to three known populations: centred at Price on the Yorke Peninsula, between Clinton Conservation Park and Sandy Point near Port Wakefield, and between Port Prime and Torrens Island on the Lefevre Peninsula (DoE 2015c).

Within the local Port Prime to Torrens Island population, the subspecies has four known sub-populations at Torrens Island (10 ha), Port Gawler (120 ha), Light River (Middle Beach) (665 ha) and Baker Creek (north of Thompson Beach) (30 ha) (DoE 2015c).

Habitat presence

Habitat located within the Strategic Assessment Area that may be suitable for foraging, roosting or nesting include:

– Tidal flats (2.58 ha) – including 0.35 ha of mangrove shrubland (foraging only)
– Constructed wetland (2.54 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species.

Definitions

Habitat critical to the survival of the species

Habitat critical to the survival of the slender-billed thornbill (Gulf St Vincent) has not been defined for the subspecies and has therefore been assessed against the generic definition outlined in the Commonwealth *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a). This defines habitat critical to the survival of a species to be:

Areas that are necessary:

- *For activities such as foraging, breeding, roosting, or dispersal*
- *For the long-term maintenance for the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)*
- *To maintain genetic diversity and long-term evolutionary development, or*
- *For the re-introduction of populations or recovery of the species or ecological community.*

Habitat within the Strategic Assessment Area would not constitute habitat critical to the survival of the species.

The subspecies forages within samphire habitat dominated by shrubby glasswort, usually within 20 m of a tidal channel or saline lake (DoE 2015c). The species relies on this habitat type for survival (DoE 2015c). Small areas of mangrove and samphire vegetation within the Strategic Assessment Area represent sub-optimal foraging habitat. Vegetation plots within the Strategic Assessment Area supported less than one percent coverage of the preferred samphire species (shrubby glasswort), which would not represent a substantial food resource.

Marginal habitats would provide additional low-quality habitat that could be utilised by birds that occur in the local region. However, movement from the nearest confirmed habitat at Torrens Island is likely to be infrequent given that it is located 1 km to the east, which is above the upper extent of the species' movement capabilities (estimated at 650 m) (DoE 2015c). While Mutton Cove, immediately to the south, would represent habitat critical to the survival of the species, there are no historical records of the species from that location.

Habitats located within the Strategic Assessment Area comprise a small proportion (less than one percent) of foraging or roosting habitat available within the surrounding region. Given the small extent, low quality, lack of preferred foraging species and distance from known nesting habitat, the habitat within the Strategic Assessment Area would not constitute habitat critical to the survival of the slender-billed thornbill (Gulf St Vincent).

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the slender-billed thornbill (Gulf St Vincent).

Important population

No individual important populations have been identified in the species' conservation advice, although due to the subspecies' declining distribution, all populations of the slender-billed thornbill (Gulf St Vincent) would be considered important.

SPECIES OCCURRENCE RECORDS FOR THE SLENDER-BILLED THORNBILL (GULF ST VINCENT) WITHIN THE STRATEGIC ASSESSMENT AREA AND SURROUNDING REGION

Legend

- Nature maps
- Strategic assessment area

Webb Beach
Dublin
Redbanks
Port Prime
Korunye
Reeves Plains
Lewiston
Milner
Gulf St Vincent
Macdonald Park
Bolivar
Direk
Elizabeth South
Elizabeth
St Kilda
Burton
Hilra
Salisbury
Chidda
Parafield
Outer Harbor
Yerlo
North Haven
Lefevre Peninsula
Green Fields
Taperoo
Draper

Australian Government
Australian Submarine Agency

GHD

FIGURE 5
Rev 0
29/11/2024

0 1 2 3 4
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_112_SlenderBilledThornbill

2.5.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the slender-billed thornbill include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the slender-billed thornbill (Gulf St Vincent), associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-14.

Table 2-14 Potential impacts of The Plan on the Slender-billed thornbill (Gulf St Vincent)

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.5.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the slender-billed thornbill (Gulf St Vincent), with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-15.

Table 2-15 Significant impact assessment for the slender-billed thornbill (Gulf St Vincent)

Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The Strategic Assessment Area is located at the southern extent of the Port Prime to Torrens Island subpopulation of the slender-billed thornbill (Gulf St Vincent). As identified in the subspecies' conservation advice (DoE 2015c), the Port Prime to Torrens Island subpopulation is considered to be an important population. The potential for direct mortality or injury to individual slender-billed thornbills (Gulf St Vincent), to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly to avoid immediate disturbance – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore not likely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the slender-billed thornbill (Gulf St Vincent).
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy of the slender-billed thornbill (Gulf St Vincent) was estimated at 60 km^2 in 2010, with a wider extent of occurrence of 1,600 km^2. Other data suggests that the current area of occupancy could be as low as 30 km^2 (DoE 2015c). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.54 ha (0.0254 km^2) of constructed wetlands and 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This area does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the slender-billed thornbill (Gulf St Vincent).
Fragment an existing important population into two or more populations	The slender-billed thornbill (Gulf St Vincent) is a relatively sedentary species, with a maximum known flight distance of approximately 650 m (DoE 2015c). Confirmed habitat for the species is located approximately 1 km west of the Strategic Assessment Area on Torrens Island, and 100 m north at Mutton Cove. The Actions and Classes of Actions proposed under The Plan would not occur between areas of local habitat and would not prevent the local movement of birds between Mutton Cove and Torrens Island. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to the species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Habitats located within the Strategic Assessment Area are not considered to constitute habitat critical to the survival of the species, given the low densities of shrubby glasswort (less than 1%). The nearest areas of habitat critical to the survival of the species occur on Torrens Island, approximately 1 km to the east of the Strategic Assessment Area. While the marginal habitats within the Strategic Assessment Area could provide some limited additional foraging resources, movement to this area from Torrens Island would be infrequent, given that it exceeds the known movement capabilities of the species. In consideration of the above, the Actions and Classes of Actions proposed under The Plan are not likely to adversely affect habitat critical to the survival of the slender-billed thornbill (Gulf St Vincent) to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of an important population	The slender-billed thornbill (Gulf St Vincent) breeds from June to September, nesting in low shrubs, with breeding pairs known to utilise Torrens Island (DoE 2015c). The Strategic Assessment Area is considered to contain limited suitable nesting habitat for the species given the low densities of low shrubs. Considering the species' sedentary nature and the absence of historical records from within the Strategic Assessment Area and adjacent Mutton Cove Conservation Reserve, it is unlikely that the species would regularly nest within or adjacent to the Strategic Assessment Area. While the marginal habitats within the Strategic Assessment Area may provide occasional foraging resources, the habitat contained within the Strategic Assessment Area is not likely to provide important foraging habitat necessary for supporting birds that nest on Torrens Island. This is due to the small extent and low quality of foraging resources available, and the distance between the areas exceeding the known movement capabilities of the species. As such, the Actions and Classes of Actions proposed under The Plan are not likely to disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The slender-billed thornbill (Gulf St Vincent) occurs within the south-east of South Australia, with the closest known population to the Strategic Assessment Area located 1 km east on Torrens Island. The species was not recorded during the 2023–2024 field surveys. The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the slender-billed thornbill (Gulf St Vincent) population.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the species becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the slender-billed thornbill (Gulf St Vincent) does not identify disease as a key threat to the species (DoE 2015c). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere substantially with the recovery of the species	There is no recovery plan for the slender-billed thornbill (Gulf St Vincent), with the conservation advice considered to meet the priorities for the species' recovery. The conservation advice for the slender-billed thornbill (Gulf St Vincent) (DoE 2015c) indicates that the species is at risk from the following threats: – Habitat loss caused by industrial and recreational developments – Inappropriate water management – Grazing by introduced species – Disturbance from human recreation – Predation by foxes – Sea level rise and climate change The primary conservation objective is to ensure that existing subpopulations of slender-billed thornbill (Gulf St Vincent) are retained and viable. High level conservation actions of the recovery plan include working towards abatement of threats and restoration of habitat through securing and protecting remaining habitat as well as inland habitat from the current range in areas where salt marshes could develop as sea level rises. Habitat management of existing areas of salt marsh is recommended through habitat retention measures (water controls for example) and implementation of a feral predator control program. Monitoring priorities and research and information priorities for the conservation of the species are outlined further in the species' conservation advice (DoE 2015c). The reduction in potential foraging and roosting habitat (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.5.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.5.5 Conclusion – slender-billed thornbill (Gulf St Vincent)

Based upon the assessment in Section 2.5.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the slender-billed thornbill (Gulf St Vincent). In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.6 Eastern curlew (*Numenius madagascariensis*)

2.6.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the eastern curlew (*Numenius madagascariensis*) is provided in Table 2-16.

Table 2-16 Eastern curlew listing summary

Listing information	Details
Threatened category	Critically endangered
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice for Numenius madagascariensis (eastern curlew)* (DCCEEW 2023a), in effect from 18 December 2023
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The eastern curlew is a migratory species that is endemic to the East Asian-Australasian Flyway. It breeds in the Northern Hemisphere during the northern summer and migrates to Australia and other southern destinations every year for the non-breeding season. During the non-breeding season, approximately 73 percent of the species' population occurs in Australia, distributed across coastal regions and inhabiting sheltered ocean beaches, mudflats, saltmarsh, estuaries, and tidal seagrass meadows (DCCEEW 2023a). In Australia, the species is found in all states, but is concentrated in the north, east and south-east, including Tasmania. In South Australia, the species is scarce between the Victorian border and Cape Jaffa and is patchily distributed north-west from the Coorong to the Streaky Bay area (DCCEEW 2014).

Hansen *et al.* (2016) reported the East Asian-Australasian Flyway population of the species as being comprised of around 35,000 individuals. DCCEEW (2014) reported an estimate of between 22,000 and 24,100 mature individuals in the wild, with a continued trend of decline.

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the eastern curlew (DCCEEW 2023a), however, the species was not observed during the 2023–2024 field surveys. Potential foraging and roosting habitat for the species is sparse throughout the Strategic Assessment Area, occurring mainly as tidal flats at the interface of the onshore area and marine area.

Regional occurrence

The species has regular historical observations in habitats surrounding the Strategic Assessment Area, including in sheltered estuaries, mangrove swamps, saltmarshes and tidal flats (DCCEEW 2024a) (Figure 6).

The eastern curlew is a regular visitor to selected parts of the Adelaide International Bird Sanctuary, with other local sites (including Bird Island) receiving occasional sightings. The species is regularly observed at two sites further inland within the Adelaide International Bird Sanctuary, including Dry Creek salt fields and Port Prime (Lees *et al.* 2020). Other more regional locations are at Port Clinton and Price on the Yorke Peninsula (Lees *et al.* 2020).

SPECIES OCCURRENCE RECORDS FOR THE EASTERN CURLEW WITHIN THE STRATEGIC ASSESSMENT AREA AND SURROUNDING REGION

Legend

- Nature maps
- Strategic assessment area

Webb Beach
Dublin
Redbanks
Korunye
Reeves Plains
Lewiston
Gulf St Vincent
Milner
Macdonald Park
Bolivar
Direk
Elizabeth South
Elizabeth
St Kilda
Burton
Hilra
Salisbury
Chidda
Parafield
Outer Harbor
Yerlo
North Haven
Lefevre Peninsula
Green Fields
Midlunga
Taperoo
Draper

Australian Government
Australian Submarine Agency

GHD

FIGURE 6
Rev 0
29/11/2024

0 1 2 3 4
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_115_EasternCurlew

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area, Species records (2023). DE - Nature maps records (2024).World Imagery (Wayback 2024-05-09): Esri, Maxar, Earthstar Geographics, and the GIS User Community

Habitat presence

Habitat located within the Strategic Assessment Area that may be suitable for foraging or roosting include:

– Tidal flats (2.58 ha) – including 0.35 ha of mangrove shrubland
– Constructed wetlands (2.54 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the eastern curlew' is provided in the conservation advice for the species (DCCEEW 2023a). This defines habitat critical to the survival of the species to be:

Areas that are necessary:

– *For activities such as foraging, breeding, roosting, or dispersal*
– *For the long-term maintenance of the species (including the maintenance of species essential to the survival of the far eastern curlew, such as macrobenthos)*
– *To maintain genetic diversity and long-term evolutionary development, or*
– *For the re-introduction of populations or recovery of the species.*

The tidal flats and constructed wetlands located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may occasionally contribute to the species' wider habitat area. Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the eastern curlew.

There is habitat critical to the survival of the species located on Torrens Island, approximately 1 km east of the onshore area of the Strategic Assessment Area.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the eastern curlew.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

– *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
– *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

– *0.1 percent of the flyway population of a single species of migratory shorebird, or*
– *2,000 migratory shorebirds, or*
– *15 migratory shorebird species*

Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the eastern curlew and has been documented to support a nationally ecologically significant proportion of the species (Table 2-17).

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the eastern curlew, are included in Table 2-17. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the eastern curlew.

Table 2-17 Ecologically significant proportions and flyway information for the eastern curlew

Detail	Estimate
Flyway population estimate	35,000
1% flyway population (internationally significant)	350
0.1% flyway population (nationally significant)	35
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	95

2.6.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the eastern curlew include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the eastern curlew, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-18.

Table 2-18 Potential impacts of The Plan on the eastern curlew

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.6.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the eastern curlew, with respect to the significant impact criteria for a critically endangered species, is provided in Table 2-19.

Table 2-19 Significant impact assessment for the eastern curlew

Criteria	Assessment
An action is likely to have a significant impact on a critically endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of a population	The East Asian-Australasian Flyway population of the eastern curlew is estimated to be 35,000, with a nationally important proportion of 35 individuals (Hansen *et al.* 2016). The species was not observed within the Strategic Assessment Area during field surveys. The population of eastern curlews within the Strategic Assessment Area, likely form part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the eastern curlew and has been documented to support an ecologically significant proportion of the species. The potential for direct mortality or injury to individual eastern curlews, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (as species does not breed in Australia, all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the eastern curlew.
Reduce the area of occupancy of the species	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The eastern curlew's area of occupancy is estimated between 13,000 km^2 and 20,000 km^2, with a wider extent of occurrence estimated between 9,900,000 km^2 10,900,000 km^2 (DCCEEW 2023a). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.54 ha (0.0254 km^2) of constructed wetlands and 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 13,000 km^2 extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the eastern curlew.
Fragment an existing population into two or more populations	The eastern curlew is a highly mobile shorebird that migrates annually from the Northern Hemisphere to coastal areas of Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the eastern curlew, as the habitat within the Strategic Assessment Area likely forms part of the wider habitat critical to the survival of the species within Gulf St Vincent. This area includes the Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, which extends approximately 60 km along the coastline of Gulf St Vincent to the north of the Strategic Assessment Area. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the eastern curlew and has been documented to support an ecologically significant proportion of the species. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.54 ha of constructed wetlands and 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat considered critical to the survival of the species is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the eastern curlew to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of a population	The eastern curlew breeds in Siberia, far eastern Russia and north-eastern China from May to June (DCCEEW 2023a). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The eastern curlew occupies an extensive international distribution, inhabiting Australia during its non-breeding period where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the eastern curlew.
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the eastern curlew becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the eastern curlew does not identify disease as a key threat to the species (DCCEEW 2023a). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere with the recovery of the species	There is no recovery plan for the eastern curlew, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the eastern curlew (DCCEEW 2023a), indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation objectives are to minimise the loss of habitat critical to the survival of the eastern curlew throughout Australia, and to prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.6.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.6.5 Conclusion – eastern curlew

Based upon the assessment in Section 2.6.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the eastern curlew. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.7 Grey plover (*Pluvialis squatarola*)

2.7.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the grey plover (*Pluvialis squatarola*) is provided in Table 2-20.

Table 2-20 Grey plover listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice for Pluvialis squatarola (grey plover)* (DCCEEW 2024l), in effect from 5 January 2024
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Plan no longer in effect following preparation of specific conservation advice (formerly *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a))
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The grey plover is a migratory shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. Breeding occurs only in the Northern Hemisphere. The species occurs in coastal areas across all Australian states, including in bays, estuaries, lagoons with mudflats, and rocky platforms (DCCEEW 2024k). Roosting occurs in sandy areas along unvegetated banks. South Australia has one of the largest populations of grey plovers in Australia (DCCEEW 2024k).

Significant populations of the species occur between the Coorong and Eyre Peninsula in South Australia, and along the coast of Western Australia. Western Australia supports 38 percent of the grey plover population in Australia (DCCEEW 2024k).

Hansen *et al.* (2016) reported the East Asian-Australasian Flyway population to consist of around 80,000 individuals. DCCEEW (2024k) reported the species to have 11,300 mature individuals in the wild and of these, 38 percent migrate to Australia during the non-breeding season (September to March).

Species occurrence

Strategic Assessment Area

The grey plover was not observed within the Strategic Assessment Area, or immediate surrounding area, during the 2023–2024 field surveys.

Regional occurrence

The species was observed (one observation of 18 birds) at the Thompson Beach Estuary reference site, approximately 40 km north of the Strategic Assessment Area, during the 2023–2024 field surveys (Figure 7).

The grey plover is a regular visitor to selected parts of the Adelaide International Bird Sanctuary, including Thompson Beach, Port Prime and Webb Beach, which are located north of the Strategic Assessment Area (Lees *et al.* 2020). Local sites (including Bird Island) receive occasional sightings.

The species is regularly sighted at regional locations at Port Wakefield and Bald Hill at the north of Fleurieu Peninsula, and Clinton Conservation Park and Price salt fields on the Yorke Peninsula (Lees *et al.* 2020).

SPECIES OCCURRENCE RECORDS FOR THE GREY PLOVER WITHIN THE STRATEGIC ASSESSMENT AREA AND SURROUNDING REGION

Legend

- Migratory survey
- Nature maps
- Strategic assessment area

Webb Beach
Dublin
Redbanks
Korunye
Reeves Plains
Lewiston
Gulf St Vincent
Milner
Macdonald Park
Bolivar
Direk
Elizabeth South
Elizabeth
St Kilda
Burton
Hilra
Salisbury
Chidda
Parafield
Outer Harbor
Yerlo
North Haven
Lefevre Peninsula
Green Fields
Midlunga
Taperoo
Draper

OFFICIAL

Australian Government
Australian Submarine Agency

GHD

FIGURE 7
Rev 0
29/11/2024

0 1 2 3 4
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_114_GreyPlover

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area, Species records (2023). DE - Nature maps (2024).World Imagery (Wayback 2024-05-09): Esri, Maxar, Earthstar Geographics, and the GIS User Community

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Tidal flats (2.58 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species. The grey plover typically does not utilise mangrove shrubland or constructed wetland habitats.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the grey plover' is provided in the conservation advice for the species (DCCEEW 2024l). This defines habitat critical to the survival of the species to be:

Areas that are necessary:

– *For activities such as foraging, breeding, roosting, or dispersal*
– *For the long-term maintenance of the species (including the maintenance of species essential to the survival of the grey plover, such as macrobenthos)*
– *To maintain genetic diversity and long-term evolutionary development or*
– *For the re-introduction of populations or recovery of the species.*

The tidal flats and constructed wetlands located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may occasionally contribute to the species' wider habitat area. Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the grey plover.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the grey plover.

Important population

No individual important populations have been identified in the species' conservation advice (DCCEEW 2024l).

The grey plovers that occur in the region of the Strategic Assessment Area are part of the broader population of the East Asian-Australasian Flyway, which is an important population.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

– *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
– *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

– *0.1 percent of the flyway population of a single species of migratory shorebird, or*
– *2,000 migratory shorebirds, or*
– *15 migratory shorebird species*

The wider Gulf St Vincent region is not documented by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) to support a nationally ecologically significant proportion of the eastern curlew.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the grey plover, are included in Table 2-21. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the grey plover.

Table 2-21 Ecologically significant proportions and flyway information for the grey plover

Detail	Estimate
Flyway population estimate	80,000
1% flyway population (internationally significant)	800
0.1% flyway population (nationally significant)	80
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	254

2.7.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the grey plover include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the grey plover, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-22.

Table 2-22 Potential impacts of The Plan on the grey plover

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.7.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the grey plover, with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-23.

Table 2-23 Significant impact assessment for the grey plover

Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The East Asian-Australasian Flyway population of grey plover is estimated to be 80,000, with a nationally important proportion of 80 individuals (Hansen *et al.* 2016). The species was not recorded within the Strategic Assessment Area during field surveys. A maximum count of 18 birds was recorded at one reference site (Thompson Creek Estuary). The potential for direct mortality or injury to individual grey plovers to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the grey plover.
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for grey plover in Australia is estimated to be between 6,300 km^2 and 8,900 km^2, with a wider extent of occurrence estimated at between 9,300,000 km^2 and 10,300,000 km^2 (DCCEEW 2024k). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the species extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the grey plover.
Fragment an existing important population into two or more populations	The grey plover is a highly mobile shorebird that flies each year from the Northern Hemisphere to coastal areas in Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet a conservative definition of habitat critical to the survival of the grey plover, given that it contributes to the species' wider foraging area within the region. While in Australia the grey plover forages in mud and soft wet sand within sandflats, tidal mudflats and saltmarshes and the eaves of oceanic coastlines, bays and estuaries, roosting in sheltered embayments, estuaries and lagoons with sandy areas (DCCEEW 2024l). The species does not breed in the Strategic Assessment Area or anywhere in Australia. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.54 ha of constructed wetlands and 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat available within the region is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the grey plover.
Disrupt the breeding cycle of an important population	The grey plover breeds mainly in northern Siberia, Alaska and Canada (DCCEEW 2014l). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The grey plover occupies an extensive global distribution, visiting Australia during its non-breeding period (September to May), where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the grey plover population.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the grey plover becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the grey plover does not identify disease as a key threat to the species (DCCEEW 2014l). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere substantially with the recovery of the species	There is no recovery plan for the grey plover, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the grey plover (DCCEEW 2014l) indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation objectives are to minimise the loss of habitat critical to the survival of the grey plover throughout Australia, and prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.7.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.7.5 Conclusion – grey plover

Based upon the assessment in Section 2.7.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the grey plover. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.8 Eastern hooded plover (*Thinornis cucullatus cucullatus*)

2.8.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the eastern hooded plover (*Thinornis cucullatus cucullatus*) is provided in Table 2-24.

Table 2-24 Eastern hooded plover listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Not listed
Marine status	Listed
Conservation advice	*Conservation Advice for Thinornis cucullatus cucullatus (eastern hooded plover)* (DoE 2014), in effect from 6 November 2014
Recovery plan	Not required
Relevant threat abatement plan(s)	*Threat abatement plan for predation by the European red fox* (DEWHA 2008b), in effect from 1 October 2008
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*Threatened Species Action Plan 2022–2032* (DCCEEW 2022) *Threatened Species Strategy Action Plan 2015–16 – 20 birds by 2020* (DoE 2015d) Threatened Species Strategy Year 3 Scorecard – Hooded Plover (National Environmental Science Program Threatened Species Research Hub 2019)

Habitat and distribution

The eastern hooded plover occurs almost entirely in coastal areas, inhabiting wide sandy beaches with abundant seaweed and backed by dunes, saline and freshwater lakes near the coast, sandy and rocky reefs, and tidal bays and estuaries (DoE 2014). Breeding occurs in Australia on or near beaches above the high tide mark. In South Australia the species is mainly concentrated on Kangaroo Island and the Yorke Peninsula (DoE 2014).

The last comprehensive count of the eastern hooded plover (Ekanayake *et al.* 2016) across mainland Australia recorded 1,563 individuals, including 43 juveniles. This constitutes half of the estimated population for the species (DoE 2014). Notable populations of the species are located in Tasmania, with smaller populations in South Australia, Victoria and New South Wales (DoE 2014).

Species occurrence

Strategic Assessment Area

The eastern hooded plover was not observed within the Strategic Assessment Area during the 2023–2024 field surveys. However, it was observed at the Port Gawler Beach, Thompson Beach Estuary and Bird Island reference sites.

Regional occurrence

Eastern hooded plovers occur in low densities within the Adelaide metropolitan region (Figure 8). Major breeding populations in South Australia are located on the Yorke Peninsula and Kangaroo Island, which support approximately 7.1 percent and 5.8 percent of the Australian population, respectively (DoE 2014). There are less than 70 known eastern hooded plovers within Adelaide and the Fleurieu Peninsula (National Environmental Science Program Threatened Species Research Hub 2019).

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging, roosting or breeding include:

– Tidal flats (2.58 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species.

Definitions

Habitat critical to the survival of the species

'Habitat critical to the survival of the species' has been defined as open ocean beaches, sand dunes adjacent to beaches, tidal bays and estuaries, near-coastal saline and freshwater lakes and lagoons, rock platforms and rocky or sandy reefs close to shore (Marchant & Higgins 1993, DoE 2014).

The tidal flats located within the Strategic Assessment Area are not generally consistent with the species' preferred habitat (wide sandy beaches backed by dunes), however, they do provide potential foraging and roosting habitat for the species. The Strategic Assessment Area has a proportionally small area (less than one percent) of the foraging habitat available for this species within the surrounding region.

The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may contribute occasionally to the species' wider habitat area. Using a conservative and precautionary approach, the habitat within the Strategic Assessment Area forms part of broader areas of high quality habitat and could meet the definition for habitat critical to the survival of the eastern hooded plover.

There is no habitat listed on the register of critical habitat (EPBC Act section 207A) for the eastern hooded plover.

Important population

Important populations have been defined in the conservation advice as all breeding territories and non-breeding flocking sites, with important stretches of coasts including:

– Victoria**:** Warrnambool to Portland (4.3 percent), Mornington Peninsula (2.3 percent), Bass Coast (San Remo to Inverloch) (1.6 percent)
– South Australia: Kangaroo Island (5.8 percent), Yorke Peninsula (7.1 percent)
– Tasmania: the NRM North region (17.3 percent), Flinders Island (6.7 percent), and King Island (4 percent)

Eastern hooded plovers are relatively sedentary, with 95 percent of movements less than 20 km (DoE 2014), however, individuals are capable of movements up to 330 km (DoE 2014). Applying a conservative definition, local individuals could be considered part of a broader important population incorporating Kangaroo Island and Yorke Peninsula, as well as the Fleurieu and Lefevre Peninsulas.

2.8.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the eastern hooded plover include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

SPECIES OCCURRENCE RECORDS FOR THE EASTERN HOODED PLOVER WITHIN THE STRATEGIC ASSESSMENT AREA AND SURROUNDING REGION

Legend

- Nature maps
- Strategic assessment area

Webb Beach
Dublin
Redbanks
Port Prime
Korunye
Reeves Plains
Lewiston
Gulf St Vincent
Milner
Macdonald Park
Bolivar
Direk
Elizabeth South
Elizabeth
St Kilda
Burton
Hilra
Salisbury
Chidda
Outer Harbor
Parafield
Yerlo
North Haven
Lefevre Peninsula
Green Fields
Midlunga
Taperoo
Draper

Australian Government
Australian Submarine Agency

GHD

FIGURE 8
Rev 0
29/11/2024

0 1 2 3 4
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_113_EasternHoodedPlover

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area, Species records (2023). DE - Nature maps records (2024).World Imagery (Wayback 2024-05-09).

Potential impacts

Potential impacts to the eastern hooded plover, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-25.

Table 2-25 Potential impacts of The Plan on the Eastern hooded plover

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.8.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the eastern hooded plover, with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-26.

Table 2-26 Significant impact assessment for the eastern hooded plover

Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The population of eastern hooded plover that is present in the region of the Strategic Assessment Area is part of the wider important population of Gulf St Vincent. This population is centred around Yorke Peninsula and Kangaroo Island but extends broadly across Gulf St Vincent. The potential for direct mortality or injury to individual eastern hooded plovers, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly to avoid disturbance – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the eastern hooded plover.

Criteria	Assessment
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for eastern hooded plover is estimated to be 3,600 km^2, with a wider extent of occurrence in Australia estimated at 7,900 km^2 (DoE 2014). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This area does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the eastern hooded plover.
Fragment an existing important population into two or more populations	The eastern hooded plover is a highly mobile bird species capable of flying up to 330 km with a extent of occurrence spanning most of coastal Australia (DoE 2014). There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to the species, that would fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet a conservative definition of habitat critical to the survival of the eastern hooded plover, given that it contributes to the species' wider foraging area within the region. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat available within the region is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. Given the small magnitude of potential impacts, and the abundance of nearby habitat persisting on Bird Island, Torrens Island and the broader Adelaide International Bird Sanctuary, the Actions and Classes of Actions proposed under The Plan are not likely to adversely affect habitat critical to the survival of the eastern hooded plover.
Disrupt the breeding cycle of an important population	The eastern hooded plover breeds from August to March in Australia on or near the beach, including on sparsely vegetated dunes and stony terraces (DoE 2014). South Australian breeding populations of the eastern hooded plover are concentrated on the Yorke Peninsula and Kangaroo Island (DoE 2014). Only limited breeding occurs along the coastlines of Adelaide and the Fleurieu Peninsula (National Environmental Science Program Threatened Species Research Hub 2019). Due to the previously disturbed nature of the Strategic Assessment Area and the abundance of undisturbed coastline in the surrounding region, the species is not likely to utilise it as a key breeding location. With consideration to this, the Actions and Classes of Actions proposed under The Plan are not likely to disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the eastern hooded plover population.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the eastern hooded plover becoming established in its habitat.

Criteria	Assessment
Introduce disease that may cause the species to decline	The conservation advice for the eastern hooded plover does not identify disease as a key threat to the species (DoE 2014). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.
Interfere substantially with the recovery of the species	There is no recovery plan for the eastern hooded plover, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the eastern hooded plover (DoE 2014) indicates that the species is at risk from the following threats: – Disturbance of breeding sites and habitat degradation as a result of human activities – Climate change and variability – Predation by introduced species and native birds The primary conservation objectives are to achieve stable numbers of adults, and to maintain occupied and active breeding territories, improve breeding success, and maintain, enhance and restore habitat for the species. The reduction in potential foraging and roosting habitat (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.8.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3

2.8.5 Conclusion – eastern hooded plover

Based upon the assessment in Section 2.8.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the eastern hooded plover. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.9 Ruddy turnstone (*Arenaria interpres*)

2.9.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the ruddy turnstone (*Arenaria interpres*) is provided in Table 2-27.

Table 2-27 Ruddy turnstone listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice for Arenaria interpres (ruddy turnstone)* (DCCEEW 2024m), in effect from 5 January 2024
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Plan no longer in effect following preparation of specific conservation advice (formerly *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a))
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The ruddy turnstone is a migratory shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. Breeding occurs only in the Northern Hemisphere. While in Australia, the species inhabits rocky shores and beaches with large deposits of rotting seaweed. The ruddy turnstone has a coastal distribution ranging from Tasmania to Darwin and west to Western Australia, with occasional records of inland populations (DCCEEW 2024m).

In 2016, the East Asian-Australasian Flyway population of ruddy turnstones was estimated to contain approximately 30,000 birds, of which 20,800 are thought to spend the non-breeding season in Australia (DCCEEW 2024m).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the ruddy turnstone (DCCEEW 2024m); however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as tidal flats that represent habitat that the species could use on an occasional basis.

Regional occurrence

The nearest historical record of the ruddy turnstone is located at Outer Harbour, 1 km west of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Tidal flats (2.58 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species. The ruddy turnstone typically does not utilise mangrove shrubland or constructed wetland habitats.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the ruddy turnstone' is provided in the conservation advice for the species (DCCEEW 2024m). This defines habitat critical to the survival of the species to be:

Areas that are necessary:

- *For activities such as foraging, breeding, roosting, or dispersal,*
- *For the long-term maintenance of the species (including the maintenance of species essential to the survival of the ruddy turnstone, such as macrobenthos),*
- *To maintain genetic diversity and long-term evolutionary development, or*
- *For the re-introduction of populations or recovery of the species.*

The tidal flats located within the Strategic Assessment Area, comprise a proportionally small (less than one percent) extent of the foraging or roosting habitats available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may contribute occasionally to the species' wider habitat area. Using a conservative and precautionary approach, the habitat within the Strategic Assessment Area forms part of broader areas of high quality habitat and could meet the definition for habitat critical to the survival of the ruddy turnstone.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the ruddy turnstone.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

- *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
- *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

- *0.1 percent of the flyway population of a single species of migratory shorebird, or*
- *2,000 migratory shorebirds, or*
- *15 migratory shorebird species*

Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the ruddy turnstone and has been documented to support a nationally ecologically significant proportion of the species (Table 2-28).

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the ruddy turnstone, are included in Table 2-28. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the ruddy turnstone.

Table 2-28 Ecologically significant proportions and flyway information for the ruddy turnstone

Detail	Estimate
Flyway population estimate	30,000
1% flyway population (internationally significant)	300
0.1% flyway population (nationally significant)	30
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	254

2.9.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the ruddy turnstone include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the ruddy turnstone, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-29.

Table 2-29 Potential impacts of The Plan on the ruddy turnstone

Impact type	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.9.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the ruddy turnstone, with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-30.

Table 2-30 Significant impact assessment for the ruddy turnstone

Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The East Asian-Australasian Flyway population of the ruddy turnstone is estimated to be 30,000, with a nationally important proportion of 30 individuals (Hansen *et al.* 2016). The species was not observed within the Strategic Assessment Area during field surveys. The population of ruddy turnstones within the Strategic Assessment Area likely forms part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the ruddy turnstone and has been documented to support an ecologically significant proportion of the species. The potential for direct mortality or injury to individual ruddy turnstones, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (as species does not breed in Australia, all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore be unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the ruddy turnstone.
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for the ruddy turnstone is estimated to be between 9,200 km^2 and 14,000 km^2, with a wider extent of occurrence between 11,000,000 km^2 and 12,200,000 km^2 (DCCEEW 2024m). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 13,000 km^2 extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the ruddy turnstone.
Fragment an existing important population into two or more populations	The ruddy turnstone is a highly mobile shorebird that migrates annually from the Northern Hemisphere to coastal areas of Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the ruddy turnstone, as the habitat within the Strategic Assessment Area likely forms part of the wider habitat critical to the survival of the species within Gulf St Vincent. This area includes the Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, which extends approximately 60 km along the coastline of Gulf St Vincent to the north of the Strategic Assessment Area. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the ruddy turnstone and has been documented to support a nationally ecologically significant proportion of the species. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat considered critical to the survival of the species in the region is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan and would persist in the surrounding region. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the ruddy turnstone to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of an important population	The ruddy turnstone breeds in the high Arctic, from mid-May to early July (DCCEEW 2024m). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The ruddy turnstone occupies an extensive global distribution, inhabiting Australia during its non-breeding season where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the ruddy turnstone.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the ruddy turnstone becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the ruddy turnstone does not identify disease as a key threat to the species (DCCEEW 2024m). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere substantially with the recovery of the species	There is no recovery plan for the ruddy turnstone, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the ruddy turnstone (DCCEEW 2024m) indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation objectives are to minimise the loss of habitat critical to the survival of the ruddy turnstone throughout Australia, and prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.9.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.9.5 Conclusion – ruddy turnstone

Based upon the assessment in Section 2.9.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the ruddy turnstone. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.10 Curlew sandpiper (*Calidris ferruginea*)

2.10.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the curlew sandpiper (*Calidris ferruginea*) is provided in Table 2-31.

Table 2-31 Curlew sandpiper listing summary

Listing information	Details
Threatened category	Critically endangered
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice for Calidris ferruginea (curlew sandpiper)* (DCCEEW 2024c), in effect from 18 December 2023
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The curlew sandpiper is a shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. Breeding occurs only in the Northern Hemisphere. While in Australia, the species occurs in high densities in coastal areas, with small numbers known to occur inland. The species commonly inhabits intertidal mudflats in sheltered coastal areas such as estuaries, bays, inlets and lagoons and also in non-tidal swamps, lakes and lagoons. They have also been recorded further inland around ephemeral and permanent lakes, dams, waterholes and bore drains (DCCEEW 2024c).

The East Asian-Australasian Flyway population of curlew sandpipers was estimated in 2016 to contain approximately 90,000 birds, of which 45,500 are thought to spend the non-breeding season in Australia (DCCEEW 2024c).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the curlew sandpiper (DCCEEW 2024c); however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as tidal flats that represent habitat that the species could use on an occasional basis.

Regional occurrence

The nearest historical records to the Strategic Assessment Area are located in Mutton Cove (immediately south) and Torrens Island (1 km south-east).

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting includes:

– Tidal flats (2.58 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species. The curlew sandpiper typically does not utilise mangrove shrubland or constructed wetland habitats.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the curlew sandpiper' is provided in the conservation advice for the species (DCCEEW 2024c). This defines habitat critical to the survival of the species to be:

Areas that are necessary:

- *For activities such as foraging, breeding, roosting, or dispersal,*
- *For the long-term maintenance of the subspecies (including the maintenance of species essential to the survival of the curlew sandpiper, such as macrobenthos),*
- *To maintain genetic diversity and long-term evolutionary development, or*
- *For the re-introduction of populations or recovery of the species.*

The tidal flats and constructed wetlands located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may occasionally contribute to the species' wider habitat area. Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the curlew sandpiper.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the curlew sandpiper.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

- *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
- *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

- *0.1 percent of the flyway population of a single species of migratory shorebird, or*
- *2,000 migratory shorebirds, or*
- *15 migratory shorebird species*

Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the curlew sandpiper and has been documented to support a nationally ecologically significant proportion of the species (Table 2-32).

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the curlew sandpiper, are included in Table 2-32. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the curlew sandpiper.

Table 2-32 Ecologically significant proportions and flyway information for the curlew sandpiper

Detail	Estimate
Flyway population estimate	90,000
1% flyway population (internationally significant)	900
0.1% flyway population (nationally significant)	90
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	888

2.10.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the curlew sandpiper include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the curlew sandpiper, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-33.

Table 2-33 Potential impacts of The Plan on the curlew sandpiper

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.10.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the curlew sandpiper, with respect to the significant impact criteria for a critically endangered species, is provided in Table 2-34.

Table 2-34 Significant impact assessment for the curlew sandpiper

Criteria	Assessment
An action is likely to have a significant impact on a critically endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of a population	The East Asian-Australasian Flyway population of the curlew sandpiper is estimated to be 90,000, with a nationally important proportion of 90 individuals (Hansen *et al.* 2016). The species was not observed within the Strategic Assessment Area during field surveys. The population of curlew sandpipers within the Strategic Assessment Area, likely form part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the curlew sandpiper, and has been documented to support a nationally ecologically significant proportion of the species. The potential for direct mortality or injury to individual curlew sandpipers, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore not likely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of a population of the curlew sandpiper.
Reduce the area of occupancy of the species	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for the curlew sandpiper is estimated to be 6,800 km^2, with a wider extent of occurrence of 7,600,000 km^2 (DCCEEW 2024c). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 6,800 km^2 extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the curlew sandpiper.
Fragment an existing population into two or more populations	The curlew sandpiper is a highly mobile shorebird that migrates annually from the Northern Hemisphere to coastal areas of Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the curlew sandpiper, as the habitat within the Strategic Assessment Area likely forms part of the wider habitat critical to the survival of the species within Gulf St Vincent. This area includes the Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, which extends approximately 60 km along the coastline of Gulf St Vincent to the north of the Strategic Assessment Area. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the curlew sandpiper, and has been documented to support a nationally ecologically significant proportion of the species. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat considered critical to the survival of the species is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the curlew sandpiper to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of a population	The curlew sandpiper breeds across Arctic Siberia from June to July (DCCEEW 2024c). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The curlew sandpiper occupies an extensive global distribution, inhabiting Australia during its non-breeding season, where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the curlew sandpiper.
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the curlew sandpiper becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the curlew sandpiper does not identify disease as a key threat to the species (DCCEEW 2024c). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere with the recovery of the species	There is no recovery plan for the curlew sandpiper, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the curlew sandpiper (DCCEEW 2024c) indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation outcome stated in the conservation advice is to minimise the loss of habitat critical to the survival of the curlew sandpiper throughout Australia, and prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.10.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3

2.10.5 Conclusion – curlew sandpiper

Based upon the assessment in Section 2.10.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the curlew sandpiper. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.11 Great knot (*Calidris tenuirostris*)

2.11.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the great knot (*Calidris tenuirostris*) is provided in Table 2-35.

Table 2-35 Great knot listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice for Calidris tenuirostris (great knot)* (DCCEEW 2024d), in effect from 5 January 2024
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Plan no longer in effect following preparation of specific conservation advice (formerly *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a))
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

This species is a migratory shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. Breeding occurs only in the Northern Hemisphere. While in Australia, the species is widely distributed in coastal area, with occasional records further inland (DCCEEW 2024d). Preferred habitat includes sheltered coastal habitats such as mudflats, inlets, bays, harbours, estuaries, and lagoons (DCCEEW 2024d).

The East Asian-Australasian Flyway population of great knots was estimated in 2016 as containing approximately 425,000 birds, of which 381,900 are thought to spend the non-breeding season in Australia (DCCEEW 2024d).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the great knot (DCCEEW 2024d); however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as tidal flats that represent habitat that the species could use on an occasional basis.

Regional occurrence

The nearest historical record is located on Torrens Island, approximately 1 km south-east of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Tidal flats (2.58 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species. The great knot does not regularly utilise mangrove shrubland or constructed wetland habitats.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the great knot' is provided in the conservation advice for the species (DCCEEW 2024d). This defines habitat critical to the survival of the species to be:

Areas that are necessary:

- *For activities such as foraging, breeding, roosting, or dispersal,*
- *For the long-term maintenance of the species (including the maintenance of species essential to the survival of the great knot, such as macrobenthos),*
- *To maintain genetic diversity and long-term evolutionary development, or*
- *For the re-introduction of populations or recovery of the species.*

The tidal flats and constructed wetlands located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may occasionally contribute to the species' wider habitat area. Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the great knot.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the great knot.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

- *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
- *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

- *0.1 percent of the flyway population of a single species of migratory shorebird, or*
- *2,000 migratory shorebirds, or*
- *15 migratory shorebird species*

Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of international importance for the great knot and has been documented to support an internationally ecologically significant proportion of the species (Table 2-36).

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the great knot, are included in Table 2-36. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the great knot.

Table 2-36 Ecologically significant proportions and flyway information for the great knot

Detail	Estimate
Flyway population estimate	425,000
1% flyway population (internationally significant)	4,250
0.1% flyway population (nationally significant)	425
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	7,586

2.11.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the great knot include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the great knot, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-37.

Table 2-37 Potential impacts of The Plan on the great knot

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.11.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the great knot, with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-38.

Table 2-38 Significant impact assessment for the great knot

Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The East Asian-Australasian Flyway population of the great knot is estimated to be 425,000, with a nationally important proportion of 425 individuals (Hansen *et al.* 2016). The species was not observed within the Strategic Assessment Area during field surveys. The population of great knots within the Strategic Assessment Area, likely form part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of international importance for the great knot, and has been documented to support an internationally ecologically significant proportion of the species. The potential for direct mortality or injury to individual great knots, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the great knot.
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for the great knot is estimated to be 2,800 km^2, with a wider extent of occurrence of 35,000 km^2 (DCCEEW 2024d). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 35,000 km^2 extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the great knot.
Fragment an existing important population into two or more populations	The great knot is a highly mobile shorebird that migrates annually from the Northern Hemisphere to coastal areas of Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the great knot, as the habitat within the Strategic Assessment Area likely forms part of the wider habitat critical to the survival of the species within Gulf St Vincent. This area includes the Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, which extends approximately 60 km along the coastline of Gulf St Vincent to the north of the Strategic Assessment Area. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of international importance for the great knot, and has been documented to support an ecologically significant proportion of the species. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat considered critical to the survival of the species is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the great knot to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of an important population	The great knot breeds in the Northern Hemisphere from May to late June (DCCEEW 2024d). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The great knot occupies an extensive global distribution, inhabiting Australia during its non-breeding season, where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the great knot.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the great knot becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the great knot does not identify disease as a key threat to the species (DCCEEW 2024d). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere substantially with the recovery of the species	There is no recovery plan for the great knot, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the great knot (DCCEEW 2024d), indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation objectives are to minimise the loss of habitat critical to the survival of the great knot throughout Australia, and prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.11.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.11.5 Conclusion – great knot

Based upon the assessment in Section 2.11.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the great knot. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.12 Loggerhead turtle (*Caretta caretta*)

2.12.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the loggerhead turtle (*Caretta caretta*) is provided in Table 2-39.

Table 2-39 Loggerhead turtle listing summary

Listing information	Details
Threatened category	Endangered
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared

Listing information	Details
Recovery plan	*Recovery Plan for Marine Turtles in Australia* (DEE 2017a), in effect from 3 June 2017
Relevant threat abatement plan(s)	*Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017)* (DEE 2017b) *Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans* (DEE 2018) *Threat abatement plan for predation by the European red fox* (DEWHA 2008b)
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	*Marine bioregional plan for the North Marine Region* (DSEWPC 2012a) *Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b) *Marine bioregional plan for the South-west Marine Region* (DSEWPC 2012c) *Marine bioregional plan for the Temperate East Marine Region* (DSEWPC 2012d)
Other Commonwealth documents	*National Guidelines for the Survey of Cetaceans, Marine Turtles and the Dugong* (DCCEEW 2024) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023) *South-east marine region profile: A description of the ecosystems, conservation values and uses of the South-east Marine Region* (DoE 2015g)

Habitat and distribution

The loggerhead turtle is distributed globally throughout tropical, sub-tropical and temperate waters, with large populations in Oman, the eastern United States, southern Japan, Greece, Turkey and Australia (DCCEEW 2024p). In Australia there are two main breeding populations of loggerhead turtles, one in Queensland (eastern Australia), and one in Western Australia (DCCEEW 2024p). Loggerhead turtles are known to forage in waters with both hard and soft substrates, including rocky and coral reefs, muddy bays, sandflats, estuaries and seagrass meadows (DCCEEW 2024p). The species forages in all coastal states and territories, but are uncommon in South Australia, Tasmania and Victoria (DCCEEW 2024p).

In 1977, the number of nesting females within the South Pacific Ocean population (comprising Australia and New Caledonia) was about 3,500 and as of 2009, it is estimated to be around 500 (NOAA 2024).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the loggerhead turtle; however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as estuarine seagrass meadows that the species could utilise periodically for foraging.

Regional occurrence

The nearest historical record of the loggerhead turtle is located near the mouth of the Onkaparinga River, approximately 44 km south of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging include:

– Seagrass meadow (6.23 ha)

Marine turtle species are only occasionally observed in the Gulf St Vincent and are uncommon in port environments.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the loggerhead turtle' is provided in the *Recovery Plan for marine turtles in Australia* (DEE 2017a). This identifies habitat critical to the survival of the species based upon the following:

- *Nesting habitat critical to the survival of loggerhead turtles includes at least 70 percent of nesting for the stock.*
- *Nesting habitat critical to survival of marine turtles is of a geographically relevant scale.*
- *Where relevant, nesting habitat determined to be critical to the survival of marine turtles includes areas that are: geographically dispersed, major and minor rookeries, mainland and island beaches, and winter or summer nesting.*
- *To ensure the validity of long-term monitoring programs for assessing trends in nesting turtle abundance, all index beaches are considered habitat critical to survival of marine turtles.*
- *Internesting habitat critical to the survival of marine turtles is located immediately seaward of designated nesting habitat critical to the survival of marine turtles. The internesting habitat critical buffer for loggerhead turtles is 20 km.*

The loggerhead turtle is known to breed in two distinct populations in Australia: the eastern population in Queensland, and the western population in Western Australia (DCCEEW 2024p). As the species is not known to breed in South Australia, it is highly unlikely that the Strategic Assessment area contains nesting habitat for the species. Therefore, the habitat within the Strategic Assessment Area would not meet the definition for habitat critical to the survival of the loggerhead turtle.

Biologically Important Areas

As part of the Commonwealth marine bioregional planning process, Biologically Important Areas (BIAs) have been identified for a number of species, including the loggerhead turtle. BIAs are important areas for the conservation of protected species, where individuals display biologically important behaviour, such as breeding, foraging, resting or migration (DSEWPC 2013).

South Australia does not contain any areas mapped as a 'Biologically Important Area', for the loggerhead turtle.

2.12.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the loggerhead turtle include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the loggerhead turtle, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-40.

Table 2-40 Potential impacts of The Plan on the loggerhead turtle

Impact	Description
Direct potential impacts	Mortality or injury of fauna Permanent reduction of foraging habitat: – Seagrass meadow (3.49 ha) Mobilisation of pollutants Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Sedimentation and turbidity – Changing water quality
Cumulative effects	Incremental cumulative effect: – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.12.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the loggerhead turtle, with respect to the significant impact criteria for an endangered species, is provided in Table 2-41.

Table 2-41 Significant impact assessment for the loggerhead turtle

Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of a population	The potential for direct mortality or injury to individual loggerhead turtles, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is considered uncommon across the southern coast of Australia, and has not been recorded within the Strategic Assessment Area or surrounding region within the last ten years. Therefore it is unlikely that this area regularly supports populations of the loggerhead turtle. – The species is not known to breed in South Australia, with two distinct breeding populations in Queensland and Western Australia. Therefore, the Actions and Classes of Actions proposed under The Plan are not likely to have a direct impact upon any habitat potentially necessary for breeding. – Due to the large distance from known breeding populations, it is unlikely that the habitat within the Strategic Assessment Area and surrounding region provides important internesting habitat for the loggerhead turtle. – The area of potential foraging and roosting habitat likely to be directly impacted (2.74 ha of seagrass meadow) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Marine turtle species, such as the loggerhead turtle, can be at risk of vessel strike during dredge activities. However, the mandatory use of soft start guidelines in Australia mean that direct mortality during dredging activities is unlikely to have a stock-level impact. Additionally, dredge machinery is slow moving, with any individual loggerhead turtles potentially present in the area expected to be able to avoid dredge equipment during construction and operational activities. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of a population of the loggerhead turtle.

Criteria	Assessment
Reduce the area of occupancy of the species	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for the loggerhead turtle is estimated to be 1,414,990 km^2 throughout Australia (DCCEEW 2024p). The Strategic Assessment Area contains approximately 6.23 ha of seagrass meadows that may provide suitable foraging habitat for the species. The Actions and Classes of Actions proposed under The Plan would remove approximately 3.49 ha (0.0349 km^2) of seagrass meadows that represent potential foraging habitat for the species. This is a relatively small proportion of the 1,414,990 km^2 area of occupancy, and does not constitute a 2 km x 2 km reduction in the area of occupancy of the loggerhead turtle.
Fragment an existing population into two or more populations	The loggerhead turtle is highly mobile, with an extensive area of occurrence. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	Habitat critical to the survival of the species, as defined in the *Recovery Plan for Marine Turtles in Australia* (DEE 2017a), includes both nesting and internesting habitat that is critical to the survival of the loggerhead turtle. The loggerhead turtle is known to breed in two distinct populations in Australia: the eastern population in Queensland, and the western population in Western Australia (DCCEEW 2024p). As the species is not known to breed in South Australia, it is highly unlikely that the Strategic Assessment area contains important nesting habitat for the species. In addition, the large distance from known breeding populations indicates that it is unlikely that the habitat within the Strategic Assessment Area and surrounding region provides important internesting habitat for the loggerhead turtle. Therefore, the habitat within the Strategic Assessment Area would not meet the definition for habitat critical to the survival of the loggerhead turtle. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the loggerhead turtle to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of a population	Breeding colonies of the loggerhead turtle are predominantly restricted to tropical and subtropical areas along the coastline of Queensland and Western Australia. Breeding is not known to occur in South Australia (DCCEEW 2024p). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect the nesting behaviour of the species. Therefore, The Plan would not disrupt the breeding cycle of a population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Strategic Assessment Area contains approximately 6.23 ha of seagrass meadows that may provide suitable foraging habitat for the species. The Actions and Classes of Actions proposed under The Plan would remove approximately 3.49 ha of seagrass meadows that represent potential foraging habitat for the species. However, as the species is considered uncommon across the southern coast of Australia, and has not been recorded within the Strategic Assessment Area or surrounding region within the last ten years, it is unlikely that this area is regularly utilised by the loggerhead turtle. In addition, the area of potential foraging habitat that is proposed to be removed under The Plan is a relatively small proportion of habitat available in the region, with up to 5,000 km^2 of seagrass estimated within Gulf St Vincent (EPA SA 2009). With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the loggerhead turtle.

Criteria	Assessment
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	Although several existing marine and terrestrial weed and pest fauna species have been identified within the Strategic Assessment Area, the recovery plan for the species does not identify invasive species as a key threat to the loggerhead turtle. As such, it is unlikely that the Actions or Classes of Actions proposed under The Plan would result in the introduction or spread of invasive species that could cause harm to loggerhead turtles or their habitat.
Introduce disease that may cause the species to decline	The recovery plan for the loggerhead turtle does not identify disease as a key threat to the species (DEE 2017a). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.
Interfere with the recovery of the species	The *Recovery Plan for Marine Turtles in Australia* (DEE 2017a) identifies a requirement to protect nesting and internesting habitat critical to the survival of the loggerhead turtle. The habitat within the Strategic Assessment Area does not meet the definition for habitat critical to the survival of the loggerhead turtle. This is due to the species not being known to breed in South Australia, and the distance of the Strategic Assessment Area from known breeding populations. Therefore, the reduction in potential foraging habitat (3.49 ha of seagrass meadows) is not considered likely to seriously impact on the breeding success of the species. The habitats within the Strategic Assessment Area are not considered habitat critical to the survival of the species. Therefore, the loss and degradation of habitat resulting from the Actions and Classes of Actions proposed under The Plan would not constitute habitat critical to the survival of the species, and is unlikely to interfere with the species recovery objectives.

2.12.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.12.5 Conclusion – loggerhead turtle

Based on the assessment in Section 2.12.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the loggerhead turtle. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.13 Greater sand plover (*Charadrius leschenaultii*)

2.13.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the greater sand plover (*Charadrius leschenaultii*) is provided in Table 2-42.

Table 2-42 Greater sand plover listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice for Charadrius leschenaultii (greater sand plover)* (DCCEEW 2023b), in effect from 18 December 2023
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Plan no longer in effect following preparation of specific conservation advice (formerly *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a))
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

This species is a migratory shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. Breeding occurs only in the Northern Hemisphere. While in Australia, the species inhabits coastal areas in all states, with most individuals occurring along the north-west coast. Preferred habitats include sheltered sandy, shelly, or muddy coastal areas, and occasionally rocky points, saltmarsh and claypans (DCCEEW 2023b).

The East Asian-Australasian Flyway population of greater sand plovers was estimated in 2016 as containing between 200,000 and 300,000 birds, of which 126,616 (68 percent) are thought to spend the non-breeding season in Australia (DCCEEW 2023b).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the greater sand plover (DCCEEW 2023b); however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as tidal flats that represent habitat that the species could use on an occasional basis.

Regional occurrence

The nearest historical record is located at Taperoo Beach, approximately 3 km south-west of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Tidal flats (2.58 ha) – including 0.35 ha of mangrove shrubland
– Constructed wetland (2.54 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material. As these areas are typically compacted and lack common prey items, they provide limited habitat potential for this species.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the greater sand plover' is provided in the conservation advice for the species (DCCEEW 2023b). This defines habitat critical to the survival of the species to be:

Areas that are necessary:

- *For activities such as foraging, breeding, roosting, or dispersal,*
- *For the long-term maintenance of the species (including the maintenance of species essential to the survival of the greater sand plover, such as macrobenthos),*
- *To maintain genetic diversity and long-term evolutionary development, or*
- *For the re-introduction of populations or recovery of the species.*

The tidal flats and constructed wetlands located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may occasionally contribute to the species' wider habitat area. Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the greater sand plover.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the greater sand plover.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

- *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
- *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

- *0.1 percent of the flyway population of a single species of migratory shorebird, or*
- *2,000 migratory shorebirds, or*
- *15 migratory shorebird species*

The wider Gulf St Vincent region is not documented in the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as supporting an ecologically significant proportion of the greater sand plover.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the greater sand plover, are included in Table 2-43. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the greater sand plover.

Table 2-43 Ecologically significant proportions and flyway information for the greater sand plover

Detail	Estimate
Flyway population estimate	200,000–300,000
1% flyway population (internationally significant)	2,000
0.1% flyway population (nationally significant)	200
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

2.13.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the greater sand plover include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the greater sand plover, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-44.

Table 2-44 Potential impacts of The Plan on the greater sand plover

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.13.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the greater sand plover, with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-45.

Table 2-45 Significant impact assessment for the greater sand plover

Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The potential for direct mortality or injury to individual greater sand plovers, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (as species does not breed in Australia, all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the greater sand plover.
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). In Australia, the area of occupancy for the greater sand plover is estimated to be 6,000 km^2, with an estimated extent of occurrence of 10,200,000 km^2 (DCCEEW 2023b). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.54 ha (0.0254 km^2) of constructed wetlands and 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 10,200,000 km^2 extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the greater sand plover.
Fragment an existing important population into two or more populations	The greater sand plover is a highly mobile shorebird that migrates annually from the Northern Hemisphere to coastal areas of Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet a conservative definition of habitat critical to the survival of the greater sand plover, given that it contributes to the species' wider foraging area within the region. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.54 ha of constructed wetlands and 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat available within the region is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. Given the small magnitude of potential impacts, and the abundance of nearby habitat persisting on Bird Island, Torrens Island and the broader Adelaide International Bird Sanctuary, the Actions and Classes of Actions proposed under The Plan are not likely to adversely affect habitat critical to the survival of the greater sand plover.

Criteria	Assessment
Disrupt the breeding cycle of an important population	The greater sand plover breeds in central Asia, from Mongolia to adjacent areas of southern Siberia and north-western China (DCCEEW 2023b). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The greater sand plover occupies an extensive global distribution, inhabiting Australia during its non-breeding period, where it utilises habitat for foraging and roosting purposes The area of potential foraging and roosting habitat likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the greater sand plover population.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the greater sand plover becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the greater sand plover does not identify disease as a key threat to the species (DCCEEW 2023b). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.
Interfere substantially with the recovery of the species	There is no recovery plan for the greater sand plover, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the greater sand plover (DCCEEW 2023b) indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation objectives are to minimise the loss of habitat critical to the survival of the greater sand plover throughout Australia, and prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.13.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.13.5 Conclusion – greater sand plover

Based upon the assessment in Section 2.13.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the greater sand plover. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.14 Lesser sand plover (*Charadrius mongolus*)

2.14.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the lesser sand plover (*Charadrius mongolus*) is provided in Table 2-46.

Table 2-46 Lesser sand plover listing summary

Listing information	Details
Threatened category	Endangered
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice Charadrius mongolus Lesser sand plover* (DCCEEW 2024e), in effect from 5 May 2016
Recovery plan	Not required
Relevant threat abatement plan(s)	*Threat abatement plan for predation by the European red fox* (DEWHA 2008b)
Relevant wildlife conservation plan	Plan no longer in effect following preparation of specific conservation advice (formerly *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a))
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

This species is a migratory shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. Breeding occurs only in the Northern Hemisphere. While in Australia the species is widespread in coastal regions in all states, with occasional records further inland. Preferred habitats include coastal intertidal sandflats or mudflats in sheltered bays, harbours, and estuaries, and occasionally sandy beaches, coral reefs, and rocky platforms (DCCEEW 2024e).

The East Asian-Australasian Flyway population of lesser sand plovers was estimated in 2006 as containing between 130,000 and 140,000 birds, of which approximately 19 percent is thought to spent the non-breeding season in Australia (DCCEEW 2024e).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the lesser sand plover (DCCEEW 2024e); however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as tidal flats that represent habitat that the species could use on an occasional basis.

Regional occurrence

The nearest historical record is located in Mutton Cove, immediately south of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Tidal flats (2.58 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species. The lesser sand plover typically does not utilise mangrove shrubland or constructed wetland habitats.

Definitions

Habitat critical to the survival of the species

Habitat critical to the survival of the lesser sand plover has not been defined for the species, and has therefore been assessed against the generic definition outlined in the Commonwealth *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a). This defines habitat critical to the survival of a species to be:

Areas that are necessary:

– *For activities such as foraging, breeding, roosting, or dispersal*
– *For the long-term maintenance for the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)*
– *To maintain genetic diversity and long-term evolutionary development, or*
– *For the re-introduction of populations or recovery of the species or ecological community.*

The tidal flats located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may occasionally contribute to the species' wider habitat area. Using a conservative and precautionary approach, the tidal flat habitat within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the lesser sand plover.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the lesser sand plover.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

– *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
– *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

– *0.1 percent of the flyway population of a single species of migratory shorebird, or*
– *2,000 migratory shorebirds, or*
– *15 migratory shorebird species*

The wider Gulf St Vincent region is not documented in the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as supporting either an ecologically significant proportion of the lesser sand plover.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the lesser sand plover, are included in Table 2-47. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the lesser sand plover.

Table 2-47 Ecologically significant proportions and flyway information for the lesser sand plover

Detail	Estimate
Flyway population estimate	180,000–275,000
1% flyway population (internationally significant)	1,800
0.1% flyway population (nationally significant)	180
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

2.14.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the lesser sand plover include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the lesser sand plover, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-48.

Table 2-48 Potential impacts of The Plan on the lesser sand plover

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.14.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the lesser sand plover, with respect to the significant impact criteria for an endangered species, is provided in Table 2-49.

Table 2-49 Significant impact assessment for the lesser sand plover

Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of a population	The potential for direct mortality or injury to individual lesser sand plovers, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (as species does not breed in Australia, all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the lesser sand plover.
Reduce the area of occupancy of the species	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). In Australia, the area of occupancy for the lesser sand plover is estimated to be 2,600 km^2, with a wider extent of occurrence of 35,300 km^2 (DCCEEW 2024e). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 35,300 km^2 extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the lesser sand plover.
Fragment an existing population into two or more populations	The lesser sand plover is a highly mobile shorebird that migrates annually from the Northern Hemisphere to coastal areas of Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet a conservative definition of habitat critical to the survival of the lesser sand plover, given that it contributes to the species' wider foraging area within the region. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat available within the region is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. Given the small magnitude of potential impacts, and the abundance of nearby habitat persisting on Bird Island, Torrens Island and the broader Adelaide International Bird Sanctuary, the Actions and Classes of Actions proposed under The Plan are not likely to adversely affect habitat critical to the survival of the lesser sand plover.
Disrupt the breeding cycle of a population	The lesser sand plover breeds the Northern Hemisphere during the boreal summer, from mid-May to mid-June (DCCEEW 2024e). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The lesser sand plover occupies an extensive global distribution, inhabiting Australia during its non-breeding period, where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the lesser sand plover population.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the lesser sand plover becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the lesser sand plover does not identify disease as a key threat to the species (DCCEEW 2024e). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere with the recovery of the species	There is no recovery plan for the lesser sand plover, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the lesser sand plover (DCCEEW 2024e) indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation objectives are to minimise the loss of habitat critical to the survival of the lesser sand plover throughout Australia, and prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.14.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.14.5 Conclusion – lesser sand plover

Based upon the assessment in Section 2.14.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the lesser sand plover. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.15 Green turtle (*Chelonia mydas*)

2.15.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the green turtle (*Chelonia mydas*) is provided in Table 2-50.

Table 2-50 Green turtle listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	*Recovery Plan for Marine Turtles in Australia* (DEE 2017a), 3 June 2017
Relevant threat abatement plan(s)	*Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017)* (DEE 2017b) *Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans* (DEE 2018) *Threat abatement plan for predation by the European red fox* (DEWHA 2008b)
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	*Marine bioregional plan for the North Marine Region* (DSEWPC 2012a) *Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b) *Marine bioregional plan for the South-west Marine Region* (DSEWPC 2012c) *Marine bioregional plan for the Temperate East Marine Region* (DSEWPC 2012d)
Other Commonwealth documents	*National Guidelines for the Survey of Cetaceans, Marine Turtles and the Dugong* (DCCEEW 2024) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023) *Threatened Species Action Plan 2022–2032* (DCCEEW 2022)

Habitat and distribution

The green turtle is distributed globally throughout tropical and sub-tropical waters (DCCEEW 2024q). In Australia green turtles are known to nest, forage and migrate across northern Australia, including Queensland, the Northern Territory and Western Australia. The species is uncommon in New South Wales, Victoria and South Australia. Green turtles forage in shallow tropical tidal and sub-tidal coral and rocky reefs, and inshore seagrass beds (DCCEEW 2024q).

The Australian population of green turtles was estimated to be more than 70,000, as of 2005 (DCCEEW 2024q).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the green turtle; however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as seagrass meadows that the species could utilise periodically for foraging.

Regional occurrence

The nearest historical record is located on the northern extent of Torrens Island, approximately 800 m north of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging include:

– Seagrass meadow (6.23 ha)

Marine turtle species are only occasionally observed in the Gulf St Vincent and are uncommon in port environments.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the green turtle' is provided in the *Recovery Plan for marine turtles in Australia* (DEE 2017a). This identifies habitat critical to the survival of the species based upon the following:

- *Nesting habitat critical to the survival of green turtles includes at least 70 percent of nesting for the stock.*
- *Nesting habitat critical to survival of marine turtles is of a geographically relevant scale.*
- *Where relevant, nesting habitat determined to be critical to the survival of marine turtles includes areas that are: geographically dispersed, major and minor rookeries, mainland and island beaches, and winter or summer nesting.*
- *To ensure the validity of long-term monitoring programs for assessing trends in nesting turtle abundance, all index beaches are considered habitat critical to survival of marine turtles.*
- *Internesting habitat critical to the survival of marine turtles is located immediately seaward of designated nesting habitat critical to the survival of marine turtles. The internesting habitat critical buffer for green turtles is 20 km.*

In Australia, the green turtle is known to breed in Queensland, the Northern Territory and Western Australia (DCCEEW 2024q). As the species is not known to breed in South Australia, it is highly unlikely that the Strategic Assessment area contains nesting habitat for the species. Therefore, the habitat within the Strategic Assessment Area would not meet the definition for habitat critical to the survival of the green turtle.

Biologically Important Areas

As part of the Commonwealth marine bioregional planning process, Biologically Important Areas (BIAs) have been identified for a number of species, including the green turtle. BIAs are important areas for the conservation of protected species, where individuals display biologically important behaviour, such as breeding, foraging, resting or migration (DSEWPC 2013).

South Australia does not contain any areas mapped as a 'Biologically Important Area', for the green turtle.

2.15.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the green turtle include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the green turtle, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-51.

Table 2-51 Potential impacts of The Plan on the green turtle

Impact	Description
Direct potential impacts	Mortality or injury of fauna Permanent reduction of foraging habitat: – Seagrass meadow (3.49 ha) Mobilisation of pollutants Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Sedimentation and turbidity – Changing water quality
Cumulative effects	Incremental cumulative effect: – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.15.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the green turtle, with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-52.

Table 2-52 Significant impact assessment for the green turtle

Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The potential for direct mortality or injury to individual green turtles, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is considered uncommon across the southern coast of Australia and has not been recorded within the Strategic Assessment Area or surrounding region within the last ten years. Therefore, it is unlikely that this area regularly supports populations of the green turtle. – The species is not known to breed in South Australia, with breeding colonies predominantly restricted to areas along the coastline of Queensland, the Northern Territory and Western Australia. Therefore, the Actions and Classes of Actions proposed under The Plan are not likely to have a direct impact upon habitat potentially necessary for breeding. – Due to the large distance from known breeding populations, it is unlikely that the habitat within the Strategic Assessment Area and surrounding region provides important internesting habitat for the green turtle. – The area of potential foraging and roosting habitat likely to be directly impacted (2.74 ha of seagrass meadow) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Marine turtle species, such as the green turtle, can be at risk of vessel strike during dredge activities. However, the mandatory use of soft start guidelines in Australia mean that direct mortality during dredging activities is unlikely to have a stock-level impact. Additionally, dredge machinery is slow moving, with any individual green turtles potentially present in the area expected to be able to avoid dredge equipment during construction and operational activities. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of a population of the green turtle.

Criteria	Assessment
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The exact area of occupancy of the green turtle is unknown, however, the species is known to be globally distributed across tropical and subtropical waters (DCCEEW 2024q). The Strategic Assessment Area contains approximately 6.23 ha of seagrass meadows that may provide suitable foraging habitat for the species. The Actions and Classes of Actions proposed under The Plan would remove approximately 3.49 ha (0.0349 km^2) of seagrass meadows that represent potential foraging habitat for the species. This does not constitute a 2 km x 2 km reduction in the area of occupancy of the green turtle.
Fragment an existing important population into two or more populations	The green turtle is highly mobile, with an extensive area of occurrence. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	Habitat critical to the survival of the species, as defined in the *Recovery Plan for Marine Turtles in Australia* (DEE 2017a), includes both nesting and internesting habitat that is critical to the survival of the green turtle. The green turtle is known to breed predominantly in areas along the coastline of Queensland, the Northern Territory and Western Australia (DCCEEW 2024q). As the species is not known to breed in South Australia, it is highly unlikely that the Strategic Assessment area contains important nesting habitat for the species. In addition, the large distance from known breeding populations indicates that it is unlikely that the habitat within the Strategic Assessment Area and surrounding region provides important internesting habitat for the green turtle. Therefore, the habitat within the Strategic Assessment Area would not meet the definition for habitat critical to the survival of the green turtle. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the green turtle to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of an important population	In Australia, breeding colonies of the green turtle are predominantly restricted to areas along the coastline of Queensland, the Northern Territory and Western Australia (DCCEEW 2024q). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect the nesting behaviour of the species. Therefore, The Plan would not disrupt the breeding cycle of a population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Strategic Assessment Area contains approximately 6.23 ha of seagrass meadows that may provide suitable foraging habitat for the green turtle. The Actions and Classes of Actions proposed under The Plan would remove approximately 3.49 ha of seagrass meadows that represent potential foraging habitat for the species. However, as the species is considered uncommon across the southern coast of Australia, and has not been recorded within the Strategic Assessment Area or surrounding region within the last ten years, it is unlikely that this area is regularly utilised by the green turtle. In addition, the area of potential foraging habitat that is proposed to be removed under The Plan is a relatively small proportion of habitat available in the region, with up to 5,000 km^2 of seagrass estimated within Gulf St Vincent (EPA SA 2009). With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the green turtle.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Although several existing marine and terrestrial weed and pest fauna species have been identified within the Strategic Assessment Area, the recovery plan for the species does not identify invasive species as a key threat to the green turtle. As such, it is unlikely that the Actions or Classes of Actions proposed under The Plan would result in the introduction or spread of invasive species that could cause harm to green turtles or their habitat.
Introduce disease that may cause the species to decline	The recovery plan for the green turtle does not identify disease as a key threat to the species (DEE 2017a). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere substantially with the recovery of the species	The *Recovery Plan for Marine Turtles in Australia* (DEE 2017a) identifies a requirement to protect nesting and internesting habitat critical to the survival of the green turtle. The habitat within the Strategic Assessment Area does not meet the definition for habitat critical to the survival of the green turtle. This is due to the species not being known to breed in South Australia, and the distance of the Strategic Assessment Area from known breeding populations. Therefore, the reduction in potential foraging habitat (3.49 ha of seagrass meadows) is not considered likely to seriously impact on the breeding success of the species. The habitats within the Strategic Assessment Area are not considered habitat critical to the survival of the species. Therefore, the loss and degradation of habitat resulting from the Actions and Classes of Actions proposed under The Plan is unlikely to interfere with the species recovery objectives.

2.15.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.15.5 Conclusion – green turtle

Based upon the assessment in Section 2.15.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the green turtle. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.16 Leatherback turtle (*Dermochelys coriacea*)

2.16.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the leatherback turtle (*Dermochelys coriacea*) is provided in Table 2-53.

Table 2-53 Leatherback turtle listing summary

Listing information	Details
Threatened category	Endangered
Migratory status	Listed
Marine status	Listed
Conservation advice	*Approved Conservation Advice for Dermochelys coriacea (Leatherback Turtle)* (DEWHA 2008a) 8 January 2009
Recovery plan	*Recovery Plan for Marine Turtles in Australia* (DEE 2017a), 3 June 2017
Relevant threat abatement plan(s)	*Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017)* (DEE 2017b) *Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans* (DEE 2018) *Threat abatement plan for predation by the European red fox* (DEWHA 2008b)
Relevant wildlife conservation plan	Nil

Listing information	Details
Marine bioregional plan(s)	*Marine bioregional plan for the North Marine Region* (DSEWPC 2012a) *Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b) *Marine bioregional plan for the South-west Marine Region* (DSEWPC 2012c) *Marine bioregional plan for the Temperate East Marine Region* (DSEWPC 2012d)
Other Commonwealth documents	*National Guidelines for the Survey of Cetaceans, Marine Turtles and the Dugong* (DCCEEW 2024) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The leatherback turtle is distributed globally throughout tropical, subtropical and sub-polar waters, from the North Sea to the southern Pacific and Atlantic Oceans (DEWHA 2008a). The species has been recorded foraging in coastal waters offshore of all states, with small numbers nesting occasionally along the coastline of central Queensland, northern New South Wales and the Northern Territory. Leatherback turtles are known to forage in the pelagic zone of tropical and cool temperate waters (DEWHA 2008a).

In 2004, the global estimated population size for the leatherback turtle was 35,800 individuals (DCCEEW 2024r).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the leatherback turtle; however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as seagrass meadows that the species could utilise periodically for foraging.

Regional occurrence

The nearest historical record is located within Gulf St Vincent, approximately 3 km south-west of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging include:

– Seagrass meadow (6.23 ha)

Marine turtle species are only occasionally observed in the Gulf St Vincent, and are uncommon in a port environment.

Definitions

Habitat critical to the survival of the species

A definition of ‘habitat critical to the survival of the leatherback turtle’ is provided in the *Recovery Plan for marine turtles in Australia* (DEE 2017a). This identifies habitat critical to the survival of the species based upon the following:

– *Nesting habitat critical to the survival of leatherback turtles includes all areas where nesting has occurred in Australia since 1996.*
– *Nesting habitat critical to survival of marine turtles is of a geographically relevant scale.*
– *Where relevant, nesting habitat determined to be critical to the survival of marine turtles includes areas that are: geographically dispersed, major and minor rookeries, mainland and island beaches, and winter or summer nesting.*
– *To ensure the validity of long-term monitoring programs for assessing trends in nesting turtle abundance, all index beaches are considered habitat critical to survival of marine turtles.*

– *Internesting habitat critical to the survival of marine turtles is located immediately seaward of designated nesting habitat critical to the survival of marine turtles. The internesting habitat critical buffer for leatherback turtles is 20 km.*

In Australia, the leatherback turtle is reported to breed occasionally in Queensland, New South Wales and the Northern Territory (DEWHA 2008a). As the species is not known to breed in South Australia, it is highly unlikely that the Strategic Assessment area contains nesting habitat for the species. Therefore, the habitat within the Strategic Assessment Area would not meet the definition for habitat critical to the survival of the leatherback turtle.

Biologically Important Areas

As part of the Commonwealth marine bioregional planning process, Biologically Important Areas (BIAs) have been identified for a number of species, including the leatherback turtle. BIAs are important areas for the conservation of protected species, where individuals display biologically important behaviour, such as breeding, foraging, resting or migration (DSEWPC 2013).

South Australia does not contain any areas mapped as a 'Biologically Important Area', for the leatherback turtle.

2.16.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the leatherback turtle include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to the leatherback turtle, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-54.

Table 2-54 Potential impacts of The Plan on the leatherback turtle

Impact	Description
Direct potential impacts	Mortality or injury of fauna Permanent reduction of foraging habitat: – Seagrass meadow (3.49 ha) Mobilisation of pollutants Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Sedimentation and turbidity – Changing water quality
Cumulative effects	Incremental cumulative effect: – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.16.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the leatherback turtle, with respect to the significant impact criteria for an endangered species, is provided in Table 2-55.

Table 2-55 Significant impact assessment for the Australian sea lion

Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of a population	The potential for direct mortality or injury to individual leatherback turtles, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is considered uncommon across the southern coast of Australia and has not been recorded within the Strategic Assessment Area or surrounding region within the last ten years. Therefore, it is unlikely that this area regularly supports populations of the leatherback turtle. – The species is not known to breed in South Australia, with breeding colonies restricted to areas along the coastline of central Queensland, New South Wales and the Northern Territory. Therefore, the Actions and Classes of Actions proposed under The Plan are not likely to have a direct impact upon habitat potentially necessary for breeding. – Due to the large distance from known breeding populations, it is unlikely that the habitat within the Strategic Assessment Area and surrounding region provides important internesting habitat for the leatherback turtle. – The area of potential foraging and roosting habitat likely to be directly impacted (2.74 ha of seagrass meadow) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Marine turtle species, such as the leatherback turtle, can be at risk of vessel strike during dredge activities. However, the mandatory use of soft start guidelines in Australia mean that direct mortality during dredging activities is unlikely to have a stock-level impact. Additionally, dredge machinery is slow moving, with any individual loggerhead turtles potentially present in the area expected to be able to avoid dredge equipment during construction and operational activities. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of a population of the leatherback turtle.
Reduce the area of occupancy of the species	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for the leatherback turtle is estimated to be 6,006,685 km^2 throughout Australia (DCCEEW 2024r). The Strategic Assessment Area contains approximately 6.23 ha of seagrass meadows that may provide suitable foraging habitat for the species. The Actions and Classes of Actions proposed under The Plan would remove approximately 3.49 ha (0.0349 km^2) of seagrass meadows that represent potential foraging habitat for the species. This is a relatively small proportion of the 6,006,685 km^2 area of occupancy, and does not constitute a 2 km x 2 km reduction in the area of occupancy of the leatherback turtle.
Fragment an existing population into two or more populations	The leatherback turtle is highly mobile, with an extensive area of occurrence. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Habitat critical to the survival of the species, as defined in the *Recovery Plan for Marine Turtles in Australia* (DEE 2017a), includes both nesting and internesting habitat that is critical to the survival of the leatherback turtle. The leatherback turtle is known to breed in areas along the coastline of central Queensland, New South Wales and the Northern Territory (DCCEEW 2024r). As the species is not known to breed in South Australia, it is highly unlikely that the Strategic Assessment area contains important nesting habitat for the species. In addition, the large distance from known breeding populations indicates that it is unlikely that the habitat within the Strategic Assessment Area and surrounding region provides important internesting habitat for the leatherback turtle. Therefore, the habitat within the Strategic Assessment Area would not meet the definition for habitat critical to the survival of the leatherback turtle. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the leatherback turtle to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of a population	In Australia, breeding colonies of the leatherback turtle are relatively rare and restricted to areas along the coastline of central Queensland, New South Wales and the Northern Territory, and is not known to breed in South Australia (DCCEEW 2024q). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect the nesting behaviour of the species. Therefore, The Plan would not disrupt the breeding cycle of a population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Strategic Assessment Area contains approximately 6.23 ha of seagrass meadows that may provide suitable foraging habitat for the leatherback turtle. The Actions and Classes of Actions proposed under The Plan would remove approximately 3.49 ha of seagrass meadows that represent potential foraging habitat for the species. However, as the species is considered uncommon across the southern coast of Australia, and has not been recorded within the Strategic Assessment Area or surrounding region within the last ten years, it is unlikely that this area is regularly utilised by the leatherback turtle. In addition, the area of potential foraging habitat that is proposed to be removed under The Plan is a relatively small proportion of habitat available in the region, with up to 5,000 km^2 of seagrass estimated within Gulf St Vincent (EPA SA 2009). With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the leatherback turtle.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	Although several existing marine and terrestrial weed and pest fauna species have been identified within the Strategic Assessment Area, the recovery plan for the species does not identify invasive species as a key threat to the leatherback turtle. As such, it is unlikely that the Actions or Classes of Actions proposed under The Plan would result in the introduction or spread of invasive species that could cause harm to leatherback turtles or their habitat.
Introduce disease that may cause the species to decline	The recovery plan for the leatherback turtle does not identify disease as a key threat to the species. Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.
Interfere with the recovery of the species	The *Recovery Plan for Marine Turtles in Australia* (DEE 2017a) identifies a requirement to protect nesting and internesting habitat critical to the survival of the leatherback turtle. The habitat within the Strategic Assessment Area does not meet the definition for habitat critical to the survival of the leatherback turtle. This is due to the species not being known to breed in South Australia, and the distance of the Strategic Assessment Area from known breeding populations. Therefore, the reduction in potential foraging habitat (3.49 ha of seagrass meadows) is not considered likely to seriously impact on the breeding success of the species. The habitats within the Strategic Assessment Area are not considered habitat critical to the survival of the species. Therefore, the loss and degradation of habitat resulting from the Actions and Classes of Actions proposed under The Plan would not constitute habitat critical to the survival of the species, and is unlikely to interfere with the species recovery objectives.

2.16.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.16.5 Conclusion – leatherback turtle

Based upon the assessment in Section 2.16.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the leatherback turtle. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.17 Black-tailed godwit (*Limosa limosa*)

2.17.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the black-tailed godwit (*Limosa limosa*) is provided in Table 2-56.

Table 2-56 Black-tailed godwit listing summary

Listing information	Details
Threatened category	Endangered
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice for Limosa limosa (black-tailed godwit)* (DCCEEW 2024n), in effect from 5 January 2024
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Plan no longer in effect following preparation of specific conservation advice (formerly *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a))
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The species is a migratory shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. Breeding occurs only in the Northern Hemisphere. While in Australia the species mainly inhabits sandflats, mudflats, and saltmarshes and the beaches of bays, estuaries, and coastlines (DCCEEW 2024n). Further inland, the species can be found in muddy lakes and wetlands (DCCEEW 2024n). During the non-breeding season, the species is widely distributed across Australia, with coastal regions on the north coast supporting the highest population density (DCCEEW 2024n). In South Australia, most birds arrive at Gulf St Vincent in November to December, increasing in number between February and April (DCCEEW 2024n).

The East Asian-Australasian Flyway population of the black-tailed godwit was estimated in 2016 to be comprised of approximately 160,000 individuals, of which around 50,500 are thought to spend the non-breeding season in Australia (DCCEEW 2024n).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the black-tailed godwit (DCCEEW 2024n); however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as tidal flats that represent habitat that the species could use on an occasional basis.

Regional occurrence

The nearest historical record is located on Torrens Island, approximately 1 km south-east of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Tidal flats (2.58 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species. The black-tailed godwit typically does not utilise mangrove shrubland or constructed wetland habitats.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the black-tailed godwit' is provided in the conservation advice for the species (DCCEEW 2024n). This defines habitat critical to the survival of the species as:

Areas that are necessary:

– *For activities such as foraging, breeding, roosting, or dispersal,*
– *For the long-term maintenance of the species (including the maintenance of species essential to the survival of the black-tailed godwit, such as macrobenthos),*
– *To maintain genetic diversity and long-term evolutionary development, or*
– *For the re-introduction of populations or recovery of the species.*

The tidal flats located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may occasionally contribute to the species' wider habitat area. Using a conservative and precautionary approach, the tidal flat habitat within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the black-tailed godwit.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the black-tailed godwit.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

– *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
– *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

– *0.1 percent of the flyway population of a single species of migratory shorebird, or*
– *2,000 migratory shorebirds, or*
– *15 migratory shorebird species*

The wider Gulf St Vincent region is not documented in the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as supporting an ecologically significant proportion of the black-tailed godwit.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the black-tailed godwit, are included in Table 2-57. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the black-tailed godwit.

Table 2-57 Ecologically significant proportions and flyway information for the black-tailed godwit

Detail	Estimate
Flyway population estimate	160,000
1% flyway population (internationally significant)	1,600
0.1% flyway population (nationally significant)	160
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

2.17.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the black-tailed godwit include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the black-tailed godwit, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-58.

Table 2-58 Potential impacts of The Plan on the black-tailed godwit

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.17.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the black-tailed godwit, with respect to the significant impact criteria for an endangered species, is provided in Table 2-59.

Table 2-59 Significant impact assessment for the black-tailed godwit

Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of a population	The potential for direct mortality or injury to individual black-tailed godwits, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (as species does not breed in Australia, all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the black-tailed godwit.
Reduce the area of occupancy of the species	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for the black-tailed godwit is estimated to be 13,000 km^2, with a wider extent of occurrence of 9,400,000 km^2, covering a wide range of habitats (DCCEEW 2024n). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 9,400,000 km^2 extent of occurrence, and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the black-tailed godwit.
Fragment an existing population into two or more populations	The black-tailed godwit is a highly mobile shorebird that migrates annually from the Northern Hemisphere to coastal areas of Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet a conservative definition of habitat critical to the survival of the black-tailed godwit, given that it contributes to the species' wider foraging area within the region. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat available within the region is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan, and would persist in the surrounding region. Given the small magnitude of potential impacts, and the abundance of nearby habitat persisting on Bird Island, Torrens Island and the broader Adelaide International Bird Sanctuary, the Actions and Classes of Actions proposed under The Plan are not likely to adversely affect habitat critical to the survival of the black-tailed godwit.
Disrupt the breeding cycle of a population	The black-tailed godwit breeds in Iceland and The Faeroes in the northern Atlantic, Europe, Russia and China during the Northern Hemisphere summer, from April to mid-June (DCCEEW 2024n). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The black-tailed godwit occupies an extensive global distribution, inhabiting Australia during its non-breeding period, where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the black-tailed godwit population.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the black-tailed godwit becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the black-tailed godwit does not identify disease as a key threat to the species (DCCEEW 2024n). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere with the recovery of the species	There is no recovery plan for the black-tailed godwit, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the black-tailed godwit (DCCEEW 2024n), indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation objectives are to minimise the loss of habitat critical to the survival of the black-tailed godwit throughout Australia, and prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.17.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.17.5 Conclusion – black-tailed godwit

Based upon the assessment in Section 2.17.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the black-tailed godwit. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.18 Orange-bellied parrot (*Neophema chrysogaster*)

2.18.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the orange-bellied parrot (*Neophema chrysogaster*) is provided in Table 2-60.

Table 2-60 Orange-bellied parrot listing summary

Listing information	Details
Threatened category	Critically endangered
Migratory status	Not listed
Marine status	Listed
Conservation advice	*Commonwealth Listing Advice on Neophema chrysogaster* (TSSC 2006), in effect from 13 September 2006
Recovery plan	*National Recovery Plan for the Orange-bellied Parrot, Neophema chrysogaster* (DELWP 2016), in effect from 6 May 2016
Relevant threat abatement plan(s)	*Threat abatement plan for predation by feral cats* (DoE 2015b) *Threat abatement plan for competition and land degradation by rabbits* (DEE 2016) *Threat abatement plan for predation by the European red fox* (DEWHA 2008b)
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act* (DEWHA 2010) *Threatened Species Action Plan 2022–2032* (DCCEEW 2022)

Habitat and distribution

The orange-bellied parrot is endemic to south-eastern Australia. Breeding birds primarily inhabit the area around Melaleuca in south-western Tasmania, while non-breeding birds are commonly found along the coasts of South Australia and Victoria (DELWP 2016). Preferred habitat for non-breeding birds on mainland Australia include coastal saltmarshes and adjacent pastures, close to free-standing water bodies (DELWP 2016).

As of 2006, it was estimated that the wild population of the species consisted of around 50 birds, with approximately 320 individuals in captivity (DELWP 2016).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the orange-bellied parrot (DELWP 2016); however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as low open shrubland and constructed wetlands that represent habitat that the species could use on an occasional basis.

Regional occurrence

The nearest historical record is located in the Adelaide Plains, north of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Low open shrubland (24.33 ha)
– Constructed wetland (2.54 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not provide high quality habitat for the species.

Definitions

Habitat critical to the survival of the species

Because the wild population of the orange-bellied parrot is so small, all sites where breeding occurs, and all non-breeding locations occupied since the year 2000, are considered 'habitat critical to the survival of the orange-bellied parrot' (DELWP 2016).

Breeding for the orange-bellied parrot is restricted to Tasmania (DELWP 2016), therefore the habitat within the Strategic Assessment Area would not meet the definition of 'habitat critical to the survival of the orange-bellied parrot' on that basis.

Vegetation within the Strategic Assessment Area is consistent with habitat used by the species in its' non-breeding range; however, the species requires habitat that is more than 2 km from developed areas (DELWP 2016). As such, it is not likely that the species would utilise the habitats located within the Strategic Assessment Area.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the orange-bellied parrot.

2.18.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the orange-bellied parrot include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the orange-bellied parrot, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-61.

Table 2-61 Potential impacts of The Plan on the orange-bellied parrot

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Constructed wetland (2.54 ha) – Low open shrubland (24.33 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.18.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the orange-bellied parrot, with respect to the significant impact criteria for a critically endangered species, is provided in Table 2-62.

Table 2-62 Significant impact assessment for the orange-bellied parrot

Criteria	Assessment
An action is likely to have a significant impact on a critically endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of a population	The potential for direct mortality or injury to individual orange-bellied parrots, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly to avoid disturbance – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging habitat likely to be directly impacted (2.54 ha of constructed wetlands and 24.33 ha of low open shrubland) is a relatively small proportion of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan are unlikely to have a direct impact upon any habitat potentially necessary for breeding, as the species is not known to breed within the Strategic Assessment Area. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the orange-bellied parrot.
Reduce the area of occupancy of the species	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The total area of occupancy for the orange-bellied parrot is estimated to be 14,319 km^2 (TSSC 2006). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.54 ha (0.0254 km^2) of constructed wetlands and 24.33 ha (0.2433 km^2) of low open shrubland that represent potential foraging and roosting habitat for the species. This does not constitute a 2 km x 2 km reduction in the area of occupancy of the orange-bellied parrot.
Fragment an existing population into two or more populations	The species is considered to represent a single population due to the small number of orange-bellied parrots in the wild (TSSC 2006). The species is highly mobile, migrating annually from its breeding sites in south-western Tasmania, along the coast of south-east mainland Australia in a northward direction (TSSC 2006, DELWP 2016). There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to the species, that would fragment an existing population into two or more populations.

Criteria	Assessment
Adversely affect habitat critical to the survival of a species	Because the wild population of the orange-bellied parrot is so small, all sites where breeding occurs, and all non-breeding locations occupied since the year 2000, are considered 'habitat critical to the survival of the orange bellied parrot' (DELWP 2016). Breeding for the orange-bellied parrot is restricted to Tasmania (DELWP 2016). As the species is not known to breed in South Australia, it is unlikely that the Strategic Assessment Area contains important breeding locations for the species. Additionally, although habitat present within the Strategic Assessment Area is consistent with that used by the orange-bellied parrot in its non-breeding range, it is located within 2 km of developed areas which is not preferred by the species (DELWP 2016). As such, it is not likely that the species would regularly utilise the habitats located within the Strategic Assessment Area for non-breeding purposes. Therefore, the habitat within the Strategic Assessment Area would not meet the definition for habitat critical to the survival of the orange-bellied parrot. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the orange-bellied parrot to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of a population	The orange-bellied parrot breeds in south-western Tasmania in the summer, migrating to the coast of south-east mainland Australia for the winter (DELWP 2016). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect the nesting behaviour of the species. Therefore, The Plan would not disrupt the breeding cycle of a population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Strategic Assessment Area contains approximately 2.54 ha of constructed wetlands and 24.33 ha of low open shrubland that may provide suitable foraging habitat for the species. The area of potential foraging and roosting habitat likely to be directly impacted is a relatively small proportion of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the orange-bellied parrot.
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat	Several existing marine and terrestrial weed and pest fauna species have been identified within the Strategic Assessment Area. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the orange-bellied parrot becoming established in its habitat.
Introduce disease that may cause the species to decline	Psittacine Circoviral Disease has significant impacts on captive orange-bellied parrots and affects wild populations (DELWP 2016). Standard hygiene protocols will be implemented during construction and will limit the potential for introduction or spread of disease. Given that the species has not been recorded within 10 km of the Strategic Assessment Area in the last ten years, it is unlikely that the area supports regular populations of the orange-bellied parrot. Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.

Criteria	Assessment
Interfere with the recovery of the species	The recovery plan for the orange-bellied parrot (DELWP 2016) sets out the vision, objectives and strategies for the species' recovery. The primary threats to the species include: – Development and land use change – Inappropriate hydrological regimes – Invasive weeds – Loss of genetic diversity and inbreeding The primary recovery objectives are: – To achieve a stable or increasing population in the wild within five years – To increase the capacity of the captive population, both to support future releases of captive-bred birds to the wild and to provide a secure long-term insurance population – To protect and enhance habitat to maintain, and support growth of, the wild population Although habitat present within the Strategic Assessment Area is consistent with that used by the orange-bellied parrot in its non-breeding range, it is located within 2 km of developed areas which is not preferred by the species (DELWP 2016). As such, it is not likely that the species would regularly utilise the habitats located within the Strategic Assessment Area for non-breeding purposes. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, or the species' breeding cycle, as the orange-bellied parrot is not known to breed in South Australia. The Actions and Classes of Actions proposed under The Plan are not likely to contribute to a substantial increase in other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.18.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.18.5 Conclusion – orange-bellied parrot

Based upon the assessment in Section 2.18.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the orange-bellied parrot. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.19 Australian sea lion (*Neophoca cinerea*)

2.19.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the Australian sea lion (*Neophoca cinerea*) is provided in Table 2-63.

Table 2-63 Australian sea lion listing summary

Listing information	Details
Threatened category	Endangered
Migratory status	Not listed
Marine status	Listed
Conservation advice	*Conservation Advice Neophoca cinerea Australian Sea Lion* (TSSC 2020), in effect from 23 December 2020
Recovery plan	*Recovery Plan for the Australian Sea Lion (Neophoca cinerea)* (DSEWPC 2013), in effect from 5 July 2013
Relevant threat abatement plan(s)	*Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans* (DEE 2018)
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	*Marine bioregional plan for the South-west Marine Region* (DSEWPC 2012c)
Other Commonwealth documents	*South-east marine region profile: A description of the ecosystems, conservation values and uses of the South-east Marine Region* (DoE 2015g) *Threatened Species Action Plan 2022–2032* (DCCEEW 2022)

Habitat and distribution

The Australian sea lion is distributed from Houtman Abrolhos in Western Australia to Kangaroo Island in South Australia (DCCEEW 2024g). While onshore, the species' preferred habitat includes exposed island and reefs, rocky terrain, caves, cliff overhangs, sandy beaches and vegetated sand dunes and swales. Preferred marine habitat includes shallow waters less than 200 m deep (DCCEEW 2024g).

Due to the species occurring across a multitude of small, isolated colonies distributed over a wide area, determining population estimates is difficult. As of 2017, the conservative population estimate for Australian sea lions was between 6,000 and 11,463 individuals (TSSC 2020).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the Australian sea lion (DCCEEW 2024g); however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present in the Port Adelaide River portion of the Strategic Assessment Area, which the species could utilise periodically.

Regional occurrence

The nearest historical record is located in the Port Adelaide River at Pelican Point, approximately 600 m north of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for the Australian sea lion include:

– Estuarine river (186 ha)

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the Australian sea lion' is provided in the recovery plan for the species (DSEWPC 2013). This includes 58 known colonies across Western Australia and South Australia that are used to meet essential life cycle requirements (i.e. breeding).

The nearest of these breeding areas to the Strategic Assessment Area is located on Kangaroo Island, over 200 km south-west. Therefore, the habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of breeding, and would not constitute habitat critical to the survival of the Australian sea lion.

Biologically Important Areas

As part of the Commonwealth marine bioregional planning process, Biologically Important Areas (BIAs) have been identified for a number of species, including the Australian sea lion. BIAs are important areas for the conservation of protected species, where individuals display biologically important behaviour, such as breeding, foraging, resting or migration (DSEWPC 2013).

The Adelaide metropolitan waters, in which the Strategic Assessment Area is located, are mapped as a 'Biologically Important Area', as potential male foraging habitat for the Australian sea lion (DCCEEW 2011).

2.19.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the Australian sea lion include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the Australian sea lion, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-64.

Table 2-64 Potential impacts of The Plan on the Australian sea lion

Impact	Description
Direct potential impacts	Mortality or injury of fauna Temporary reduction of foraging habitat Mobilisation of pollutants Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Sedimentation and turbidity – Changing water quality
Cumulative effects	Incremental cumulative effect: – Reduction in potential habitat from future development along Port Adelaide River and sea level rise

2.19.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the Australian sea lion, with respect to the significant impact criteria for an endangered species, is provided in Table 2-65.

Table 2-65 Significant impact assessment for the Australian sea lion

Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of a population	The potential for direct mortality or injury to individual Australian sea lions, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species has not been recorded within the Strategic Assessment Area or surrounding region within the last ten years. – The species is not known to breed within the Strategic Assessment Area, with breeding colonies of the Australian sea lion predominantly restricted to offshore islands, with the exception of three sheltered mainland colonies at Point Labatt (South Australia), Baxter Cliffs (Western Australia) and Bunder Cliffs (South Australia and Western Australia). – Habitat within the Strategic Assessment Area and surrounding region that may provide suitable foraging habitat for the species are of marginal quality, having been subject to existing and historical disturbance from prior habitat loss and ongoing industrial activities. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of a population of the Australian sea lion.
Reduce the area of occupancy of the species	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for the Australian sea lion is estimated to be 324 km^2, with a wider extent of occurrence at 100,000 km^2 (DCCEEW 2024g). The Strategic Assessment Area contains approximately 186 ha of estuarine river that may provide suitable foraging habitat for the species. The Actions and Classes of Actions proposed under The Plan would not permanently remove any of this habitat, with only temporary disturbances expected during dredging activities. As a result, the Actions and Classes of Actions proposed under The Plan would not result in a 2 km x 2 km reduction in the area of occupancy of the Australian sea lion.
Fragment an existing population into two or more populations	The Australian sea lion is highly mobile, with an extensive area of occurrence. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	Habitat critical to the survival of the species, as defined in the *Recovery Plan for the Australian sea lion* (DSEWPC 2013), includes 58 known colonies across Western Australia and South Australia, that are used to meet essential life cycle requirements (i.e. breeding). The nearest of these breeding areas is located over 200 km south-west of the Strategic Assessment Area, on Kangaroo Island, Therefore, the habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of breeding, and would not constitute habitat critical to the survival of the Australian sea lion. The reduction of potential habitat as a result of the Actions and Classes of Actions proposed under The Plan, would not be likely to adversely affect habitat critical to the survival of the Australian sea lion to the extent that it would have a significant impact on the species.
Disrupt the breeding cycle of a population	Breeding colonies of the Australian sea lion are predominantly restricted to offshore islands, with the exception of three sheltered mainland colonies at Point Labatt (South Australia), Baxter Cliffs (Western Australia) and Bunder Cliffs (South Australia and Western Australia) (DCCEEW 2024g). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect the nesting behaviour of the species. Therefore, The Plan would not disrupt the breeding cycle of a population of the species.

Criteria	Assessment
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Strategic Assessment Area contains approximately 186 ha of estuarine river that may provide suitable foraging habitat for the species. However, this habitat is of marginal quality, having been subject to existing and historical disturbance from prior habitat loss and ongoing adjacent industrial activities. Additionally, the species has not been recorded within 10 km of the Strategic Assessment Area in the last ten years. This indicates that it is unlikely that the area regularly supports large populations of Australian sea lions. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the Australian sea lion.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	Although several existing marine and terrestrial weed and pest fauna species have been identified within the Strategic Assessment Area, the recovery plan for the species does not identify invasive species as a key threat to the Australian sea lion. As such, it is unlikely that the Actions or Classes of Actions proposed under The Plan would result in the introduction or spread of invasive species that could cause harm to Australian sea lions or their habitat.
Introduce disease that may cause the species to decline	The Australian sea lion is potentially susceptible to epidemics such as morbillivirus that have resulted in significant declines in other pinniped species (DCCEEW 2024g). High-density populations are generally more susceptible to disease outbreaks given increased potential for rapid transmission. Given that the species has not been recorded within 10 km of the Strategic Assessment Area in the last ten years, it is unlikely that the area regularly supports large populations of the Australian sea lion. Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.
Interfere with the recovery of the species	The *Recovery Plan for the Australian sea lion* (DSEWPC 2013) sets out the vision, objectives and strategies for the species' recovery. The primary threats to the species include: – Fishery bycatch • Demersal gillnet fishing for shark • Pot fishing for rock lobster – Entanglement in marine debris The primary recovery objectives are to improve the population status, leading to the future removal of the Australian sea lion from the threatened species list, and ensure that anthropogenic activities do not hinder recovery, or impact on the conservation status of the species, in the future. The Actions and Classes of Actions proposed under The Plan are unlikely to have a direct impact upon habitat potentially necessary for breeding, as the species is not known to breed within the Strategic Assessment Area. In addition, potential foraging habitat for the species within the Strategic Assessment Area and surrounding region is of marginal quality, subject to existing and historical disturbance from prior habitat loss and ongoing adjacent industrial activities. As such, it is not likely that large populations of the species would regularly utilise the habitats located within the Strategic Assessment Area. The Actions and Classes of Actions proposed under The Plan are not likely to contribute to a substantial increase in other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.19.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.19.5 Conclusion – Australian sea lion

Based upon the assessment in Section 2.19.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan would not be likely to have a significant impact on the Australian sea lion. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

2.20 Terek sandpiper (*Xenus cinereus*)

2.20.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the terek sandpiper (*Xenus cinereus*) is provided in Table 2-66.

Table 2-66 Terek sandpiper listing summary

Listing information	Details
Threatened category	Vulnerable
Migratory status	Listed
Marine status	Listed
Conservation advice	*Conservation Advice for Xenus cinereus (terek sandpiper)* (DCCEEW 2024f), in effect from 5 January 2024
Recovery plan	Not required
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	Plan no longer in effect following preparation of specific conservation advice (formerly *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a))
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The terek sandpiper is a migratory shorebird species that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. Breeding occurs only in the Northern Hemisphere. During the non-breeding season, the species is widely distributed across Australia, with the coastal regions on the north and east coast supporting the highest population densities. Preferred habitats include coastal mudflats, sandflats, mangrove swamps, sandy beaches, coral reefs, sandy beaches, and saltpans (DCCEEW 2024f).

The East Asian-Australasian Flyway population of greater sand plovers was estimated in 2016 as containing approximately 60,000 birds, of which 23,000 are thought to spend the non-breeding season in Australia (DCCEEW 2024f)

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the terek sandpiper (DCCEEW 2024f); however, the species was not observed during the 2023–2024 field surveys. Potential habitat for the species is present within the Strategic Assessment Area, occurring as tidal flats that represent habitat that the species could use on an occasional basis.

Regional occurrence

The nearest historical record is located on Torrens Island, approximately 1 km south-east of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Tidal flats (2.58 ha)

Most of the onshore area is comprised of low open shrubland that has established on fill material, which does not typically provide suitable habitat for the species. The terek sandpiper typically does regularly utilise mangrove shrubland or constructed wetland habitats.

Definitions

Habitat critical to the survival of the species

A definition of 'habitat critical to the survival of the terek sandpiper' is provided in the conservation advice for the species (DCCEEW 2024f). This defines habitat critical to the survival of the species to be:

Areas that are necessary:

– *For activities such as foraging, breeding, roosting, or dispersal,*
– *For the long-term maintenance of the species (including the maintenance of species essential to the survival of the terek sandpiper, such as macrobenthos),*
– *To maintain genetic diversity and long-term evolutionary development, or*
– *For the re-introduction of populations or recovery of the species.*

The tidal flats located within the Strategic Assessment Area comprise a proportionally small area (less than one percent) of foraging or roosting habitat available within the surrounding region. The habitat within the Strategic Assessment Area is not likely to be essential to the species for the purposes of foraging or roosting but may occasionally contribute to the species' wider habitat area. Using a conservative and precautionary approach, the tidal flat habitat within the Strategic Assessment Area could meet the definition for habitat critical to the survival of the terek sandpiper.

There is no habitat listed in the register of critical habitat (EPBC Act section 207A) for the terek sandpiper.

Important habitat

Under the EPBC Act, 'important habitat' in Australia for migratory shorebirds include those recognised as nationally or internationally important. Under the Ramsar Convention, wetland habitat is considered internationally important if it regularly supports:

– *1 percent of the individuals in a population of one species or subspecies of waterbird, or*
– *a total abundance of at least 20,000 waterbirds*

Wetland habitat is considered nationally important if it regularly supports:

– *0.1 percent of the flyway population of a single species of migratory shorebird, or*
– *2,000 migratory shorebirds, or*
– *15 migratory shorebird species*

The wider Gulf St Vincent region is not documented in the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as supporting an ecologically significant proportion of the eastern curlew.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the terek sandpiper, are included in Table 2-67. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the terek sandpiper.

Table 2-67 Ecologically significant proportions and flyway information for the terek sandpiper

Detail	Estimate
Flyway population estimate	50,000
1% flyway population (internationally significant)	500
0.1% flyway population (nationally significant)	50
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

2.20.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the terek sandpiper include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the terek sandpiper, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 2-68.

Table 2-68 Potential impacts of The Plan on the terek sandpiper

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

2.20.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the terek sandpiper, with respect to the significant impact criteria for a vulnerable species, is provided in Table 2-69.

Table 2-69 Significant impact assessment for the terek sandpiper

Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there a real chance or possibility that the action will:	
Lead to a long-term decrease in the size of an important population of a species	The potential for direct mortality or injury to individual terek sandpipers, to the extent that it could lead to a long-term decrease in population size, is considered low because: – The species is mobile and can fly (as the species does not breed in Australia, all birds present are fledged and independent) – The species is easily disturbed and would typically take flight well before a vehicle got close – Vehicles and equipment would be restricted to low speeds within the construction area (and therefore unlikely to strike a bird) – The areas that the species is known or likely to occupy are not typically accessible to vehicles and equipment Additionally, the potential for the reduction of potential habitat to result in a long-term decrease in population size is considered to be low, as: – The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered 'necessary' to the species for the purposes of foraging or roosting, and would not result in a long-term decrease in the population. – The Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. In consideration of the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would lead to a long-term decrease in the size of an important population of the terek sandpiper.
Reduce the area of occupancy of an important population	Within an extent of occurrence (or distribution), the area of occupancy of a species is the area inhabited (or 'occupied') by a species. The International Union for Conservation of Nature recommends that an area of occupancy be defined by a grid size of 2 km x 2 km (i.e., 4 km^2, or 400 ha) (TSSC 2015, IUCN 2014). The area of occupancy for the terek sandpiper is estimated to be 3,800 km^2, with a wider extent of occurrence of 10,000,000 km^2 throughout Australia (DCCEEW 2024f). The Actions and Classes of Actions proposed under The Plan would remove approximately 2.58 ha (0.0258 km^2) of tidal flats that represent potential foraging and roosting habitat for the species. This is a relatively small proportion of the 10,000,000 km^2 extent of occurrence and does not constitute a 2 km x 2 km reduction in the area of occupancy of an important population of the terek sandpiper.
Fragment an existing important population into two or more populations	The terek sandpiper is a highly mobile shorebird that migrates annually from the Northern Hemisphere to coastal areas of Australia, including the region of the Strategic Assessment Area. There are no aspects of the Actions or Classes of Actions proposed under The Plan that would create an impassible barrier to this highly mobile species, that would fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	Using a conservative and precautionary approach, the habitats within the Strategic Assessment Area could meet a conservative definition of habitat critical to the survival of the terek sandpiper, given that it contributes to the species' wider foraging area within the region. It is estimated that the Actions and Classes of Actions proposed under The Plan would result in the removal of 2.58 ha of tidal flats that represent potential foraging and roosting habitat for the species. The remainder of habitat available within the region is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan and would persist in the surrounding region. Given the small magnitude of potential impacts, and the abundance of nearby habitat persisting on Bird Island, Torrens Island and the broader Adelaide International Bird Sanctuary, the Actions and Classes of Actions proposed under The Plan are not likely to adversely affect habitat critical to the survival of the terek sandpiper.

Criteria	Assessment
Disrupt the breeding cycle of an important population	The terek sandpiper breeds in northern Russia from May to August (DCCEEW 2024f). As the species does not breed within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not be likely to affect nesting or fledging of the species. Therefore, The Plan would not disrupt the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The terek sandpiper occupies an extensive global distribution, inhabiting Australia during its non-breeding period, where it utilises habitat for foraging and roosting purposes. The area of potential foraging and roosting habitat likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. With consideration to the above, it is not likely that the Actions or Classes of Actions proposed under The Plan would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that there would be a decline in the terek sandpiper population.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the terek sandpiper becoming established in its habitat.
Introduce disease that may cause the species to decline	The conservation advice for the terek sandpiper does not identify disease as a key threat to the species (DCCEEW 2024f). Additionally, there are no aspects of the Actions and Classes of Actions proposed under The Plan that would be expected to introduce disease that would cause the species to decline.
Interfere substantially with the recovery of the species	There is no recovery plan for the terek sandpiper, with the conservation advice considered sufficient to meet the priorities for the species' recovery. The conservation advice for the terek sandpiper (DCCEEW 2024f) indicates that the species is at risk from the following threats: – Habitat loss caused by residential, commercial, and aquaculture development – Invasive species – Climate change and severe weather – Human disturbance – Hunting The primary conservation objectives are to minimise the loss of habitat critical to the survival of the terek sandpiper throughout Australia, and prevent further population declines by working with Range States to address threats along the East Asian-Australasian Flyway. The reduction in potential foraging and roosting habitat (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. In addition, the Actions and Classes of Actions proposed under The Plan will not have a direct impact upon any habitat potentially necessary for breeding, as the species does not breed within Australia. Therefore, it is unlikely that the habitat proposed to be removed within the Strategic Assessment Area would be considered essential to the survival of the species. The Actions and Classes of Actions proposed under The Plan would not contribute to an increase in the other identified threats, and would not be likely to interfere substantially with the recovery of the species.

2.20.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on threatened species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

2.20.5 Conclusion – terek sandpiper

Based upon the assessment in Section 2.20.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the terek sandpiper. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3. Listed migratory species

3.1 Overview

The list of migratory species established under section 209 of the EPBC Act provides for protection of listed migratory species and their habitats to address Australia's international obligations in relation to migratory species. The international agreements include:

– The Bonn Convention (United Nations Convention on the Conservation of Migratory Species of Wild Animals)
– The China-Australia Migratory Bird Agreement (CAMBA)
– The Japan-Australia Migratory Bird Agreement (JAMBA)
– The Republic of South Korea-Australia Migratory Bird Agreement (ROKAMBA)

Section 146L of the EPBC Act sets out approval considerations for migratory species. In summary, any outcomes of The Plan must not be inconsistent with any of the international agreements relating to migratory species.

A desktop assessment and field surveys were undertaken to inform a likelihood of occurrence assessment, included in full as **Appendix C** of the **Biodiversity Values Report** (**Appendix G** of **The Report**). Species that were identified as 'known', 'likely' or having the 'potential' to occur within the Strategic Assessment Area have been further assessed for potential significant impacts in this report.

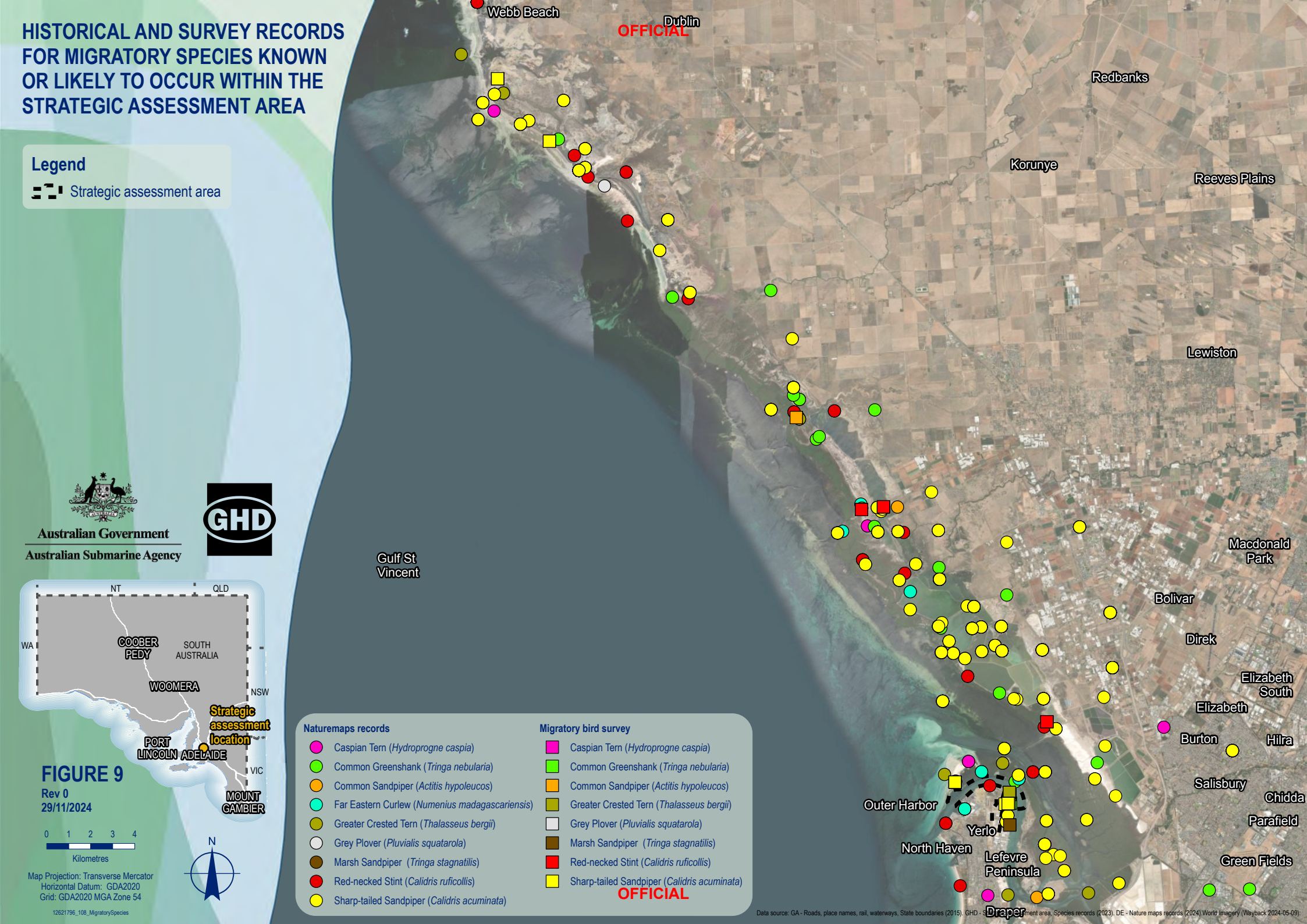
The *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a) include criteria against which migratory species must be assessed. The key aspects of the criteria relate to 'important habitat' and consideration of the size of the population that is present, and whether this is an 'ecologically significant proportion' of the population.

Listed migratory species assessed for significance are listed in Table 3-1. This table does not include threatened species under the EPBC Act as these were assessed against the threatened species criteria, in Chapter 2.

Table 3-1 Listed migratory species assessed

Scientific name	Common name
Actitis hypoleucos	Common sandpiper
Apus pacificus	Fork-tailed swift
Calidris alba	Sanderling
Calidris melanotos	Pectoral sandpiper
Calidris pugnax	Ruff
Calidris ruficollis	Red-necked stint
Calidris subminuta	Long-toed stint
Charadrius bicinctus	Double-banded plover
Charadrius veredus	Oriental plover
Hydroprogne caspia	Caspian tern
Limicola falcinellus	Broad-billed sandpiper
Limosa lapponica	Bar-tailed godwit
Numenius phaeopus	Whimbrel
Pluvialis fulva	Pacific golden plover
Sterna hirundo	Common tern
Thalasseus bergii	Greater crested tern
Tringa brevipes	Grey-tailed tattler
Tringa glareola	Wood sandpiper
Tringa stagnatilis	Marsh sandpiper

HISTORICAL AND SURVEY RECORDS FOR MIGRATORY SPECIES KNOWN OR LIKELY TO OCCUR WITHIN THE STRATEGIC ASSESSMENT AREA



Legend

Strategic assessment area

Naturemaps records

- Caspian Tern (*Hydroprogne caspia*)
- Common Greenshank (*Tringa nebularia*)
- Common Sandpiper (*Actitis hypoleucos*)
- Far Eastern Curlew (*Numenius madagascariensis*)
- Greater Crested Tern (*Thalasseus bergii*)
- Grey Plover (*Pluvialis squatarola*)
- Marsh Sandpiper (*Tringa stagnatilis*)
- Red-necked Stint (*Calidris ruficollis*)
- Sharp-tailed Sandpiper (*Calidris acuminata*)

Migratory bird survey

- Caspian Tern (*Hydroprogne caspia*)
- Common Greenshank (*Tringa nebularia*)
- Common Sandpiper (*Actitis hypoleucos*)
- Greater Crested Tern (*Thalasseus bergii*)
- Grey Plover (*Pluvialis squatarola*)
- Marsh Sandpiper (*Tringa stagnatilis*)
- Red-necked Stint (*Calidris ruficollis*)
- Sharp-tailed Sandpiper (*Calidris acuminata*)

Australian Government
Australian Submarine Agency

GHD

FIGURE 9
Rev 0
29/11/2024

0 1 2 3 4
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_108_MigratorySpecies

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area, Species records (2023). DE - Nature maps records (2024).World Imagery (Wayback 2024-05-09).

3.2 Common sandpiper (*Actitis hypoleucos*)

3.2.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the common sandpiper (*Actitis hypoleucos*) is provided in Table 3-2.

Table 3-2 Common sandpiper listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The common sandpiper migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. The species is widely distributed across all coastlines in Australia, but is most abundant in the Northern Territory, Queensland and Western Australia (DCCEEW 2024s).

Preferred habitat of the species includes coastal and inland wetlands, mostly on muddy margins or rocky shores and occasionally in grassy areas adjoining wetlands (DCCEEW 2024s). It typically feeds during the daytime on molluscs, crustaceans and insects, feeding by sight or by probing the ground surface.

Species occurrence

Strategic Assessment Area

The common sandpiper was observed within the Strategic Assessment Area during surveys conducted between December 2023 and March 2024 (during the 2023–2024 migration period). The species was observed within the Strategic Assessment Area along the shoreline (maximum count of four from the tidal flats survey site) and the swale drain (maximum count of eight from the constructed wetland survey site).

Regional occurrence

Common sandpipers were observed at five reference sites within the surrounding region: Mutton Cove, St Kilda Beach, Thompson Beach North, Middle Beach and Bird Island (estuary), with a maximum count of nine individuals at Thompson Beach North.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

– Constructed wetland (2.54 ha), located within the onshore area of the Strategic Assessment Area, including a stormwater drain located in Falie Reserve, and a swale drain north of Mutton Cove Conservation Reserve.

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

The *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a) provides further information around important habitat for migratory shorebirds in Australia. Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara (approximately 14,633 ha) is 'important habitat' for migratory shorebird species, as it has been documented to support one percent of the individuals in a population of one species or subspecies of shorebird and a total documented abundance of at least 20,000 shorebirds. Potential shorebird habitat within the Strategic Assessment Area contributes a proportionally small extent of potential habitat (approximately 5.12 ha) compared to the broader areas of important habitat in the region, including within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, and other habitats in the Gulf St Vincent region.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the common sandpiper, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary) that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the common sandpiper, are included in Table 3-3. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the common sandpiper.

Table 3-3 Ecologically significant proportions and flyway information for the common sandpiper

Detail	Estimate
Flyway population estimate	190,000
1% flyway population (internationally significant)	1,900
0.1% flyway population (nationally significant)	190
Maximum count (within the Strategic Assessment Area) during migratory bird survey	8

3.2.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the common sandpiper include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the common sandpiper, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-4.

Table 3-4 Potential impacts of The Plan on the common sandpiper

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.2.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the common sandpiper, with respect to the significant impact criteria for migratory species, is included in Table 3-5.

Table 3-5 Significant impact assessment for the common sandpiper

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The common sandpiper was recorded within the Strategic Assessment Area (maximum count of eight individuals) and at reference sites in the region (maximum count nine individuals) during field surveys. The species forages during the daytime on molluscs, crustaceans and insects. Based upon field surveys, the most likely areas for the species to forage or roost would be tidal flat and constructed wetland habitats within the Strategic Assessment Area. The area likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify, destroy or isolate an area of important habitat for the common sandpiper.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the common sandpiper is estimated to be 190,000, with a nationally important proportion of 190 individuals (Hansen *et al.* 2016). A maximum count of 8 was recorded in the Strategic Assessment Area during field surveys. Therefore, the maximum count observed within the Strategic Assessment Area during field surveys does not constitute an important population. The lifecycle of an ecologically significant proportion of the population of common sandpiper would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the species, primarily molluscs, crustaceans, and insects, would only be reduced from within the tidal flat and constructed wetland habitats. This represents a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the common sandpiper.

Criteria	Assessment
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the common sandpiper becoming established in an area of important habitat for the species.

3.2.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.2.5 Conclusion – common sandpiper

Based upon the assessment in Section 3.2.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the common sandpiper. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.3 Fork-tailed swift (*Apus pacificus*)

3.3.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the fork-tailed swift (*Apus pacificus*) is provided in Table 3-6.

Table 3-6 Fork-tailed swift listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	*Threat abatement plan for predation by feral cats* (DoE 2015b)
Relevant wildlife conservation plan	Nil
Marine bioregional plan(s)	Nil

Listing information	Details
Other Commonwealth documents	*Draft Referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE 2015e) *South-east marine region profile: A description of the ecosystems, conservation values and uses of the South-east Marine Region* (DoE 2015g)

Habitat and distribution

The fork-tailed swift is a migrant species to all states and territories of Australia during its non-breeding season (DCCEEW 2024t). In South Australia, the species is widespread from the Victorian border to the Spencer Gulf, where it is common along the coast of the Eyre Peninsula.

The species is almost exclusively aerial, mainly flying between 1 m and 300 m above ground over inland plains, foothills and coastal areas, as well as over settled areas, cliffs and beaches (DCCEEW 2024t).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the fork-tailed swift (DCCEEW 2024t), however, the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical recorded is located in Taperoo, approximately 3 km south of the Strategic Assessment Area.

Habitat presence

As the fork-tailed swift is almost exclusively aerial, there is no habitat located within the Strategic Assessment Area that the species would utilise directly for foraging or sheltering.

Definitions

Important habitat

The definition of ‘important habitat’ in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. *habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or*

b. *habitat that is of critical importance to the species at particular life-cycle stages, and/or*

c. *habitat utilised by a migratory species which is at the limit of the species range, and/or*

d. *habitat within an area where the species is declining.*

Fork tailed swifts are an almost exclusively aerial species that does infrequently land or roost in the terrestrial environment. The species breeds in the Northern Hemisphere and migrates to Australia around October and November and departs in April. In accordance with the above definition, the habitat within the Strategic Assessment Area would not constitute ‘important habitat’ for the fork-tailed swift.

Ecologically significant proportion

The *Draft Referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE 2015e) provides details of what constitutes an ecologically significant proportion for the fork-tailed swift (Table 3-7).

Table 3-7 Ecologically significant proportions information for the fork-tailed swift

Detail	Estimate
1% population (internationally significant)	1,000
0.1% population (nationally significant)	100
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.3.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the fork-tailed swift include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to the fork-tailed swift, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-8.

Table 3-8 Potential impacts of The Plan on the fork-tailed swift

Impact	Description
Direct potential impacts	Mortality or injury of fauna
	Altered behaviour of a species
Indirect potential impacts	None identified
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region

3.3.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the fork-tailed swift, with respect to the significant impact criteria for migratory species, is included in Table 3-9.

Table 3-9 Significant impact assessment for the fork-tailed swift

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance,* includes: a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or b. habitat that is of critical importance to the species at particular life-cycle stages, and/or c. habitat utilised by a migratory species which is at the limit of the species range, and/or d. habitat within an area where the species is declining. Fork tailed swifts are an almost exclusively aerial species that infrequently land or roost in the terrestrial environment. The species breeds in the Northern Hemisphere and migrates to Australia around October and November and departs in April. Based upon the above definition, habitats within the Strategic Assessment Area would not constitute 'important habitat' for the species. As such, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify, destroy or isolate an area of important habitat for the fork-tailed swift.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The lifecycle of the fork-tailed swift would be not likely to be seriously disrupted as a result of the Actions and Classes of Actions proposed under The Plan, because: – It is an aerial species that, whilst forming feeding flocks, does not congregate – It does not breed within Australia (the species breeds in the Northern Hemisphere) – Individuals are not likely to be subject to direct vehicle or equipment strike as they are an aerial species that does not often land or use the terrestrial environment – Feeding resources known to be used by the species (aerial insects), would remain available in the region – The migration pathway of the species would not be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations) In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the fork-tailed swift.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	As indicated above, the fork-tailed swift is an almost exclusively aerial species (that is, it does not typically land or roost in the terrestrial environment). Therefore, Actions and Classes of Actions proposed under The Plan are unlikely to result in an invasive species that is harmful to the fork-tailed swift becoming established in an area of important habitat for the species.

3.3.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.3.5 Conclusion – fork-tailed swift

Based upon the assessment in Section 3.3.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the fork-tailed swift. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.4 Sanderling (*Calidris alba*)

3.4.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the sanderling (*Calidris alba*) is provided in Table 3-10.

Table 3-10 Sanderling listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

Sanderlings migrate to Australia via the East Asian-Australasian Flyway. The species breeds in the Northern Hemisphere. The estimated extent of occurrence of the species is 1,260,000 km^2 (DCCEEW 2024u).

The species has been recorded from coastal areas of all states and territories around Australia. In South Australia the species is widespread between the Victorian border and Kingston, as well as The Coorong, Murray River, Kangaroo Island, Yorke and Eyre Peninsulas, and Streaky Bay. It is typically found in small to large flocks, with hundreds of individuals at favoured localities. Sanderlings may group with other shorebirds, but often roost high on the beach as a single species flock (DCCEEW 2024u).

In Australia, preferred habitat of the sanderling includes open sandy beaches exposed to open sea-swell, exposed sandbars and spits, and shingle (gravelly) banks (DCCEEW 2024u). They are rarely recorded from near-coastal wetlands (lagoons, salt lakes, salt ponds and samphire flats). Roosting of the species occurs on or behind bare sand on the upper beach, and amongst washed up kelp, coastal dunes, rocky reefs and ledges (DCCEEW 2024u).

The sanderling is omnivorous and feeds on plants and seeds, insects, crustaceans, fish and other opportunistic prey. Feeding occurs actively on moist sand between breaking waves on the beach. It may also forage at edges of shallow pools, and on nearby mudflats (DCCEEW 2024u).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the sanderling, although the species was not observed within the Strategic Assessment Area during the 2023–2024 field surveys. (DCCEEW 2024u).

Regional occurrence

Sanderlings were observed at three reference sites during 2023–2024 field surveys: St Kilda Beach, Port Gawler Beach and Thompson Beach North, with a maximum count of 12 individuals at Thompson Beach North.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national significance for the sanderling and has been documented to support a nationally ecologically significant proportion of the species (Table 3-11).

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the sanderling, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the sanderling, are included in Table 3-11. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the sanderling.

Table 3-11 Ecologically significant proportions and flyway information for the sanderling

Detail	Estimate
Flyway population estimate	30,000
1% flyway population (internationally significant)	300
0.1% flyway population (nationally significant)	30
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	100

3.4.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the sanderling include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure

– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to the sanderling, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-12.

Table 3-12 Potential impacts of The Plan on the sanderling

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.4.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the sanderling, with respect to the significant impact criteria for migratory species, is included in Table 3-13.

Table 3-13 Significant impact assessment for the sanderling

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The sanderling was not observed within the Strategic Assessment Area during field surveys. However, it was observed with a maximum count of 12 at the Thompsons Beach North reference site during field surveys. The population of sanderlings within the Strategic Assessment Area, likely form part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the sanderling and has been documented to support a nationally ecologically significant proportion of the species. Based upon species habitat preferences, the most likely areas for the species to forage or roost would be tidal flat habitat within the Strategic Assessment Area. The area likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify, destroy or isolate an area of important habitat for the sanderling.

Criteria	Assessment
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the sanderling is estimated to be 30,000, with a nationally important proportion threshold of 30 individuals (Hansen *et al.* 2016). No individuals were recorded in the Strategic Assessment Area during 2023–2024 field surveys, while a maximum count of 12 was identified from the Thompsons Beach North reference site. Based upon this, an ecologically significant proportion of the species was not identified within the Strategic Assessment Area at the time of surveys. However, an ecologically significant proportion of the species been previously documented across the wider Gulf St Vincent region. The lifecycle of an ecologically significant proportion of the population of sanderlings would not be likely to be seriously disrupted, because: – It does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as plants and seeds, insects, crustaceans, fish and other prey, would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the sanderling.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the sanderling becoming established in an area of important habitat for the species.

3.4.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.4.5 Conclusion – sanderling

Based upon the assessment in Section 3.4.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the sanderling. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.5 Pectoral sandpiper (*Calidris melanotos*)

3.5.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the pectoral sandpiper (*Calidris melanotos*) is provided in Table 3-14.

Table 3-14 Pectoral sandpiper listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The pectoral sandpiper migrates to Australia via the East Asian-Australasian Flyway, although it is considered that those that migrate to Australia may be associated with the American population rather than being a discrete East Asian-Australasian Flyway population (Hansen *et al.* 2016).

The portion of the population that migrates to Australia is widely distributed across the country. It is most commonly recorded in Queensland, New South Wales and Victoria. In South Australia, the species is found mostly in the south-east, from the Murray River to Yorke Peninsula (DCCEEW 2024v).

Pectoral sandpiper habitat includes shallow fresh to saline wetlands, coastal lagoons, estuaries, bays, swamps, lakes, saltmarshes, river pools, creeks, floodplains and artificial wetlands. It demonstrates a preference for wetlands associated with open fringing mudflats and fringing vegetation, and forages on a diet of algae, seeds, crustaceans, arachnids and insects, in shallow water or soft mud at the edge of wetlands. The species feeds by probing the substrate with rapid strokes (DCCEEW 2024v).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the pectoral sandpiper (DCCEEW 2024v) although the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest record of the pectoral sandpiper is from Barkers Inlet, approximately 1 km north-east of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that may be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

– Constructed wetlands (2.54 ha), located within the onshore area of the Strategic Assessment Area, including a stormwater drain located in Falie Reserve, and a swale drain north of Mutton Cove Conservation Reserve.

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the pectoral sandpiper, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used by the species on at least on an occasional basis.

The *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a) provides further information around important habitat for migratory shorebirds in Australia. Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara (approximately 14,633 ha) is 'important habitat' for migratory shorebird species, as it has been documented to support one percent of the individuals in a population of one species or subspecies of shorebird and a total documented abundance of at least 20,000 shorebirds. Potential shorebird habitat within the Strategic Assessment Area contributes a proportionally small extent of potential habitat (approximately 5.12 ha) compared to the broader areas of important habitat in the region, including within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, and other habitats in the Gulf St Vincent region.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the pectoral sandpiper, are included in Table 3-15. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the pectoral sandpiper.

Table 3-15 Ecologically significant proportions and flyway information for the pectoral sandpiper

Detail	Estimate
Flyway population estimate	1,220,000–1,930,000
1% flyway population (internationally significant)	12,200
0.1% flyway population (nationally significant)	1,220
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.5.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the pectoral sandpiper include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the pectoral sandpiper, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-16.

Table 3-16 Potential impacts of The Plan on the pectoral sandpiper

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.5.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the pectoral sandpiper, with respect to the significant impact criteria for migratory species, is included in Table 3-17.

Table 3-17 Significant impact assessment for the pectoral sandpiper

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The pectoral sandpiper was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has historically been recorded in Barker Inlet, approximately 1 km north-east of the Strategic Assessment Area. Based upon the species habitat preferences, and feeding and roosting behaviours (DCCEEW 2024v), the most likely areas for the species to forage or roost within the Strategic Assessment Area would be the constructed wetland and tidal flat habitats. The area likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the pectoral sandpiper.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the pectoral sandpiper is estimated to be between 1,220,000 and 1,930,000 individuals, with a nationally important proportion of 1,200 individuals (Hansen *et al.* 2016). No individuals were recorded within the Strategic Assessment Area or reference sites during field surveys. The lifecycle of an ecologically significant proportion of the population of pectoral sandpipers would be not likely to be seriously disrupted, because: – It does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as algae, seeds, crustaceans, arachnids and insects, would only be reduced from within the tidal flat and constructed wetland habitats. This represents a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations) and location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the pectoral sandpiper.

Criteria	Assessment
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the pectoral sandpiper becoming established in an area of important habitat for the species.

3.5.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.5.5 Conclusion – pectoral sandpiper

Based upon the assessment in Section 3.5.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the pectoral sandpiper. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.6 Ruff (*Calidris pugnax*)

3.6.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the ruff (*Calidris pugnax*) is provided in Table 3-18.

Table 3-18 Ruff listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	Nil

Listing information	Details
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The ruff is a migratory shorebird species that breeds in the Northern Hemisphere. During the non-breeding season, most of the population migrates to Africa, the Indian Subcontinent and southern Europe. Part of the population of the species (an estimated 25,000 to 100,000 individuals that use the East Asian-Australasian Flyway) migrates to Australia during this time. Within Australia, the species has been recorded regularly in all states and territories. In South Australia, the species has been recorded at several locations. Near to the Strategic Assessment Area, this includes the salt lakes at St Kilda and Buckland Park. It has also been recorded from the salt lake near Whyalla in Gulf St Vincent, as well as near Wallaroo (DCCEEW 2024w).

Species habitat includes fresh, brackish or saline wetlands with exposed mudflats around the edges, as well as terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodplains (DCCEEW 2024w).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the ruff (DCCEEW 2024w) however, the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical record is located in Barkers Inlet, approximately 1 km north-east of the Strategic Assessment Area. The ruff has also previously been recorded at the St Kilda and Buckland Park salt lakes, which are over 3 km to the north and north-east from the onshore area of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that may be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).
– Constructed wetlands (2.54 ha), located within the onshore area of the Strategic Assessment Area, including a stormwater drain located in Falie Reserve, and a swale drain north of Mutton Cove Conservation Reserve.

Definitions

Important habitat

The definition of ‘important habitat’ in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a) habitat within the Strategic Assessment Area may constitute important habitat for the ruff, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary) that could be used at least on an occasional basis by the species.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the ruff, are included in Table 3-19. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the ruff.

Table 3-19 Ecologically significant proportions and flyway information for the ruff

Detail	Estimate
Flyway population estimate	25,000–100,000
1% flyway population (internationally significant)	250
0.1% flyway population (nationally significant)	25
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.6.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the ruff include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the ruff, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-20.

Table 3-20 Potential impacts of The Plan on the ruff

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.6.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the ruff, with respect to the significant impact criteria for migratory species, is included in Table 3-21.

Table 3-21 Significant impact assessment for the ruff

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The ruff was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has historically been recorded in Barker Inlet and the salt lakes near St Kilda and Buckland Park. Based upon the species habitat preferences, and feeding and roosting behaviours (DCCEEW 2024w), the most likely areas for the species to forage or roost within the Strategic Assessment Area would be the constructed wetland and tidal flat habitats. The area likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify, destroy or isolate an area of important habitat for the ruff.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian Flyway population of the ruff is estimated to be between 25,000 and 100,000 individuals, with a nationally important proportion of 25 individuals (Hansen *et al.* 2016). No individuals were recorded within the Strategic Assessment Area or reference sites during field surveys. The lifecycle of an ecologically significant proportion of the population of ruff would be not likely to be seriously disrupted, because: – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as algae, seeds, crustaceans, arachnids and insects, would only be reduced from within the tidal flat and constructed wetland habitats which would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations) and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the ruff.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the ruff becoming established in an area of important habitat for the species.

3.6.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.6.5 Conclusion – ruff

Based upon the assessment in Section 3.6.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the ruff. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.7 Red-necked stint (*Calidris ruficollis*)

3.7.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the red-necked stint (*Calidris ruficollis*) is provided in Table 3-22.

Table 3-22 Red-necked stint listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

It is estimated during the non-breeding season, that 80 percent of the global population of red-necked stint migrates to Australia via the East Asian-Australasian Flyway. The flyway population was estimated to be 475,000 in 2016 (DCCEEW 2024x) The species is distributed along most of the Australian coastline, with large concentrations in Victoria and Tasmania. In South Australia, it is most commonly recorded along The Coorong, Penrice Saltfields, Lake George, Kangaroo Island and Price Saltfields (DCCEEW 2024x).

Preferred habitat includes sheltered inlets, bays, lagoons, estuaries with intertidal mudflats, often near spits, islets and banks (DCCEEW 2024x). The species is omnivorous and feeds by probing soft mud for worms, molluscs, snails and slugs, shrimps, spiders beetles, flies and ants, and seeds from plants in saltmarsh and water. They often feed with other species in the same genus, including sharp-tailed sandpipers (*Calidris acuminata*) and curlew sandpipers (*C. ferruginea*).

Species occurrence

Strategic Assessment Area

The red-necked stint was observed within the Strategic Assessment Area during surveys conducted between December 2023 and March 2024. The species was observed at the swale drain site within the Strategic Assessment Area, with a maximum count of four individuals.

Regional occurrence

Red-necked stints were also observed at five reference sites:

– St Kilda Beach
– Port Gawler Beach
– Port Gawler Swale Drain
– Thompson Beach North
– Bird Island

A maximum count of 32 individuals was recorded at Bird Island.

Habitat presence

Habitat located within the Strategic Assessment Area that may be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).
– Constructed wetlands (2.54 ha), located within the onshore area of the Strategic Assessment Area, including a stormwater drain located in Falie Reserve, and a swale drain north of Mutton Cove Conservation Reserve.

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

Gulf St Vincent is documented in the *National Directory of Important Migratory Shorebird Habitat* (Weller *et al.* 2020) to be a place of international significance for the red-necked stint, as it supports at least one percent of the flyway population of the species (Table 3-23).

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the red-necked stint, as it is part of a broader habitat area that could be used at least on an occasional basis within the region.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the red-necked stint, are included in Table 3-23. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the red-necked stint.

Table 3-23 Ecologically significant proportions and flyway information for the red-necked stint

Detail	Estimate
Flyway population estimate	475,000
1% flyway population (internationally significant)	4,750
0.1% flyway population (nationally significant)	475
Maximum count (within the Strategic Assessment Area) during migratory bird survey	4
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	8,612

3.7.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the red-necked stint include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the red-necked stint, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-24.

Table 3-24 Potential impacts of The Plan on the red-necked stint

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.7.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the red-necked stint, with respect to the significant impact criteria for migratory species, is included in Table 3-25.

Table 3-25 Significant impact assessment for the red-necked stint

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The red-necked stint was recorded in the swale drain of the Strategic Assessment Area (maximum count of four), as well as at five of the reference sites (maximum count of 32) during field surveys. The population of red-necked stint within the Strategic Assessment Area likely form part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of international importance for the red-necked stint and has been documented to support an internationally ecologically significant proportion of the species. The species is omnivorous and forages on worms, molluscs, snails and slugs, shrimps, spiders beetles, flies, ants, and plant seeds. Based upon field surveys and species feeding and roosting behaviours, the most likely areas for the species to forage or roost within the Strategic Assessment Area, would be the constructed wetland and tidal flat habitats. The area likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify, destroy or isolate an area of important habitat for the red-necked stint.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the red-necked stint is estimated to be 475,000, with a nationally important proportion of 475 individuals (Hansen *et al.* 2016). The red-necked stint was recorded from the swale drain within the Strategic Assessment Area (maximum count of four), as well as at five of the reference sites (maximum count of 32) during field surveys. Based upon this, an ecologically significant proportion of the species was not identified within the Strategic Assessment Area at the time of surveys. However, an ecologically significant proportion of the species been documented across the wider Gulf St Vincent region. The lifecycle of an ecologically significant proportion of the population of red-necked stints would not be likely to be seriously disrupted, because: – It does not breed within Australia – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the species, primarily worms, molluscs, snails and slugs, shrimps, spiders beetles, flies, ants, and plant seeds would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disturbed, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. – There are limited roosting areas for the species within the Strategic Assessment Area. The nearest area where birds are known to congregate is approximately 3.5 km away at the salt lakes. The Actions and Classes of Actions proposed under The Plan that may produce noise or vibration are unlikely to impact congregations at the salt lakes. As such, it would cause negligible disturbance to the species. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the red-necked stint.

Criteria	Assessment
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance, and two introduced macroalgae species (*Caulerpa spp.*) are known to occur in Port Adelaide River. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the red-necked stint becoming established in an area of important habitat for the species.

3.7.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.7.5 Conclusion – red-necked stint

Based upon the assessment in Section 3.7.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the red-necked stint. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.8 Long-toed stint (*Calidris subminuta*)

3.8.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the long-toed stint (*Calidris subminuta*) is provided in Table 3-26.

Table 3-26 Long-toed stint listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	Nil

Listing information	Details
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The long-toed stint migrates to Australia via the East Asian-Australasian Flyway and is a regular visitor to most states and territories (except Victoria) but is more uncommon in the east. In South Australia, the species is frequently observed from Bool Lagoon, Big and Little Swamps, and the southern end of the Eyre Peninsula, including The Coorong, Langhorne Creek, St Kilda and the Price Saltworks (DCCEEW 2024y). The flyway population is estimated to be 230,000.

Preferred habitat for the long-toed stint includes shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species typically forages on wet mud, in shallow water, or in low vegetation (short grass, weeds and other vegetation) on islets or around wetland edges. It is omnivorous, and feeds on seeds, molluscs, crustaceans and insects. (DCCEEW 2024y).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the long-toed stint (DCCEEW 2024y); however, the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical record is approximately 3 km south-east of the Strategic Assessment Area, located on Torrens Island. There are records of the species from St Kilda salt lakes.

Habitat presence

Habitat located within the Strategic Assessment Area that may be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).
– Constructed wetlands (2.54 ha), located within the onshore area of the Strategic Assessment Area, including a stormwater drain located in Falie Reserve, and a swale drain north of Mutton Cove Conservation Reserve.

Definitions

Important habitat

The definition of ‘important habitat’ in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the long-toed stint, as it is part of a broader area of nationally important habitat within the region (including Adelaide International Bird Sanctuary) that could be used at least on an occasional basis by the species.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the long-toed stint, are included in Table 3-27. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the long-toed stint.

Table 3-27 Ecologically significant proportions and flyway information for the long-toed stint

Detail	Estimate
Flyway population estimate	230,000
1% flyway population (internationally significant)	2,300
0.1% flyway population (nationally significant)	230
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.8.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the long-toed stint include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the long-toed stint, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-28.

Table 3-28 Potential impacts of The Plan on the long-toed stint

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.8.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the long-toed stint, with respect to the significant impact criteria for migratory species, is included in Table 3-29.

Table 3-29 Significant impact assessment for the long-toed stint

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The long-toed stint was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has historically been recorded from Torrens Island and the salt lakes at St Kilda. Based upon the species habitat preferences, and feeding and roosting behaviours (DCCEEW 2024y), the most likely areas for the species to forage or roost within the Strategic Assessment Area would be the constructed wetland and tidal flat habitats. The area likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the long-toed stint.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian Flyway population of the long-toed stint is estimated to be 230,000, with a nationally important proportion of 230 individuals (Hansen *et al.* 2016). No individuals were recorded from the Strategic Assessment Area or reference sites during field surveys. The lifecycle of an ecologically significant proportion of the population of ruff would be not likely to be seriously disrupted, because: – It does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as algae, seeds, crustaceans, arachnids and insects, would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the long-toed stint.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the long-toed stint becoming established in an area of important habitat for the species.

3.8.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.8.5 Conclusion – long-toed stint

Based upon the assessment in Section 3.8.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the long-toed stint. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.9 Double-banded plover (*Charadrius bicinctus*)

3.9.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the double-banded plover (*Charadrius bicinctus*) is provided in Table 3-30.

Table 3-30 Double-banded plover listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

Double-banded plovers are widespread in New Zealand, where the species breeds. Part of the species population, largely from the South Island of New Zealand, migrates to Australia during its non-breeding season (DCCEEW 2024z). During its non-breeding season, the species is commonly observed in eastern and southern Australia between western Eyre Peninsula, South Australia and the Tropic of Capricorn. Records in Queensland and Western Australia are less common (DCCEEW 2024z).

In South Australia, double-banded plovers are most commonly recorded from between the Victorian border and western Eyre Peninsula (approximately 250 km west of the Strategic Assessment Area) (DCCEEW 2024z).

Double-banded plovers utilise a broad range of habitats during their nonbreeding season, including littoral, estuarine and fresh or saline wetlands, as well as saltmarsh, grasslands and pasture (including tilled ground). The species, which has been found to feed during the day as well as at night, forages on molluscs, insects, worms, crustaceans, spiders, seeds and fruits. The species roosts on bare open areas or among vegetation (DCCEEW 2024z).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the double-banded plover (DCCEEW 2024z); however, the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical record is located in Taperoo, approximately 3 km south of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that may be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).
– Constructed wetlands (2.54 ha), located within the onshore area of the Strategic Assessment Area, including a stormwater drain located in Falie Reserve, and a swale drain north of Mutton Cove Conservation Reserve.

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller *et al.* 2020) as a place of national significance for the double-banded plover and has been documented to support an ecologically significant proportion of the species (Table 3-31).

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the double-banded plover, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the double-banded plover, are included in Table 3-31. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the double-banded plover.

Table 3-31 Ecologically significant proportions and flyway information for the double-banded plover

Detail	Estimate
Flyway population estimate	19,000
1% flyway population (internationally significant)	190
0.1% flyway population (nationally significant)	19
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	53

3.9.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the double-banded plover include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the double-banded plover, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-32.

Table 3-32 Potential impacts of The Plan on the double-banded plover

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.9.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the double-banded plover, with respect to the significant impact criteria for migratory species, is included in Table 3-33.

Table 3-33 Significant impact assessment for the double-banded plover

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The double-banded plover was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. The population of double-banded plovers within the Strategic Assessment Area, likely form part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the double-banded plover and has been documented to support an ecologically significant proportion of the species. Based upon the species habitat preferences, and feeding and roosting behaviours, the most likely areas for the species to forage or roost within the Strategic Assessment Area would be the constructed wetland and tidal flat habitats. The area likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify, destroy or isolate an area of important habitat for the double-banded plover.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the double-banded plover is estimated to be 19,000, with a nationally important proportion of 19 individuals (Hansen *et al.* 2016). No individuals were recorded from the Strategic Assessment Area or reference sites during field surveys. Based upon this, an ecologically significant proportion of the species was not identified within the Strategic Assessment Area at the time of surveys. However, an ecologically significant proportion of the species has been documented across the wider Gulf St Vincent region. The lifecycle of an ecologically significant proportion of the population of double-banded plovers would be not likely to be seriously disrupted, because: – It does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as molluscs, insects, worms, crustaceans and spiders, seeds and fruits, would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the double-banded plover.

Criteria	Assessment
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the double-banded plover becoming established in an area of important habitat for the species.

3.9.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.9.5 Conclusion – double-banded plover

Based upon the assessment in Section 3.9.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the double-banded plover. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.10 Oriental plover (*Charadrius veredus*)

3.10.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the oriental plover (*Charadrius veredus*) is provided in Table 3-34.

Table 3-34 Oriental plover listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	Nil

Listing information	Details
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The oriental plover is one of the migratory shorebird species that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. The species is mostly observed in northern Australia, in both coastal and inland areas of Western Australia, the Northern Territory and Queensland. It is rarely recorded in southern Australia (DCCEEW 2024aa).

Preferred habitat includes estuarine mudflats and sandbanks, rocky ocean beaches or nearby reefs and near-coastal grasslands in coastal areas, and flat, open, semi-arid or arid grasslands such as claypans, dry paddocks, playing fields, lawns and cattle camps further inland (DCCEEW 2024aa).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the distribution range of the oriental plover (DCCEEW 2024aa). No sightings of the species were recorded during field surveys of the Strategic Assessment Area.

Regional occurrence

The nearest historical record is located in Waterloo Corner, located approximately 7 km north-east of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that may be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

Definitions

Important habitat

The definition of ‘important habitat’ in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. *habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or*

b. *habitat that is of critical importance to the species at particular life-cycle stages, and/or*

c. *habitat utilised by a migratory species which is at the limit of the species range, and/or*

d. *habitat within an area where the species is declining.*

The *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a) provides further information around important habitat for migratory shorebirds in Australia. Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara (approximately 14,633 ha) is ‘important habitat’ for migratory shorebird species, as it has been documented to support one percent of the individuals in a population of one species or subspecies of shorebird and a total documented abundance of at least 20,000 shorebirds.

Potential shorebird habitat within the Strategic Assessment Area contributes a proportionally small extent of potential habitat (approximately 5.12 ha) compared to the broader areas of important habitat in the region, including within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, and other habitats in the Gulf St Vincent region

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the oriental plover, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the oriental plover, are included in Table 3-35. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the oriental plover.

Table 3-35 Ecologically significant proportions and flyway information for the oriental plover

Detail	Estimate
Flyway population estimate	230,000
1% flyway population (internationally significant)	2,300
0.1% flyway population (nationally significant)	230
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.10.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the oriental plover include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the oriental plover, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-36.

Table 3-36 Potential impacts of The Plan on the oriental plover

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.10.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the oriental plover, with respect to the significant impact criteria for migratory species, is included in Table 3-37.

Table 3-37 Significant impact assessment for the oriental plover

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The oriental plover was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has historically been recorded within 10 km of the Strategic Assessment Area. Based upon field surveys and species feeding and roosting behaviours, the most likely areas for the species to forage or roost would be most likely be the tidal flat habitat within the Strategic Assessment Area. The area likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify, destroy or isolate an area of important habitat for the oriental plover.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the oriental plover is estimated to be 230,000, with a nationally important proportion of 230 individuals (Hansen *et al.* 2016). No individuals were recorded from the Strategic Assessment Area or reference sites during field surveys. The lifecycle of an ecologically significant proportion of the population of the oriental plover would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as algae, seeds, crustaceans, arachnids and insects, would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the oriental plover.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the oriental plover becoming established in an area of important habitat for the species.

3.10.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.10.5 Conclusion – oriental plover

Based upon the assessment in Section 3.10.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the oriental plover. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.11 Caspian tern (*Hydroprogne caspia*)

3.11.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the Caspian tern (*Hydroprogne caspia*) is provided in Table 3-38.

Table 3-38 Caspian tern listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Seabirds* (DAWE 2020b)
Marine bioregional plan(s)	*Marine bioregional plan for the North Marine Region* (DSEWPC 2012a) *Marine bioregional plan for the South-west Marine Region* (DSEWPC 2012c)
Other Commonwealth documents	Nil

Habitat and distribution

Caspian terns are found across North America, Europe, Africa, Asia, Australia and New Zealand, where they generally inhabit large lakes and ocean coasts. It is widespread within Australia and occurs in both coastal and inland areas (DCCEEW 2024k). The Caspian tern is a resident species in Australia. In South Australia it occurs from Carpenters Rocks to Ceduna, and along the Murray River, with breeding recorded along the coast from the Coorong, north-west to Ceduna, and inland at Lake Eyre and Lake Goyder (DCCEEW 2024k).

Habitat for the species includes sheltered coastal embayments with sandy or muddy margins, as well as near-coastal or inland terrestrial wetlands, especially lakes, waterholes, reservoirs, rivers, creeks and artificial wetlands. The diet of the Caspian tern is predominantly fish, as well as other birds, eggs, carrion, aquatic invertebrates, insects and earthworms. When catching fish, they typically hover up to 15 m above the water and dive into the water, fully submerge and re-emerge. They usually feed on their catch in flight (DCCEEW 2024k).

The species roosts on exposed spits, banks or shorelines of lakes, estuaries, lagoons and inlets, commonly nesting in the open or in low or sparse vegetation, with nests often consisting of a bare or lined hollow scraped in the ground (DCCEEW 2024k). It can nest singly, although often breeds in large colonies (DAWE 2020b).

Species occurrence

Strategic Assessment Area

The Caspian tern was observed during surveys along the shoreline within the Strategic Assessment Area, with a maximum count of six individuals.

Regional occurrence

The species was observed from the surveys at four reference sites within the surrounding region: Port Gawler Beach, Port Gawler Swale Drain, Thompson Beach South and Bird Island Conservation Area (estuary), with a maximum count of six individuals at Bird Island.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland which would likely be suitable for roosting (0.35 ha).

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. *habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or*

b. *habitat that is of critical importance to the species at particular life-cycle stages, and/or*

c. *habitat utilised by a migratory species which is at the limit of the species range, and/or*

d. *habitat within an area where the species is declining.*

Habitats in the Strategic Assessment Area are considered to be 'important habitat' for Caspian terns, as Australian population estimates and trends are unknown and could be in decline, although a 38.3 percent increase per decade has been recorded in North America (DAWE 2020b).

Ecologically significant proportion

The global population of Caspian terns is estimated to be 250,000 to 470,000. Australian population estimates and trends are unknown (DAWE 2020b) and as such, an ecologically significant proportion of the population is not known.

3.11.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the Caspian tern include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to the Caspian tern, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-39.

Table 3-39 Potential impacts of The Plan on the Caspian tern

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.11.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the Caspian tern, with respect to the significant impact criteria for migratory species, is included in Table 3-40.

Table 3-40 Significant impact assessment for the Caspian tern

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The Caspian tern was recorded from the shoreline within the Strategic Assessment Area, and at four reference sites, during field surveys, with a maximum count of six individuals. Based upon field surveys, and species feeding and roosting behaviours, the most likely areas for the species to roost within the Strategic Assessment Area would be the tidal flat habitat. The species may forage for fish broadly within Port Adelaide River and Gulf St Vincent. The area of shoreline to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the Caspian tern.

Criteria	Assessment
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The lifecycle of an ecologically significant proportion of the population of Caspian terns would be not likely to be seriously disrupted, because: – The species is not known to breed within the Strategic Assessment Area – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the species, predominantly fish, are unlikely to be notably affected as a result of the Actions and Classes of Actions proposed under The Plan. Temporary changes that could result from dredging would be localised and the species would be able to forage over the wider region of Port Adelaide River and Gulf St Vincent. – Given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), migration pathways are unlikely to be disrupted. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the Caspian tern.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the Caspian tern becoming established in an area of important habitat for the species.

3.11.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.11.5 Conclusion – Caspian tern

Based upon the assessment in Section 3.11.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the Caspian tern. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.12 Broad-billed sandpiper (*Limicola falcinellus*)

3.12.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the broad-billed sandpiper (*Limicola falcinellus*) is provided in Table 3-41.

Table 3-41 Broad-billed sandpiper listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The broad-billed sandpiper is a migratory shorebird species that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. The species is commonly observed on the north and north-west coasts of Australia and are occasionally recorded in southern Australia. In South Australia, it has been recorded in St Kilda Saltworks and Buckland Park, with occasional sightings at Mutton Cove, Lefevre Peninsula, Clinton Conservation Park and Price Saltfields (DCCEEW 2024ab).

Preferred habitat includes estuarine mudflats, saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, as well as large soft intertidal mudflats with nearby shell or sandbanks (DCCEEW 2024ab).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the broad-billed sandpiper (DCCEEW 2024ab); however, the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical record is located approximately 1 km north-east of the Strategic Assessment Area within Barker Inlet.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

Definitions

Important habitat

The definition of ‘important habitat’ in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

The *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a) provides further information around important habitat for migratory shorebirds in Australia. Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara (approximately 14,633 ha) is 'important habitat' for migratory shorebird species, as it has been documented to support one percent of the individuals in a population of one species or subspecies of shorebird and a total documented abundance of at least 20,000 shorebirds.

Potential shorebird habitat within the Strategic Assessment Area contributes a proportionally small extent of potential habitat (approximately 5.12 ha) compared to the broader areas of important habitat in the region, including within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, and other habitats in the Gulf St Vincent region.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the broad-billed sandpiper as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary) that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the broad-billed sandpiper, are included in Table 3-42. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the broad-billed sandpiper.

Table 3-42 Ecologically significant proportions and flyway information for the broad-billed sandpiper

Detail	Estimate
Flyway population estimate	30,000
1% flyway population (internationally significant)	300
0.1% flyway population (nationally significant)	30
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.12.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the broad-billed sandpiper include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to the broad-billed sandpiper, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-43.

Table 3-43 Potential impacts of The Plan on the broad-billed sandpiper

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.12.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the broad-billed sandpiper, with respect to the significant impact criteria for migratory species, is included in Table 3-44.

Table 3-44 Significant impact assessment for the broad-billed sandpiper

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The broad-billed sandpiper was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has historically been recorded within Barker Inlet. Based upon the species habitat preferences, and feeding and roosting behaviours, the most likely areas for the species to forage or roost within the Strategic Assessment Area would be the tidal flat habitat. The area likely to be directly impacted (2.58 ha of tidal flats is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the broad-billed sandpiper

Criteria	Assessment
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the broad-billed sandpiper is estimated to be 30,000, with a nationally important proportion of 30 individuals (Hansen *et al.* 2016). No individuals were recorded from the Strategic Assessment Area or reference sites during field surveys. The lifecycle of an ecologically significant proportion of the population of the broad-billed sandpiper would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as algae, seeds, crustaceans, arachnids and insects, would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the broad-billed sandpiper.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the broad-billed sandpiper becoming established in an area of important habitat for the species.

3.12.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.12.5 Conclusion – broad-billed sandpiper

Based upon the assessment in Section 3.12.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the broad-billed sandpiper. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.13 Bar-tailed godwit (*Limosa lapponica*)

3.13.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the bar-tailed godwit (*Limosa lapponica*) is provided in Table 3-45.

Table 3-45 Bar-tailed godwit listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

Bar-tailed godwits migrate to Australia via the East Asian-Australasian Flyway after breeding in the Northern Hemisphere. The species has been recorded in coastal areas of all Australian states and territories. In South Australia the species is mostly recorded around coasts from Lake Alexandrina to Denial Bay. It is typically found in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is often found foraging amongst beds of seagrass and occasionally in saltmarsh (DCCEEW 2024ag).

In Australia, the species usually forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. The bar-tailed godwit prefers exposed sandy substrates on intertidal flats, banks, beaches and soft mud; often with beds of seagrasses. The species has been known to forage among mangroves, or on coral reefs or rock platforms among rubble, crevices and holes (DCCEEW 2024ag). The bar-tailed godwit usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh. (DCCEEW 2024ag).

The bar-tailed godwit is carnivorous with a diet consisting of worms, molluscs, crustaceans, insects and some plant material. (DCCEEW 2024ag).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the bar-tailed godwit, although the species was not observed within the Strategic Assessment Area during the 2023–2024 field surveys. (DCCEEW 2024ag). Potential habitat for the species is present within the Strategic Assessment Area, occurring as tidal flats that represent habitat that the species could use on an occasional basis.

Regional occurrence

The nearest historical record is located on Torrens Island, approximately 1 km south-east of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

Gulf St Vincent is recognised by the National Directory of Important Migratory Shorebird Habitat (Weller et al. 2020) as a place of national significance for the bar-tailed godwit and has been documented to support a nationally ecologically significant proportion of the species (Table 3-46).

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the bar-tailed godwit, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the bar-tailed godwit, are included in Table 3-46. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the bar-tailed godwit.

Table 3-46 Ecologically significant proportions and flyway information for the bar-tailed godwit

Detail	Estimate
Flyway population estimate	325,000
1% flyway population (internationally significant)	3,250
0.1% flyway population (nationally significant)	325
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0
Maximum count (within Gulf St Vincent) from the National Directory of Important Migratory Shorebird Habitat	1000

3.13.2 Nature and extent of impacts

Relevant actions

Actions proposed under The Plan, that may cause impacts to the bar-tailed godwit include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the bar-tailed godwit, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-47.

Table 3-47 Potential impacts of The Plan on the bar-tailed godwit

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.13.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the bar-tailed godwit, with respect to the significant impact criteria for migratory species, is included in Table 3-48.

Table 3-48 Significant impact assessment for the bar-tailed godwit

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The bar-tailed godwit was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the bar-tailed godwit has historically been recorded at Torrens Island. The population of bar-tailed godwit within the Strategic Assessment Area likely forms part of the wider population of the species in the surrounding region known to occupy Gulf St Vincent. Gulf St Vincent is recognised by the *National Directory of Important Migratory Shorebird Habitat* (Weller et al. 2020) as a place of national importance for the bar-tailed godwit and has been documented to support a nationally ecologically significant proportion of the species. Based upon field surveys, the most likely areas for the species to forage or roost within the Strategic Assessment Area would be the tidal flat habitat. The area likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the bar-tailed godwit.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the bar-tailed godwit is estimated to be 325,000, with a nationally important proportion of 325 individuals (Hansen *et al.* 2016). No individuals were recorded from the Strategic Assessment Area, or at any of the reference sites during field surveys. Based upon this, an ecologically significant proportion of the species was not identified within the Strategic Assessment Area at the time of surveys. However, an ecologically significant proportion of the species has been documented across the wider Gulf St Vincent region. The lifecycle of an ecologically significant proportion of the population of bar-tailed godwits would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as plants and seeds, insects, crustaceans, fish and other prey, would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the bar-tailed godwit.

Criteria	Assessment
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the bar-tailed godwit becoming established in an area of important habitat for the species.

3.13.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.13.5 Conclusion – bar-tailed godwit

Based upon the assessment in Section 3.13.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the bar-tailed godwit. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.14 Whimbrel (*Numenius phaeopus*)

3.14.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the whimbrel (*Numenius phaeopus*) is provided in Table 3-49.

Table 3-49 Whimbrel listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)

Listing information	Details
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The whimbrel is a migratory shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. The species is found in all states and territories in Australia but is more common in the north. In South Australia, it occurs between the mouth of the Murray River, Kangaroo Island, Gulf St Vincent, and the Price and St Kilda Saltfields (DCCEEW 2024ac).

Preferred habitat includes intertidal mudflats of sheltered coasts, harbours, lagoons, estuaries and river deltas, often with mangroves (DCCEEW 2024ac).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the whimbrel (DCCEEW 2024ac); however, the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical record is located approximately 1 km north of the Strategic Assessment Area on Torrens Island.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

Definitions

Important habitat

The definition of ‘important habitat’ in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

The *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a) provides further information around important habitat for migratory shorebirds in Australia. Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara (approximately 14,633 ha) is ‘important habitat’ for migratory shorebird species, as it has been documented to support one percent of the individuals in a population of one species or subspecies of shorebird and a total documented abundance of at least 20,000 shorebirds.

Potential shorebird habitat within the Strategic Assessment Area contributes a proportionally small extent of potential habitat (approximately 5.12 ha) compared to the broader areas of important habitat in the region, including within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, and other habitats in the Gulf St Vincent region.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the whimbrel, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the whimbrel, are included in Table 3-50. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the whimbrel.

Table 3-50 Ecologically significant proportions and flyway information for the whimbrel

Detail	Estimate
Flyway population estimate	65,000
1% flyway population (internationally significant)	650
0.1% flyway population (nationally significant)	65
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.14.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the whimbrel include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the whimbrel, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-51.

Table 3-51 Potential impacts of The Plan on the whimbrel

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.14.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the whimbrel, with respect to the significant impact criteria for migratory species, is included in Table 3-52.

Table 3-52 Significant impact assessment for the whimbrel

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The whimbrel was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has historically been recorded on Torrens Island. Based upon the species habitat preferences, and feeding and roosting behaviours, the most likely areas for the species to forage or roost within the Strategic Assessment Area would be the tidal flat habitat. The area likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the whimbrel.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the whimbrel is estimated to be 65,000, with a nationally important proportion of 65 individuals (Hansen *et al.* 2016). No individuals were recorded in the Strategic Assessment Area or reference sites during field surveys. The lifecycle of an ecologically significant proportion of the population of the whimbrel would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as algae, seeds, crustaceans, arachnids and insects, would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the whimbrel.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the whimbrel becoming established in an area of important habitat for the species.

3.14.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.14.5 Conclusion – whimbrel

Based upon the assessment in Section 3.14.4 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the whimbrel. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.15 Pacific golden plover (*Pluvialis fulva*)

3.15.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the Pacific golden plover (*Pluvialis fulva*) is provided in Table 3-53.

Table 3-53 Pacific golden plover listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The Pacific golden plover is a migratory shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. The species is widespread in coastal regions of Australia, most commonly along the east coast of Queensland and New South Wales. In South Australia, the species is recorded at many sites between The Coorong and Streaky Bay, including the coasts of Gulf St Vincent and Spencer Gulf (DCCEEW 2024ad).

Preferred habitat includes coastal habitats such as beaches, mudflats and sandflats in sheltered harbours, estuaries and lagoons, and occasionally inland wetlands (DCCEEW 2024ai).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the Pacific golden plover (DCCEEW 2024ai). The species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical record is located approximately 2 km south-east of the Strategic Assessment Area within Torrens Island.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

– Constructed wetlands (2.54 ha), located within the onshore area of the Strategic Assessment Area, including a stormwater drain located in Falie Reserve, and a swale drain north of Mutton Cove Conservation Reserve.

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

The *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a) provides further information around important habitat for migratory shorebirds in Australia. Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara (approximately 14,633 ha) is 'important habitat' for migratory shorebird species, as it has been documented to support one percent of the individuals in a population of one species or subspecies of shorebird and a total documented abundance of at least 20,000 shorebirds.

Potential shorebird habitat within the Strategic Assessment Area contributes a proportionally small extent of potential habitat (approximately 5.12 ha) compared to the broader areas of important habitat in the region, including within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, and other habitats in the Gulf St Vincent region.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the Pacific golden plover, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the Pacific golden plover, are included in Table 3-54. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the pacific golden plover.

Table 3-54 Ecologically significant proportions and flyway information for the Pacific golden plover

Detail	Estimate
Flyway population estimate	120,000
1% flyway population (internationally significant)	1,200
0.1% flyway population (nationally significant)	120
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.15.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the Pacific golden plover include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the Pacific golden plover, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-55.

Table 3-55 Potential impacts of The Plan on the Pacific golden plover

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.15.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the Pacific golden plover, with respect to the significant impact criteria for migratory species, is included in Table 3-56.

Table 3-56 Significant impact assessment for the Pacific golden plover

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The Pacific golden plover was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has historically been recorded from Torrens Island Conservation Park. Based upon the species habitat preferences, and feeding and roosting behaviours, the most likely areas for the species to forage or roost within the Strategic Assessment Area would be the constructed wetland and tidal flat habitats. The area likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the Pacific golden plover.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the Pacific golden plover is estimated to be 120,000, with a nationally important proportion of 120 individuals (Hansen *et al.* 2016). No individuals were recorded from the Strategic Assessment Area or reference sites during field surveys. The lifecycle of an ecologically significant proportion of the population of the Pacific golden plover would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the omnivorous species, such as algae, seeds, crustaceans, arachnids and insects, would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the Pacific golden plover.

Criteria	Assessment
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the Pacific golden plover becoming established in an area of important habitat for the species.

3.15.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.15.5 Conclusion – Pacific golden plover

Based upon the assessment in Section 3.15.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the Pacific golden plover. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.16 Common tern (*Sterna hirundo*)

3.16.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the common tern (*Sterna hirundo*) is provided in Table 3-57.

Table 3-57 Common tern listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Seabirds* (DAWE 2020b)
Marine bioregional plan(s)	Nil
Other Commonwealth documents	Nil

Habitat and distribution

This common tern is a migrant to Australia during its non-breeding season, where it is widespread on the north and east coasts, and rarely recorded in South Australia and Western Australia (DCCEEW 2024ad). Preferred habitat includes near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores (DCCEEW 2024ad).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the common tern (DCCEEW 2024ad); however, the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical record is located approximately 1 km north of the Strategic Assessment Area on Torrens Island.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

Definitions

Important habitat

The definition of ‘important habitat’ in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

Habitats in the Strategic Assessment Area are considered to be ‘important habitat’ for common terns, as Australian population estimates and trends are unknown (DAWE 2020b), and the Strategic Assessment Area is near the limit of the species range.

Ecologically significant proportion

The global population of common terns is estimated to number between 1,600,000 to 3,600,000 individuals (DAWE 2020b). Australian population estimates and trends are unknown (DAWE 2020b), and as such an ecologically significant proportion of the population is not known.

3.16.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the common tern include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the common tern, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-58.

Table 3-58 Potential impacts of The Plan on the common tern

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.16.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the common tern, with respect to the significant impact criteria for migratory species, is included in Table 3-59.

Table 3-59 Significant impact assessment for the common tern

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The common tern was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has historically been recorded from Torrens Island. Based upon field surveys, and the species feeding and roosting behaviours, the most likely areas for the species roost within the Strategic Assessment Area would be the tidal flat habitat within the Strategic Assessment Area. The species may forage for fish widely across the Port Adelaide River and Gulf St Vincent. The area of shoreline to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify, destroy or isolate an area of important habitat for the common tern.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The lifecycle of an ecologically significant proportion of the population of common terns would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the species, predominantly fish, are unlikely to be notably affected as a result of the Actions and Classes of Actions proposed under The Plan. Temporary changes that could result from dredging would be localised and the species would be able to forage over the wider region of Port Adelaide River and Gulf St Vincent. – Given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), migration pathways would not be obscured. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the common tern.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the common tern becoming established in an area of important habitat for the species.

3.16.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.16.5 Conclusion – common tern

Based upon the assessment in Section 3.16.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the common tern. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.17 Greater crested tern (*Thalasseus bergii*)

3.17.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the greater crested tern (*Thalasseus bergii*) is provided in Table 3-60.

Table 3-60 Greater crested tern listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Seabirds* (DAWE 2020b)
Marine bioregional plan(s)	*Marine bioregional plan for the North Marine Region* (DSEWPC 2012a) *Marine bioregional plan for the Temperate East Marine Region* (DSEWPC 2012d)
Other Commonwealth documents	Nil

Habitat and distribution

The greater crested tern is a seabird species with a broad global distribution from coastal areas of eastern Africa through to Asia and Australia, including the Indian and Pacific Oceans (DAWE 2020b, DSEWPC 2012a). The species nests on coastlines and islands, coastal bays, inlets and large rivers. The greater crested tern breeds between September and January in eastern and southern Australia and more broadly throughout the year in warmer climates of northern and western Australia.

Fish are the primary food source for the species, with other sources including cephalopods, crustaceans and insects (ALA 2024).

Species occurrence

Strategic Assessment Area

The greater crested tern was observed within the Strategic Assessment Area during surveys conducted between December 2023 and March 2024. The species was observed at one site within the Strategic Assessment Area shoreline, with a maximum count of 19 individuals.

Regional occurrence

The species was also observed at two reference sites within the surrounding region: Port Gawler Swale Drain and Bird Island Conservation Area (estuary), with a maximum count of six individuals at Bird Island Conservation Area (estuary) and a total of 14 individuals.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. *habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or*

b. *habitat that is of critical importance to the species at particular life-cycle stages, and/or*

c. *habitat utilised by a migratory species which is at the limit of the species range, and/or*

d. *habitat within an area where the species is declining.*

Habitats in the Strategic Assessment Area are considered to be 'important habitat' for greater crested terns, as Australian population estimates and trends are unknown (DAWE 2020b).

Ecologically significant proportion

The global population of greater crested terns are estimated to be between 150,000 to 1,100,00 individuals (DAWE 2020b). Significant breeding populations are known to occur in Australia within the Great Barrier Reef and Coral Sea Marine Park Islands.

Australian population estimates and trends are unknown (DAWE 2020b), and as such an ecologically significant proportion of the population is not known.

3.17.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the greater crested tern include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to the greater crested tern, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-61.

Table 3-61 Potential impacts of The Plan on the greater crested tern

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.17.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the greater crested tern, with respect to the significant impact criteria for migratory species, is included in Table 3-62.

Table 3-62 Significant impact assessment for the greater crested tern

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The greater crested tern was recorded on the shoreline within the Strategic Assessment Area during field surveys, with a maximum count of 19 individuals. Based upon field surveys and species feeding and roosting behaviours, the most likely areas for the species to roost within the Strategic Assessment Area would be the tidal flat habitat. The species may forage for fish widely across the Port Adelaide River and Gulf St Vincent. The area of shoreline likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the greater crested tern.

Criteria	Assessment
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The lifecycle of an ecologically significant proportion of the population of greater crested terns would be not likely to be seriously disrupted, because: – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the species, predominantly fish, would be unlikely to be notably affected as a result of the Actions and Classes of Actions proposed under The Plan. Temporary changes that could result from dredging would be localised and the species would be able to forage over the wider region of Port Adelaide River and Gulf St Vincent. – Given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), migration pathways are not likely to be disrupted. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the greater crested tern.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the greater crested tern becoming established in an area of important habitat for the species.

3.17.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.17.5 Conclusion – greater crested tern

Based upon the assessment in Section 3.17.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the greater crested tern. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.18 Grey-tailed tattler (*Tringa brevipes*)

3.18.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the grey-tailed tattler (*Tringa brevipes*) is provided in Table 3-63.

Table 3-63 Grey-tailed tattler listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	*Marine bioregional plan for the North-west Marine Region* (DSEWPC 2012b)
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The grey-tailed tattler is a migratory shorebird species that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. The species is found in most coastal regions in Australia, primarily in the north. In South Australia, the species is infrequently recorded along the coasts between Port MacDonnell and Denial Bay. It is also found west of Streaky Bay (DCCEEW 2024ae).

Preferred habitat of the grey-tailed tattler includes sheltered coasts with reefs and rock platforms or intertidal mudflats, as well as shores of rock, shingle, gravel or shells and on intertidal mudflats in embayments, estuaries and coastal lagoons, especially those fringed with mangroves (DCCEEW 2024ae).

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the grey-tailed tattler (DCCEEW 2024ae); however, the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical record is located on Bird Island, immediately north of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that may be suitable for foraging or sheltering include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1 Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. *habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or*

b. *habitat that is of critical importance to the species at particular life-cycle stages, and/or*

c. *habitat utilised by a migratory species which is at the limit of the species range, and/or*

d. *habitat within an area where the species is declining.*

The *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a) provides further information around important habitat for migratory shorebirds in Australia. Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara (approximately 14,633 ha) is 'important habitat' for migratory shorebird species, as it has been documented to support one percent of the individuals in a population of one species or subspecies of shorebird and a total documented abundance of at least 20,000 shorebirds.

Potential shorebird habitat within the Strategic Assessment Area contributes a proportionally small extent of potential habitat (approximately 5.12 ha) compared to the broader areas of important habitat in the region, including within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, and other habitats in the Gulf St Vincent region.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the grey-tailed tattler, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the grey-tailed tattler, are included in Table 3-64. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the grey-tailed tattler.

Table 3-64 Ecologically significant proportions and flyway information for the grey-tailed tattler

Detail	Estimate
Flyway population estimate	70,000
1% flyway population (internationally significant)	700
0.1% flyway population (nationally significant)	70
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.18.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the grey-tailed tattler include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to the grey-tailed tattler, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-65.

Table 3-65 Potential impacts of The Plan on the grey-tailed tattler

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.18.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the grey-tailed tattler, with respect to the significant impact criteria for migratory species, is included in Table 3-66.

Table 3-66 Significant impact assessment for the grey-tailed tattler

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The grey-tailed tattler was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has been recorded historically within the region, including adjacent to the Strategic Assessment Area on Bird Island. The species forages primarily on insects and molluscs. Based upon the species habitat preferences, and species feeding and roosting behaviours, the most likely areas for the species to forage or roost within the Strategic Assessment Area would be tidal flat habitat. The area likely to be directly impacted (2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the grey-tailed tattler.

Criteria	Assessment
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The lifecycle of an ecologically significant proportion of the population of the grey-tailed tattler would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the species, primarily invertebrates such as insects and molluscs, would only be reduced from within the 2.58 ha of tidal flats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. – There are limited resting areas for the species within the Strategic Assessment Area that the species would typically rest in. The nearest area where birds are known to congregate is on Bird Island, approximately 2 km from the onshore area of the Strategic Assessment Area. At this distance, negligible disturbance to species would result from the Actions and Classes of Actions proposed under The Plan that may produce regular noise or vibration. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the grey-tailed tattler.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance, while two introduced macroalgae species (*Caulerpa* spp.) are known to occur in Port Adelaide River. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the grey-tailed tattler becoming established in an area of important habitat for the species.

3.18.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.18.5 Conclusion – grey-tailed tattler

Based upon the assessment in Section 3.18.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the grey-tailed tattler. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.19 Wood sandpiper (*Tringa glareola*)

3.19.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the wood sandpiper (*Tringa glareola*) is provided in Table 3-67.

Table 3-67 Wood sandpiper listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Not prepared
Recovery plan	Not prepared
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	Nil
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The wood sandpiper is a shorebird that migrates to Australia via the East Asian-Australasian Flyway during its non-breeding season. The species is distributed across all states and territories in Australia, with large numbers in the north-west. In South Australia, the species occurs between the Eyre Peninsula and Old Nilpinna to Purnu Bore, observed most frequently on the Yorke Peninsula, Adelaide Plains and Murray Mallee (DCCEEW 2024af).

Preferred habitat includes well-vegetated, shallow, freshwater wetlands such as swamps, billabongs, lakes, pools and waterholes, as well as artificial wetlands (DCCEEW 2024af). The species is carnivorous and feeds mostly on insects and molluscs in the moist or dry mud at the edges of wetlands, along shores, amongst aquatic vegetation or in clear shallow water.

Species occurrence

Strategic Assessment Area

The Strategic Assessment Area is located within the known distribution of the wood sandpiper (DCCEEW 2024af); however the species was not observed during the 2023–2024 field surveys.

Regional occurrence

The nearest historical record is located on Torrens Island, approximately 3 km south-east of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or sheltering include:

– Constructed wetlands (2.54 ha), located within the onshore area of the Strategic Assessment Area, including a swale drain north of Mutton Cove Conservation Reserve.

Definitions

Important habitat

The definition of 'important habitat' in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. *habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or*

b. *habitat that is of critical importance to the species at particular life-cycle stages, and/or*

c. *habitat utilised by a migratory species which is at the limit of the species range, and/or*

d. *habitat within an area where the species is declining.*

The *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a) provides further information around important habitat for migratory shorebirds in Australia. Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara (approximately 14,633 ha) is 'important habitat' for migratory shorebird species, as it has been documented to support one percent of the individuals in a population of one species or subspecies of shorebird and a total documented abundance of at least 20,000 shorebirds.

Potential shorebird habitat within the Strategic Assessment Area contributes a proportionally small extent of potential habitat (approximately 5.12 ha) compared to the broader areas of important habitat in the region, including within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, and other habitats in the Gulf St Vincent region.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the wood sandpiper, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the wood sandpiper (*Tringa glareola*), are included in Table 3-68. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the wood sandpiper.

Table 3-68 Ecologically significant proportions and flyway information for the wood sandpiper

Detail	Estimate
Flyway population estimate	130,000
1% flyway population (internationally significant)	1,300
0.1% flyway population (nationally significant)	130
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.19.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the wood sandpiper include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the wood sandpiper, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-69.

Table 3-69 Potential impacts of The Plan on the wood sandpiper

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.19.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the wood sandpiper, with respect to the significant impact criteria for migratory species, is included in Table 3-70.

Table 3-70 Significant impact assessment for the wood sandpiper

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The wood sandpiper was not recorded within the Strategic Assessment Area or at any of the reference sites during field surveys. However, the species has been recently and historically recorded at Torrens Island Conservation Park, approximately 3 km south-east. The species is carnivorous and feeds mostly on insects and molluscs in moist or dry mud at the edges of wetlands, along shores, amongst aquatic vegetation and in clear shallow water. Based upon the species habitat preferences, and species feeding and roosting behaviours, the most likely area for the species to forage or roost within the Strategic Assessment Area would be the constructed wetland habitat. The area likely to be impacted (2.54 ha of constructed wetlands) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the wood sandpiper.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the wood sandpiper is estimated to be 130,000, with a nationally important proportion of 130 individuals (Hansen *et al*. 2016). No individuals were recorded from the Strategic Assessment Area or reference sites during field surveys. The lifecycle of an ecologically significant proportion of the population of the wood sandpiper would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the species, primarily insects and molluscs, would only be reduced from within the 2.58 ha tidal flats and 2.54 ha constructed wetland which would comprise a negligible portion of the available tidal areas available along the approximate 60 km shoreline of Gulf St Vincent. – Migration pathways within the East Asian-Australasian Flyway would not be obscured and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations) and location of the Strategic Assessment Area near to the southern extent of the flyway. – There are limited areas for the species within the Strategic Assessment Area that the species would typically rest in. The nearest area where wood sandpipers are known to congregate, is at the Barker Inlet Wetlands, approximately 8 km south-west from the onshore area of the Strategic Assessment Area. At this distance, negligible disturbance would result from the Actions and Classes of Actions proposed under The Plan that may produce noise or vibration. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the wood sandpiper.

Criteria	Assessment
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the wood sandpiper becoming established in an area of important habitat for the species.

3.19.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.19.5 Conclusion – wood sandpiper

Based upon the assessment in Section 3.19.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the wood sandpiper. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

3.20 Marsh sandpiper (*Tringa stagnatilis*)

3.20.1 Description

Species information

EPBC Act status and statutory documents

A summary of the EPBC Act status and relevant statutory documents for the marsh sandpiper (*Tringa stagnatilis*) is provided in Table 3-71.

Table 3-71 Marsh sandpiper listing summary

Listing information	Details
Threatened category	Not listed
Migratory status	Listed
Marine status	Listed
Conservation advice	Nil
Recovery plan	Nil
Relevant threat abatement plan(s)	Nil
Relevant wildlife conservation plan	*Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a)
Marine bioregional plan(s)	Nil

Listing information	Details
Other Commonwealth documents	*EPBC Act Policy Statement 3.21 – Industry Guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoE 2015f) *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023)

Habitat and distribution

The marsh sandpiper breeds in the Northern Hemisphere and migrates to Australia via the East Asian-Australasian Flyway. The species occurs individually or in small to large flocks, associating often with other waders, including greenshanks. In South Australia the species has been noted to prefer inland saline lakes and coastal saltworks, with infrequent records in mangroves (DCCEEW 2024ah).

The species is carnivorous and forages on insects, molluscs and other prey on the edges of wetlands of varying salinity. Feeding is done by probing wet mud in mudflats and marshland.

Species occurrence

Strategic Assessment Area

The species was not observed during surveys conducted within the Strategic Assessment Area and the surrounding region.

Regional occurrence

The Penrice Saltworks in South Australia has been identified to be a site of national importance (DCCEEW 2024ah). This area is approximately 4 km north of the onshore area of the Strategic Assessment Area.

Habitat presence

Habitat located within the Strategic Assessment Area that would be suitable for foraging or roosting include:

– Tidal flats (2.58 ha), located along the shoreline at the interface of the Strategic Assessment Area onshore area and marine area and includes small patches of mangrove shrubland (0.35 ha).
– Constructed wetlands (2.54 ha), located within the onshore area of the Strategic Assessment Area, including a stormwater drain located in Falie Reserve, and a swale drain north of Mutton Cove Conservation Reserve.

Definitions

Important habitat

The definition of ‘important habitat’ in the *Significant impact guidelines 1.1: Matters of National Environmental Significance* (Commonwealth of Australia 2013a), includes:

a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or

b. habitat that is of critical importance to the species at particular life-cycle stages, and/or

c. habitat utilised by a migratory species which is at the limit of the species range, and/or

d. habitat within an area where the species is declining.

The *Wildlife Conservation Plan for Migratory Shorebirds* (DoE 2015a) provides further information around important habitat for migratory shorebirds in Australia. Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara (approximately 14,633 ha) is ‘important habitat’ for migratory shorebird species, as it has been documented to support one percent of the individuals in a population of one species or subspecies of shorebird and a total documented abundance of at least 20,000 shorebirds.

Potential shorebird habitat within the Strategic Assessment Area contributes a proportionally small extent of potential habitat (approximately 5.12 ha) compared to the broader areas of important habitat in the region, including within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara, and other habitats in the Gulf St Vincent region.

In accordance with the definition provided in the *Significant impact guidelines 1.1* (Commonwealth of Australia 2013a), the habitat within the Strategic Assessment Area may constitute important habitat for the marsh sandpiper, as it is part of a broader area of habitat within the region (including Adelaide International Bird Sanctuary), that could be used at least on an occasional basis.

Ecologically significant proportion

Flyway details, indicating ecologically significant proportions for the marsh sandpiper, are included in Table 3-72. The Strategic Assessment Area as an independent unit is not known to support an ecologically significant proportion of the marsh sandpiper.

Table 3-72 Ecologically significant proportions and flyway information for the marsh sandpiper

Detail	Estimate
Flyway population estimate	130,000
1% flyway population (internationally significant)	1,300
0.1% flyway population (nationally significant)	130
Maximum count (within the Strategic Assessment Area) during migratory bird survey	0

3.20.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to the marsh sandpiper include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to the marsh sandpiper, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 3-73.

Table 3-73 Potential impacts of The Plan on the marsh sandpiper

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) Altered behaviour of a species
Indirect potential impacts	Habitat degradation caused by: – Erosion and sedimentation – Altered hydrological regime – Introduction and spread of weeds

Impact	Description
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

3.20.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on the marsh sandpiper, with respect to the significant impact criteria for migratory species, is included in Table 3-74.

Table 3-74 Significant impact assessment for the marsh sandpiper

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The marsh sandpiper was not recorded within the Strategic Assessment Area or at any reference site during field surveys. However, the species has been recorded historically at the Penrice Saltworks, approximately 4 km north of the onshore area of the Strategic Assessment Area. The species forages on insects, molluscs and other prey, usually at the edges of wetlands or in adjacent vegetation. Based upon field surveys, the most likely areas for the species to forage or roost within the Strategic Assessment Area would be tidal flat and constructed wetland habitats. The area likely to be directly impacted (2.54 ha of constructed wetlands and 2.58 ha of tidal flats) is a relatively small proportion (less than 1%) of available habitat in the surrounding region, which is unlikely to be impacted by the Actions or Classes of Actions proposed under The Plan. As a result, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially modify destroy or isolate an area of important habitat for the marsh sandpiper.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The East Asian-Australasian flyway population of the marsh sandpiper is estimated to be 130,000, with a nationally important proportion of 130 individuals (Hansen *et al.* 2016). No individuals were recorded from the Strategic Assessment Area or reference sites during field surveys. The lifecycle of an ecologically significant proportion of the population of the marsh sandpiper would be not likely to be seriously disrupted, because: – The species does not breed within Australia – Based upon surveys and understanding of the region, it is unlikely that the habitats present within the Strategic Assessment Area would support an ecologically significant proportion of the population of the species – Individuals are not likely to be subject to direct mortality or injury from vehicle or equipment strikes as they are mobile and can fly (the species does not breed in Australia, so all birds present are fledged and independent), and vehicles and vessels operating in a construction site and controlled shipping channel) are not likely to travel at high speeds. – Feeding resources known to be used by the species, primarily insects and molluscs would only be reduced from within the tidal flat and constructed wetland habitats. This would be a negligible portion (less than 1%) of habitat available along the approximate 60 km shoreline of Gulf St Vincent. – The migration pathway within the East Asian-Australasian Flyway is unlikely to be disrupted, and the species would not be likely to become disoriented, given the existing light environment (including existing Osborne Naval Shipyard, port, cruise ship terminal, residential areas, train line and power stations), and the location of the Strategic Assessment Area near the southern extent of the flyway. – There are limited resting areas for the species within the Strategic Assessment Area that the species would typically rest in. The nearest area where birds are known to congregate, is the former Penrice Saltworks more than 4 km north from the onshore area of the Strategic Assessment Area. At this distance, negligible disturbance to species would result from the Actions and Classes of Actions proposed under The Plan that may produce noise or vibration. In consideration of the above, The Plan would not be likely to seriously disrupt the lifecycle of an ecologically significant proportion of the marsh sandpiper.

Criteria	Assessment
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	The onshore area of the Strategic Assessment Area is known to contain several introduced species, including four weeds of national significance. Pest fauna species have also been recorded. Submarine Construction Yard infrastructure is to be sited within the onshore area and Port Adelaide River bank, at the interface between the onshore and marine areas. During site establishment and preparation, bulk earthworks are proposed to be conducted that are likely to remove plants, including introduced species, from the onshore area. Construction plant and equipment would be contained within the extent of the Strategic Assessment Area, and would not be likely to cause the introduction or spread of weeds to adjacent areas of Mutton Cove, Torrens Island or within Adelaide International Bird Sanctuary National Park – Winaityinaityi Pangkara. As existing introduced species would likely be removed and a pathway to the introduction, spread and proliferation of species would not occur as a result of the Actions or Classes of Actions proposed under The Plan, it would not be likely that The Plan would result in invasive species that are harmful to the marsh sandpiper becoming established in an area of important habitat for the species.

3.20.4 Mitigation measures

Mitigation measures that are to be implemented to avoid or minimise the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan, on migratory species known, likely or with the potential to occur within the Strategic Assessment Area, are summarised in Table 1-3.

3.20.5 Conclusion – marsh sandpiper

Based upon the assessment in Section 3.20.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on the marsh sandpiper. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

4. The environment

4.1 Landscapes and soils

4.1.1 Description

Landscapes features and landforms

Historically there were two distinct landforms over the Lefevre Peninsula: sand dunes to the west and flat, open, low-lying land to the east. During the establishment of Port Adelaide, spoil from dredging of the harbour was used as land reclamation fill for the low-lying tidal area in the east which includes the Strategic Assessment Area. Presently, the topography of the Strategic Assessment Area is characterised by flat terrain that has been historically filled and levelled. As a result, the onshore area of the Strategic Assessment Area does not include natural landscape features and landforms.

Mutton Cove is the only part of the Lefevre Peninsula that has remained at a pre-fill level, although vegetation has been altered over time due to changes in tidal connectivity. Mutton Cove is surrounded by buffer mounds on the northern, western and southern sides.

The existing hydrological environment of the onshore area of the Strategic Assessment Area comprises constructed stormwater management basins, including a pumped system from Falie Reserve to the eastern basin, whilst the Port Adelaide River is predominantly hardened on its western and southern banks (including at its interface with the onshore area of the Lefevre Peninsula) and in a predominantly natural state on its northern and eastern banks (at its interface with Torrens Island).

Natural dune systems and wetlands occur in the surrounding region, including on most of Torrens Island, with the exception of developed areas. One developed area, known as Bird Island, was created during the 1970s and 1990s using dredge material, and has since been extended through natural processes.

Soils and other substrates

The surface material within the Strategic Assessment Area is comprised of fill material from various sources. Below the fill layer, the general geological sequence is expected to comprise of marine origin sediments (unconsolidated sands) up to 15 m in thickness, underlain by Quaternary age sediments including Hindmarsh clay, under which lie Tertiary-aged undifferentiated sediments (Greencap 2018).

4.1.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to landscapes and soils include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure

Potential impacts

Potential impacts to landscapes and soils, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-1.

Table 4-1 Potential impacts of The Plan on landscapes and soils

Impact	Description
Direct potential impacts	Changes to landform and landscapes Mobilisation of pollutants Changes to environmental amenity
Indirect potential impacts	Habitat degradation
Cumulative effects	Successive cumulative effect Incremental cumulative impact

4.1.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on landscapes and soils within and surrounding the Strategic Assessment Area, with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-2.

Table 4-2 Significant impact assessment for landscapes and soils

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially alter natural landscape features	Due to the substantial bulk earthworks that have occurred within the Strategic Assessment Area and the Lefevre Peninsula generally, the landscape within the onshore area of the Strategic Assessment Area has been modified from its natural state and does not contain natural landscape features. The Strategic Assessment Area has been subject to land reclamation over the past 50 years of development on the Lefevre Peninsula. Constructed hydrological features are also present, including stormwater management basins in Falie Reserve and the eastern basin north of Mutton Cove. The Actions and Classes of Actions proposed under The Plan are not expected to substantially alter the natural landscape features of Port Adelaide River as it has historically been, and is currently, hardened along most of its southern and western bank, including the riverbanks within the Strategic Assessment Area. Natural landscape features occur in the surrounding region to the north and east of the Strategic Assessment Area. These include the coastal and wetland areas of Barker Inlet, and Torrens Island Conservation Reserve. There are no aspects of the Actions and Classes of Actions proposed under The Plan that are likely to result in substantial alteration to natural landscape features outside of the Strategic Assessment Area, as works are to be limited to within the Strategic Assessment Area, and indirect impacts are not anticipated to alter natural landscape features. Some areas within the assembly and testing area of the Submarine Construction Yard may be altered from their existing condition to create basins and launch facilities. However, the size of these facilities, if required is uncertain. Whilst the natural landscape features present within the Strategic Assessment Area have previously been modified, the Actions and Classes of Actions proposed under The Plan may result in the alteration of natural landscapes within the Strategic Assessment Area. The Plan is not anticipated to result in substantial alterations to natural landscape features in the surrounding area.
Cause subsidence, instability or substantial erosion	Bulk earthworks are necessary to establish the Submarine Construction Yard. Such activities have historically occurred within the Strategic Assessment Area, with much of the Lefevre Peninsula having been established as a result of land reclamation and levelling. Volumes of filling and excavation, as well as final depths and site levels, are being finalised as part of design. Designs of the Submarine Construction Yard will incorporate the requirements of the International Atomic Energy Agency and standard engineering requirements to consolidate and stabilise ground conditions (in a similar way to the established and stable areas present within the existing Osborne Naval Shipyard). As such, the Actions and Classes of Actions proposed under The Plan are not expected to cause subsidence, instability or substantial erosion.

Criteria	Assessment
Involve medium or large-scale excavation of soil or minerals	The Actions associated with the Class of Actions 'Construction of the Submarine Construction Yard', proposed under The Plan will involve medium to large-scale excavation of soil within the onshore area and at the marine area interface of the Strategic Assessment Area. Similar medium to large-scale bulk earthworks have been undertaken within the onshore area over several years. The medium to large-scale excavation works would be predominantly associated with the Site Establishment and Preparation Action and would not result in an excavated void or similar (for example, as an excavation activity for a mine site or quarry would), as the excavation of soil would be associated with ground improvement rather than extraction. The landscape following the medium or large-scale excavations will be at a finished level in consideration of future climate risks and International Atomic Energy Agency requirements. Medium to large-scale excavation of soil would occur during construction of the Submarine Construction Yard. Design elements including final levels, depths and volumes of material to be excavated are yet to be finalised.

4.1.4 Mitigation measures

Measures to be implemented to avoid or reduce the potential for impacts to landscapes and soils are provided in Table 4-3. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-3 SMART mitigation measures for potential impacts associated with landscapes and soils

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented?	How will this be measured?	Is this a realistically achievable and well-established approach?	How is this relevant to The Plan?	When will this be implemented?
Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Measured by an inspection and monitoring program – Measured against performance indicators – Legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of sediment – Mobilisation of contaminants – Hydrological changes	**During construction:** – For works involving bulk earthworks below imported fill level – For works involving piling – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Dewatering Management Plan, which is be included in the Construction Environmental Management Plan. This plan will detail: – Dewatering techniques – Anticipated dewatering flow rate, duration and total volume – Assessment of water quality – Water collection, storage, treatment and disposal options – Acid Sulfate Soils Management Plan – Investigation waste management hierarchy – Contingency plans – Equipment maintenance plans – Requirements of the EPA Licence for earthworks drainage – Monitoring and reporting requirements	– Implement an inspection and monitoring program – Measure against performance indicators, to assess the quality and quantity of water being discharged	– Standard established mitigation measure – State government requirement	– Mobilisation of contaminants	**During construction:** – For works involving dewatering
Prepare a Site Contamination Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will include: – Remediation goals, objectives and endpoints – Acid Sulfate Soil Management Plan	– Implement an inspection and monitoring program – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of contaminants	**During construction:** – For works involving bulk earthworks below imported fill – For works involving piling methodologies where spoil is generated – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Prepare a Remediation Strategy to address source areas of contamination. This strategy will detail: – Remediation options assessment – Key endpoints for remediation – Timeframes	– Monitor compliance – Report remediation status	– Standard established mitigation measure – State government requirement	– Changes to soil chemistry	**During construction:** – For works involving remediation activities **During operation:** – For works involving remediation activities

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare an Acid Sulfate Soil Management Plan (if acid sulfate soil is found to be present), which is to be included in the Construction Environmental Management Plan. This plan will detail: – Mitigation measures for excavation and disturbance of acid sulfate soil materials – Mitigation measures for oxidation – Treatment plans – Disposal procedures (to an appropriate facility) – Stockpile management measures	– Implement an inspection and monitoring program – Measure against performance indicators	– Standard established mitigation measure – State government requirement	– Changes to soil chemistry	**During construction:** – For works involving bulk earthworks below imported fill – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

4.1.5 Conclusion

Based upon the assessment in Section 4.1.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan as potential to impact on landscapes and soils. The mitigation measures outlined in 4.1.4 are intended to avoid and reduce the potential for impacts. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, potential impacts, and mitigation measures, it was assessed that these potential impacts would be likely to be acceptable.

4.2 Coastal landscapes and processes

4.2.1 Description

Coastal landscapes

Coastal landscapes present in the region of the Lefevre Peninsula include natural areas such as shorelines including tidal areas, mudflats, subtidal flats, beaches and sand dunes, islands, and the tidally influenced Port Adelaide River which extends into Gulf St Vincent. In addition to natural coastal landscapes, man-made elements such as riverbank hardening, break walls, groynes, and other maritime infrastructure, are present.

Formerly comprised of dunes and mudflats, coastal landscapes of the Lefevre Peninsula have historically been modified as a result of filling and levelling. In addition, the Port Adelaide Riverbank was historically hardened across most of its extent along the Lefevre Peninsula, with a seawall formerly extending around it, including along the interface between the onshore area and the marine area of the Strategic Assessment Area, as well as along the Mutton Cove shoreline. Much of this seawall has since deteriorated or been hardened for other infrastructure development.

The Lefevre Peninsula is shaped by the Port Adelaide River, a tidal inlet from the Gulf of St Vincent. The river is characterised by tidal mudflats and mangroves, which occur predominantly on its northern and eastern banks.

The coastal landscape of the Strategic Assessment Area includes:

– Tidal flat areas
– Subtidal areas within the Port Adelaide River, between the southern bank and the shipping channel, including an area of seagrass
– Shipping channel
– Subtidal and intertidal areas within the Port Adelaide River, adjacent to Torrens Island north of the shipping channel

The entrance to the Port Adelaide River comprises constructed breakwaters. It contains a dredged shipping channel which is regularly maintained to a depth of 14.2 m at the entrance, decreasing to a depth of 9.3 m at the northern bend of the Lefevre Peninsula (Navionics 2024). Bird Island, an extension of Torrens Island to the north of the Lefevre Peninsula, was established as a result of historic dredging of Port Adelaide River.

Related to estuarine landscapes, there are two Nationally Important Wetlands located in the vicinity of the Strategic Assessment Area:

1. Barker Inlet and St Kilda
2. Port Gawler and Buckland Park Lake

The Strategic Assessment Area intersects part of the mapped extent of the Barker Inlet and St Kilda wetland. This wetland is identified as nationally important as it exemplifies an extensive mangrove and saltmarsh community, being the largest in the Gulf of St Vincent, and in close proximity to a city. The Port Gawler and Buckland Park Lake nationally important wetland is located north of the Strategic Assessment Area and contains Buckland Park Lake, which is the only substantial freshwater wetland habitat on the Adelaide Plains. These wetlands provide habitat for EPBC Act listed threatened species also observed within the Strategic Assessment Area, including the sharp-tailed sandpiper (*Calidris acuminata*) and common greenshank (*Actitis hypoleucos*) (DCCEEW 2019).

Up to 3.49 ha of sparse seagrass meadow located between the shoreline and the Port Adelaide River navigation channel would be removed. Up to 5,000 km^2 of seagrass coverage is estimated to exist within Gulf St Vincent (EPA SA 2009). Threats to seagrass populations include sediment and turbidity and the presence of *Caulerpa cylindracea*, an exotic marine algae that can outcompete and overgrow native species (PIRSA 2017). No *Caulerpa* species were identified in recent surveys within the Strategic Assessment Area (J Diversity 2023).

Coastal processes

The Port Adelaide River and tidal zones of the Lefevre Peninsula, including Mutton Cove, are subject to two complete tidal cycles per day (semidiurnal tides). The Port Adelaide River contains a maintained shipping channel which moderates the potential natural availability and movement of sediments in the system. The system is subject to regular boat traffic.

Gulf St Vincent, to which Port Adelaide River extends, is a relatively low energy environment. Processes are more restricted to the nearshore environment compared to high wave energy coastal environments, with water movement along the shoreline rather than away from the coast. Littoral transport, the movement of sediments by waves and currents, is typically towards the north along the coast.

The Lefevre Peninsula and surrounding region are subject to constant change due to coastal processes influenced by the hydrodynamics of Gulf St Vincent.

4.2.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to coastal landscapes and processes include:

– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to coastal landscapes and processes, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-4.

Table 4-4 Potential impacts of The Plan on coastal landscapes and processes

Impact	Description
Direct potential impacts	Mobilisation of pollutants Changes to landforms and landscapes – Potential effects on water circulation due to changes to the shoreline – Alteration to sediment movement of dredging Changes to environmental amenity Clearing of vegetation / habitat loss – Seagrass meadow (3.49 ha)
Indirect potential impacts	Habitat degradation
Cumulative effects	Incremental cumulative effect

4.2.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on coastal landscapes and processes within and surrounding the Strategic Assessment Area, with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-5.

Table 4-5 Significant impact assessment for coastal landscapes and processes

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Alter coastal processes, including wave action, sediment movement or accretion, or water circulation patterns	The infrastructure to be developed under The Plan includes maritime structures along the shoreline at the interface between the onshore area and the marine areas. These would affect a change to the profile of the river bank within the Strategic Assessment Area, including changes to approximately 750 m of shoreline, which may cause localised changes to water circulation, tidal flat and seagrass habitat. Existing maintenance dredging programs are undertaken to support shipping and vessel movements along the Port Adelaide River. This existing process would have substantially altered the natural sediment movement and accretion processes from historical processes that would have occurred within the river. The extent of geomorphological changes likely to be affected by construction of maritime infrastructure is to be modelled and interrogated, to support the development of a design that would manage water flows to reduce the potential for scour, sediment build up, or other potential impacts to the waterway. Design will be required to consider processes and minimising impacts, along with ongoing maintenance, though localised geomorphological changes to sediment movement and accretion and water circulation may occur as a result of dredging and maritime infrastructure.
Permanently alter tidal patterns, water flows or water quality in estuaries	Maritime infrastructure to be developed under The Plan would alter the profile of the riverbank within the Strategic Assessment Area, and designed in a way that enables ongoing tidal movement and water flows (and vessel movements). Actions and Classes of Actions proposed under The Plan are not expected to permanently alter tidal patterns or water flows within the Port Adelaide River. The Actions and Classes of Actions proposed under The Plan will involve capital dredging within the marine area of the Strategic Assessment Area, for the construction of maritime infrastructure. Existing maintenance dredging programs are undertaken to support shipping and vessel movements along the Port Adelaide River. There is potential for localised, temporary impacts to water quality during dredging operations. The Plan is not likely to cause a permanent reduction in water quality within the any of the estuarine areas in the surrounding area.

Criteria	Assessment
Reduce biological diversity or change species composition in estuaries	Infrastructure associated with The Plan is predominantly to be developed within the onshore area of the Strategic Assessment Area and at its interface with the Port Adelaide River. Capital dredging for maritime infrastructure and vessel movements would occur within Port Adelaide River. Aspects of The Plan that occur within Port Adelaide River intersect with the Nationally Important Wetlands, Barker Inlet and St Kilda within the river. This wetland also includes regions of Torrens Island outside developed areas. Port Gawler and Buckland Park Lake wetland are situated immediately to the north and extends towards the north along the coast of Gulf St Vincent. Four biologically important areas for fairy tern, black-faced cormorant, Australian sea lion and Southern right whale also intersect the desktop search area. The implementation of The Plan is not anticipated to result in a reduction in biological diversity or change the species composition within the Port Adelaide River estuary. The direct impact and removal of 3.49 ha of seagrass is less than 1% of that available within Gulf St Vincent. The construction of maritime infrastructure and dredging proposed as part of the Actions and Classes of Actions may result in temporary and localised impacts to water quality. *Caulerpa* species have not recently been identified in surveys of the Strategic Assessment Area (J Diversity 2023), so there is limited potential for the introduction of a pest species that could affect biological diversity or change species composition in an estuarine area. This would be reassessed prior to dredging activities. It is not anticipated that The Plan would reduce biological diversity or change species composition in the estuarine environment, however further assessment of conditions is required prior to undertaking dredging activities.
Extract large volumes of sand or substantially destabilise sand dunes	To establish maritime infrastructure, capital dredging would occur within Port Adelaide River between the shoreline and the existing shipping channel. In addition, depending upon the draft of the submarine, dredging may need to be undertaken in the future within the shipping channel. The process of dredging would extract large volumes of material from the river bed, including sand. As documented, dredging has occurred within Port Adelaide River for several years. Two major dredging campaigns have occurred for channel deepening and widening to accommodate the draft of contemporary freight vessels. Dredging for The Plan will be subject to State approvals and controls, and the Action of dredging cannot proceed without standard management measures in place. If required, dredging within the Port Adelaide River would extract an unknown volume of sand, in addition to material that would be removed in constructing maritime infrastructure. Whilst the effect of dredging is well understood with well-established required controls, and has occurred within Port Adelaide River on several occasions, there is potential that the extraction of large volumes of sand may result in a significant impact to the environment. As there are no natural sand dunes located within the Strategic Assessment Area, the Actions and Classes of Actions proposed under The Plan would not substantially destabilise sand dunes.

4.2.4 Mitigation measures

Measures to be implemented to avoid or reduce the potential for impacts to coastal landscapes and processes are provided in Table 4-6. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-6 SMART mitigation measures for potential impacts associated with coastal landscapes and processes

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Measured by an inspection and monitoring program – Measured against performance indicators – Legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of sediment	**During construction:** – For works involving bulk earthworks below imported fill level – For works involving piling – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Prepare a Biosecurity Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: – Identified Weeds of National and State Significance relevant to the Strategic Assessment Area – Identified Marine Pests of National Significance relevant to the Strategic Assessment Area – Performance indicators – Mitigation measures – Roles and responsibilities – Potential impacts on the environment – Monitoring plan	– Implement an inspection and monitoring program – Measure against performance indicators	– Standard established mitigation measure – State and federal government requirement	– Clearing of vegetation	**During construction:** – For works involving clearing of vegetation – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Dredge Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Scope, methodology, environmental management, contingency and incident response – Potential impacts on the environment, public health and amenity – Mitigation measures – Water quality monitoring plan – Community consultation / communication	– Measured by the EPA when acquiring a dredge licence – Conduct mandatory water quality monitoring	– Standard established mitigation measure – State government requirement	– Geomorphological changes	**During construction:** – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

4.2.5 Conclusion

Based upon the assessment in Section 4.2.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan has potential to impact on coastal landscapes and processes. The mitigation measures outlined in 4.2.4 are intended to avoid and reduce the potential for impacts. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, potential impacts, and mitigation measures, it was assessed that these potential impacts would be likely to be acceptable.

4.3 Ocean forms, ocean processes and ocean life

4.3.1 Description

Ocean forms

Ocean forms are the structures that make up marine environments. They encompass the shape of the ocean floor, and related values such as reefs and other large natural structures. Ocean forms interact with and influence ocean processes and are also influenced by them.

The Strategic Assessment Area is located near the confluence of the Port Adelaide River and the ocean environment of Gulf St Vincent. It is not considered to be an ocean environment although it is considered a marine environment, due to the tidal reach. Because it is not located within the ocean, there are no notable ‘ocean forms’ present within the Strategic Assessment Area.

Ocean processes

Ocean processes are the physical processes of movement and flows within a marine environment that influence marine ecosystems and the species that inhabit them. The Strategic Assessment Area is subject to tidal movements, with the Port Adelaide River connecting to the Gulf St Vincent however it is not considered to be located within an ocean environment, so there are no ocean processes that take place within the Strategic Assessment Area.

Ocean life

Ocean life includes the marine flora and fauna that inhabit a marine environment.

The Strategic Assessment Area incorporates an area of the Port Adelaide River that is tidally influenced and supports fauna species that are considered to be 'ocean life' including resident and transient populations of bottlenose dolphins and other marine species. The Adelaide Dolphin Sanctuary was dedicated in 2005 by the South Australian Government to protect this dolphin population and conserve its habitat.

Whilst the Lefevre Peninsula has been largely industrialised by shipping and other maritime uses, natural areas that may comprise sensitive marine environments, occur in the region including two Nationally Important Wetlands located in the vicinity of the Strategic Assessment Area:

1. Barker Inlet and St Kilda
2. Port Gawler and Buckland Park Lake

Seagrass meadows, which support the marine ecosystem by providing food and habitat, are present along the shallower banks of the Port Adelaide River outside of the shipping channel which has previously been dredged (J Diversity 2023). Tidal flats and shallow tidal seagrass habitats that support several fish and invertebrate species also occur in Barker Inlet, as well as in nearshore areas within Gulf St Vincent.

Twenty listed marine species were assessed by the likelihood of occurrence assessment as 'known to occur', 'likely to occur' or having the 'potential to occur' within the Strategic Assessment Area (listed in Table 4-7) which are not previously assessed as an EPBC Act listed threatened species (Table 2-1) or listed migratory species (Table 3-1).

Table 4-7 Listed marine species potentially relevant to the Strategic Assessment Area

Scientific name	Common name
Anthus australis	Australasian pipit
Ardea intermedia plumifera	Plumed egret
Ardea modesta	Eastern great egret
Biziura lobata menziesii	Musk duck
Chalcites osculans	Black-eared cuckoo
Charadrius ruficapillus	Red-capped plover
Chroicocephalus novaehollandiae	Silver gull
Haliaeetus leucogaster	White-bellied sea eagle
Himantopus himantopus	Pied stilt
Larus pacificus	Pacific gull
Neophema petrophila zietzi	Rock parrot
Pelecanus conspicillatus	Australian pelican
Phalacrocorax fuscescens	Black-faced cormorant
Recurvirostra novaehollandiae	Red-necked avocet
Sterna striata	White-fronted tern
Threskiornis moluccus	Australian white ibis
Tursiops aduncus	Indian Ocean bottlenose dolphin
Tursiops truncatus	Bottlenose dolphin
Zapornia tabuensis	Spotless crake

4.3.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to ocean forms ocean processes and ocean life include:

- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to ocean forms, processes and ocean life, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-8.

Table 4-8 Potential impacts of The Plan on ocean forms, processes and ocean life

Impact	Description
Direct potential impacts	Mortality or injury of fauna – Potential effect on ocean life as a result of an accidental release of waste material and litter – vessel strike Clearing of vegetation / habitat loss – Seagrass meadow (3.49 ha) Mobilisation of pollutants Changes to environmental amenity – Disturbance and disruption to foraging and resting behaviour due to noise or vibration
Indirect potential impacts	Habitat degradation caused by: – Sedimentation and turbidity – Changes to water quality – Smothering of habitat – Temporary reduced visibility
Cumulative effects	Incremental cumulative effect: – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

4.3.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on ocean forms, ocean processes and ocean life within and surrounding the Strategic Assessment Area with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-9.

Table 4-9 Significant impact assessment for ocean forms, ocean processes and ocean life

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Reduce biological diversity or change species composition on reefs, seamounts or in other sensitive marine environments	There are no reefs or seamounts in the Strategic Assessment Area, or surrounding region. Seagrass is present within shallower banks of the Port Adelaide River outside of the shipping channel of the Port Adelaide River as well as Barker Inlet and in nearshore areas within Gulf St Vincent. An area of seagrass (3.49 ha) that occurs between the shipping channel and the shoreline would be removed for the purposes of establishing maritime infrastructure. Seagrass within the Strategic Assessment Area forms a small part of a wider network of seagrass beds in the surrounding region which provide foraging habitat for marine species. The implementation of The Plan is not anticipated to result in a reduction in biological diversity or change the species composition within the Port Adelaide River estuary. Movement of dolphins and other ocean life along Port Adelaide River would not be restricted as a result of the Actions and Classes of Actions proposed under The Plan. The direct impact and removal of 3.49 ha of seagrass is less than 1% of that available within Gulf St Vincent. The construction of maritime infrastructure and dredging proposed as part of the Actions and Classes of Actions may result in temporary and localised impacts to water quality. *Caulerpa* species have not recently been identified in surveys of the Strategic Assessment Area (J Diversity 2023), so there is limited potential for the introduction of a pest species that could affect biological diversity or change species composition in an estuarine area. This would be reassessed prior to dredging activities. Activities within the marine area, including the construction of maritime infrastructure and dredging, have potential to generate underwater noise and vibration, and may result in changes to marine fauna behaviour and avoidance of the area of the activity. It is not anticipated that The Plan would reduce biological diversity or change species composition within a sensitive marine environment, however further assessment of conditions is required prior to undertaking dredging activities.
Alter water circulation patterns by modification of existing landforms or the addition of artificial reefs or other large structures	The Actions and Classes of Actions proposed under The Plan do not involve the addition of an artificial reef. The infrastructure to be developed under The Plan includes maritime structures that would change the profile of the riverbank landform within the Strategic Assessment Area. This may result in localised changes to water circulation patterns.
Substantially damage or modify large areas of the seafloor or ocean habitat, such as seagrass	The marine area of the Strategic Assessment Area is an area of the Port Adelaide River that, although near the confluence of the Port Adelaide River and Gulf St Vincent, does not comprise an ocean. Therefore, the Actions and Classes of Actions proposed under The Plan would not substantially damage or modify areas of the seafloor. The marine area of the Strategic Assessment Area is located within an estuarine environment and covers a conservative extent for assessment and design purposes. This means that it is substantially larger than the extent likely to be required for construction and operation of the Submarine Construction Yard. Whilst not strictly 'ocean habitat', an approximate area of 3.49 ha of seagrass that occurs between the shipping channel and the shoreline would be removed for the purposes of establishing maritime infrastructure. The direct impact and removal of 3.49 ha of seagrass is less than 1% of that available within Gulf St Vincent. Future dredging that may be necessary to cater to the draft of the submarine would be limited to the shipping channel, which has previously been dredged and is not likely to contain substantial seagrass meadows. In the context of the ocean environment, and the presence of seagrass in the region, a reduction of 3.49 ha of seagrass would not substantially damage or modify seagrass to the extent that it would cause a significant impact to marine life.

Criteria	Assessment
Release oil, fuel, or other toxic substances into the marine environment in sufficient quantity to kill larger marine animals or alter ecosystem processes	The Actions and Classes of Actions proposed under The Plan would use substances that include oil, fuels, or other chemicals for operation of plant and equipment, manufacturing and propulsion, which may be toxic to the marine environment. The transport, storage, handling and use of all such substances is subject to licencing and permit conditions as well as national health and safety legislation. The Actions and Classes of Actions proposed under The Plan will involve capital dredging within the marine area of the Strategic Assessment Area, for the construction of maritime infrastructure. Existing maintenance dredging programs are undertaken to support shipping and vessel movements along the Port Adelaide River. There is potential for localised, temporary impacts to water quality during dredging operations from the disturbance of sediments. Due to the industrialised nature of the Port Adelaide River, there is potential that disturbed sediments may contain heavy metals or other contaminants. It would not be likely that quantities of hazardous materials or other toxic substances would be disturbed or released into the environment that could kill larger marine mammals or alter ecosystem processes.
Release large quantities of sewage or other waste into the marine environment	The Lefevre Peninsula has service connections for sewage, waste water and waste collection. Temporary construction facilities and permanent infrastructure would be connected to this existing infrastructure. As a result, large quantities of sewage or other waste material are not expected to be released directly into the marine environment.

4.3.4 Mitigation measures

Measures to be implemented to avoid or reduce the potential for impacts to ocean forms, ocean processes and ocean life are provided in Table 4-10. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-10 SMART mitigation measures for potential impacts associated with ocean forms, ocean processes and ocean life

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented?	How will this be measured?	Is this a realistically achievable and well-established approach?	How is this relevant to The Plan?	When will this be implemented?
Prepare an Underwater Noise Management Framework, so that the Contractor can prepare an Underwater Noise Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: – Performance outcomes – Standards – Measurement criteria – Adaptive management approach	– Measure against performance outcomes, including avoidance of injury or impact to marine life (including dolphins)	– Standard established mitigation measure – State government requirement	– Vibration – Noise – Mortality or injury of native animals	**During construction:** – For works in the marine environment – For works involving piling at the onshore area, near the marine environment

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Dredge Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Scope, methodology, environmental management, contingency and incident response – Potential impacts on the environment, public health and amenity – Mitigation measures – Water quality monitoring plan – Community consultation / communication	– Measured by the EPA when acquiring a dredge licence – Conduct mandatory water quality monitoring	– Standard established mitigation measure – State government requirement	– Vibration – Noise – Mobilisation of sediment – Mobilisation of gross pollutants	**During construction:** – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of sediment – Mobilisation of gross pollutants	**During construction:** – For works involving bulk earthworks below imported fill level – For works involving piling – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Prepare a Site Contamination Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will include: – Remediation goals, objectives and endpoints – Acid Sulfate Soil Management Plan	– Implement an inspection and monitoring program – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of gross pollutants	**During construction:** – For works involving bulk earthworks below imported fill – For works involving piling methodologies where spoil is generated – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Waste Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Identification of waste types – Collection and storage procedures – Disposal methods – Reuse of waste-derived fill processes outlined in the *Standard for the production and use of Waste Derived Fill* (EPA SA 2013) – Roles and responsibilities – Timelines – Reporting and documentation requirements	– Monitor compliance – Report any pollution events	– Standard established mitigation measure – State government requirement	– Mobilisation of gross pollutants	**During construction:** – For works involving the use and disposal of gross pollutants **During operation:** – For works involving the use and disposal of gross pollutants
– Implement all reasonable and practicable measures to minimise disturbance and prevent injury to fauna (including marine mammals and other marine fauna) – Prior to the removal of vegetation / other activities identified to have the potential to impact fauna, the area to be affected should be checked for fauna species by a suitably qualified person – Under the supervision of a suitably qualified specialist, relocate any native fauna to a similar habitat if that species' habitat will be destroyed – Implement work practices which allow avian and marine fauna that are sensitive to noise, to depart without the risk of harm – Implement any conditions of environmental approvals relevant to the protection of fauna during all Project works	– Measure against performance outcomes, including avoidance of injury or impact to fauna (including birds)	– Standard established mitigation measure – State government requirement	– Mortality or injury of animals	**During construction:** – For all works **During operation:** – For all works

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Biosecurity Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: – Identified Weeds of National and State Significance relevant to the Strategic Assessment Area – Identified Marine Pests of National Significance relevant to the Strategic Assessment Area – Performance indicators – Mitigation measures – Roles and responsibilities – Potential impacts on the environment – Monitoring plan	– Implement an inspection and monitoring program – Measure against performance indicators	– Standard established mitigation measure – State and federal government requirement	– Clearing of vegetation	**During construction:** – For works involving clearing of vegetation – For works involving dredging to create a deeper channel **During operation:** For works involving dredging to maintain river depth

4.3.5 Conclusion

Based upon the assessment in Section 4.3.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan has potential to impact on ocean forms, ocean processes and ocean life. The mitigation measures outlined in 4.3.4 are intended to avoid and reduce the potential for impacts. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, potential impacts, and mitigation measures, it was assessed that these potential impacts would likely to be acceptable.

4.4 Water resources

4.4.1 Description

Hydrology

The marine area of the Strategic Assessment Area is located within the Port Adelaide River. The Lefevre Peninsula contains many small catchments that all discharge into the Port Adelaide River or Gulf St Vincent (Southfront 2018). Rainfall is highest in winter, averaging 50 mm in July, and 15.7 mm in January (BOM 2024).

The onshore area of the Strategic Assessment Area does not contain any natural hydrological features due to the previous reclamation of the peninsula removing all tidal wetland environments. Two stormwater drains are located within the Strategic Assessment Area: Falie Reserve, and Eastern Basin (to the north of Mutton Cove), which receives water from Falie Reserve and drains into the Port Adelaide River.

There are two other stormwater basins, located outside of the Strategic Assessment Area, that drain into the Port Adelaide River: the southern Mutton Cove outlet and Veitch Road outlet.

Mutton Cove is located directly adjacent to the Strategic Assessment Area and retains a tidal connection to the Port Adelaide River through a central tidal waterway, and several tributaries that flow from it.

Hydrogeology

The Lefevre Peninsula is underlain by the St Kilda Formation, which comprises Quaternary aged unconsolidated sediments. A shallow unconfined aquifer that is tidally influenced occurs within the sand layer, which is likely to extend tidally between 100 to 150 m from the Port Adelaide River foreshore. Data from existing groundwater wells indicates that the depth to water table across the Lefevre Peninsula varies from 6 to 10 m on the western side to less than 1 to 3 m on the eastern side, where the Strategic Assessment Area is located.

Underlying soils (below the fill layer) typically comprise Quaternary sands to greater than 10 m. Clay bands were recorded from drilling logs in some wells on the eastern side of the Lefevre Peninsula, where perched water tables could be present, with increased potential for water logging due to the less permeable layer (Southfront 2018). Groundwater flow direction on the eastern side of the Lefevre Peninsula on which the Strategic Assessment Area is located, is inferred to be to the east towards the Port Adelaide River.

Previous reviews of groundwater quality indicate that groundwater is saline within the St Kilda Formation (that is, the Quaternary sands), with salinity values decreasing with distance from the Port Adelaide River. The groundwater was found to display characteristics of sea water with some elevated values for metals above potable use criteria and marine ecosystem protection criteria. The groundwater was assessed to not pose an unacceptable risk to humans or the Port Adelaide River system (S&G 2007).

Below the St Kilda Formation there are inconsistent clayey alluvial mud deposits (the Pooraka Formation, which is generally less than 1 m thick), underlain by shelly marine deposits of the Glanville Formation. This layer (2 to 3 m thick) is a deeper aquifer but is also influenced by the Port Adelaide River surface water and is expected to have similar salinities and hydraulic gradients (S&G 2007). Hindmarsh Clay is a 100 m thick predominantly clay layer below the Glanville Formation overlying Tertiary aged Carisbrooke Sands. The thick clay layer is anticipated to have limited permeability and would restrict downward movement of contamination (S&G 2007).

4.4.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to water resources include:

- Site establishment and preparation
- Construction – onshore area
- Construction – maritime infrastructure
- Capital dredging – maritime infrastructure
- Capital dredging – Port Adelaide River channel
- Routine maintenance dredging

Potential impacts

Potential impacts to water resources, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-11 below.

Table 4-11 Potential impacts of The Plan on water resources

Impact	Description
Direct potential impacts	Mobilisation of pollutants Changes to landforms and landscapes
Indirect potential impacts	Habitat degradation – Disruption to ecological processes due to smothering – Temporary reduced visibility Increased resource demand
Cumulative effects	Incremental cumulative effect

4.4.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on water resources within and surrounding the Strategic Assessment Area, with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-12.

Table 4-12 Significant impact assessment for water resources

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Measurably reduce the quantity, quality or availability of surface or ground water	The marine area of the Strategic Assessment Area is located within the Port Adelaide River. Two stormwater drains are located within the area, including Falie Reserve. Neither the Port Adelaide River nor Falie Reserve are used as a water resource. Surface and groundwater are not currently sourced for use from within the Strategic Assessment Area. The quantity and availability of water for ecological processes would not be anticipated to measurably change as a result of the Actions and Classes of Actions proposed under The Plan. With respect to surface water quality, bulk earthworks are necessary to establish the Submarine Construction Yard. Such activities have historically occurred within the Strategic Assessment Area, with much of the Lefevre Peninsula having been established as a result of filling and levelling. Water quality within the Port Adelaide River is measured qualitatively against performance indicators related to algal blooms, ammonia levels, and odour in addition to monitoring of nutrient loads (EPA SA 2008). Existing stormwater management systems remain in place across the Lefevre Peninsula to manage and passively treat surface water flows. With respect to groundwater quality, the existing groundwater conditions in the unconsolidated Quaternary sediments of the St Kilda formation are tidally influenced to around 100 to 150 m from the foreshore of the Port Adelaide River. Groundwater quality has been found to have a salinity gradient that decreases with distance from the water edge. Due partially to high salinity levels, water within the shallow aquifer is not suitable for potable use. In consideration of the above, The Plan is unlikely to measurably reduce the quantity, quality or availability of surface or ground water.
Channelise, divert or impound rivers or creeks or substantially alter drainage patterns	The hydrology of the Strategic Assessment Area and the Lefevre Peninsula has been substantially altered by previous development activities. As a result of prior development, there are no natural watercourses located within the onshore area of the Strategic Assessment Area. The southern bank of the Port Adelaide River has historically been and is currently hardened along most of its southern and western bank, including the riverbanks within the Strategic Assessment Area. Despite this, the hardening has not effectively channelised, diverted or impounded the Port Adelaide River, and it is not planned to undertake works that would channelise, divert or impound the river. Although the proposed maritime structures to be developed under The Plan would alter the profile of the riverbank within the Strategic Assessment Area, The Plan is not expected to substantially alter drainage patterns in the Port Adelaide River. In consideration of the above, The Plan is not expected to result in the substantial, or permanent alteration of drainage patterns within nearby rivers or creeks.
Measurably alter water table levels	The water table within the Strategic Assessment Area in the unconfined aquifer of the St Kilda Formation, is shallow, tidally influenced and subject to existing natural variability in water table levels (Coffey 2017, S&G 2007). Bulk earthworks to be conducted within the Strategic Assessment area as part of Site Preparation and Establishment, may change shallow water table characteristics within the immediate footprint through ground improvements that may consolidate and restrict groundwater movement below infrastructure. Due to the coastal location immediately adjacent to the shallow discharge / recharge from the Port Adelaide River, it is not anticipated that ground improvements that restrict groundwater within infrastructure footprints would cause a measurable effect to groundwater in the unconsolidated sediments of the St Kilda Formation. Recharge would continue to be from the river.

4.4.4 Mitigation measures

Measures to be implemented to avoid or reduce the potential for impacts to water resources are provided in Table 4-13. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-13 SMART mitigation measures for potential impacts associated with water resources

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– A standard established mitigation measure – State Government requirement	– Mobilisation of sediment – Mobilisation of contaminants – Hydrological changes	**During construction:** – For works involving bulk earthworks below imported fill level – For works involving piling at the onshore area, near the marine environment – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Prepare a Dredge Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Scope, methodology, environmental management, contingency and incident response – Potential impacts on the environment, public health and amenity – Mitigation measures – Water quality monitoring plan – Community consultation / communication	– Measured by the EPA when acquiring a dredge licence – Conduct mandatory water quality monitoring	– Standard established mitigation measure – State government requirement	– Mobilisation of sediment	**During construction:** – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Dewatering Management Plan, which is be included in the Construction Environmental Management Plan. This plan will detail: – Dewatering techniques – Anticipated dewatering flow rate, duration and total volume – Assessment of water quality – Water collection, storage, treatment and disposal options – Acid Sulfate Soils Management Plan – Investigation waste management hierarchy – Contingency plans – Equipment maintenance plans – Requirements of the EPA Licence for earthworks drainage – Monitoring and reporting requirements	– Implement an inspection and monitoring program – Measure against performance indicators, to assess the quality and quantity of water being discharged	– Standard established mitigation measure – State government requirement	– Mobilisation of contaminants	**During construction:** – For works involving dewatering
Prepare a Site Contamination Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will include: – Remediation goals, objectives and endpoints – Acid Sulfate Soil Management Plan	– Implement an inspection and monitoring program – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of contaminants	**During construction:** – For works involving bulk earthworks below imported fill – For works involving piling methodologies where spoil is generated – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare an Acid Sulfate Soil Management Plan (if acid sulfate soil is found to be present), which is to be included in the Construction Environmental Management Plan. This plan will detail: – Mitigation measures for excavation and disturbance of acid sulfate soil materials – Mitigation measures for oxidation – Treatment plans – Disposal procedures (to an appropriate facility) – Stockpile management measures	– Implement an inspection and monitoring program – Measure against performance indicators	– Standard established mitigation measure – State government requirement	– Changes to soil chemistry	**During construction:** – For works involving bulk earthworks below imported fill – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Prepare a Water Quality Risk Assessment, in accordance with the *Environment and Heritage Technical Manual – Attachment 6A* (DIT 2021a).	– Measure against legislative compliance requirements – Measure against water quality objectives or strategic directions for the catchment	– Standard established mitigation measure – State government requirement	– Hydrological changes	– During the design phase – Prior to construction

4.4.5 Conclusion

Based upon the assessment in Section 4.4.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on water resources. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

4.5 Pollutants, chemicals and toxic substances

4.5.1 Description

Due to the industrial history and known former uses in the region, and within the Strategic Assessment Area, there is a risk of contaminants occurring within the soil and groundwater, as well as a potential risk of mobilisation of naturally occurring contaminants, if they occur. In addition to this, chemicals or other substances would be received, handled, stored and used during construction and operation of the Submarine Construction Yard.

A site contamination index is maintained in a public register by the South Australian Environmental Protection Authority. This index documents potentially contaminating activities that have occurred within an allotment as well as section 83A notifications for site contamination that affects, or is a risk to, groundwater.

Some allotments within and in the area adjacent to the Strategic Assessment Area are registered for potentially contaminating activities including:

– Fill or soil importation
– Dredge spoil disposal or storage
– Battery manufacture, recycling or disposal
– Unspecified section 83 notifications

Programs of soil sampling have previously been undertaken within the Strategic Assessment Area and surrounding areas on the Lefevre Peninsula. A sampling program has been conducted to support the impact assessed development State pathway, as well as to support baseline and ongoing requirements associated with the International Atomic Energy Agency licence requirements.

Exceedances for toxicants above the adopted human health criteria have not been returned from previous assessments. Metal detections have been reported from samples that are consistent with the fill material types known to be present across the Strategic Assessment Area. No per- and polyfluoroalkyl substances (PFAS) have been reported within the Strategic Assessment Area, although the Lefevre Peninsula has been identified as a major site for PFAS in South Australia (EPA SA 2022).

No asbestos containing material has been identified within the Strategic Assessment Area, although there are prior records south of the Strategic Assessment Area (Coffey 2017, Greencap 2018).

Acid sulfate soil mapping indicated that the soils within the onshore area of the Strategic Assessment Area are mapped as having a low confidence, low probability of encountering acid sulfate soil, while soils within the marine area are mapped as having a low confidence, high probability of encountering acid sulfate soil. A site assessment concluded that the Strategic Assessment Area has potential for acid sulfate soil to occur (ANSIS 2024). The potential risk is at depths below the fill layer.

4.5.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts from pollutants, chemicals and toxic substances include:

– Construction of the Submarine Construction Yard
– Operation of the Submarine Construction Yard

Potential impacts

Potential impacts from pollutants, chemicals and toxic substances, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-14.

Table 4-14 Potential impacts of The Plan from pollutants, chemicals and toxic substances

Impact	Description
Direct potential impacts	Mortality or injury of fauna Altered behaviour of a species Mobilisation of pollutants Changes to environmental amenity
Indirect potential impacts	Habitat degradation
Cumulative effects	Incremental cumulative effect Successive cumulative effect

4.5.3 Assessment of significance

An assessment of the potential impacts of The Plan associated with pollutants, chemicals and toxic substances within and surrounding the Strategic Assessment Area with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-15.

Table 4-15 Significant impact assessment for pollutants, chemicals and toxic substances

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Generate smoke, fumes, chemicals, nutrients, or other pollutants which will substantially reduce local air quality or water quality	Construction activities may generate dust and other emissions, typically on a localised basis in the area of works. Bulk earthworks have been undertaken over most of the onshore area of the Strategic Assessment Area over several years and have not substantially reduced the local air or water quality. Various manufacturing and submarine building activities are to be undertaken within the onshore area of the Strategic Assessment Area. Depending upon the type and nature of the activity, some emissions would reasonably be expected to be released.
Result in the release, leakage, spillage, or explosion of flammable, explosive, toxic, radioactive, carcinogenic, or mutagenic substances, through use, storage, transport, or disposal	Hazardous materials, including flammable, explosive, toxic, radioactive, carcinogenic or mutagenic substances are subject to stringent State, Commonwealth and international permit requirements, to establish and undertake activities, including transport, storage, handling and disposal. In particular, radioactive substances require permits and licences to satisfy Australia's international commitments to uphold the safety, security, safeguards, health and quality requirements of the International Atomic Energy Agency. Storage of the power module would be within a designated and contained area, within the licenced portion of the Submarine Construction Yard. The risk of uncontrolled releases via spillage, or as a result of an incident, would be as low as reasonably possible.
Increase atmospheric concentrations of gases which will contribute to the greenhouse effect or ozone damage	There would be an increase in the use of resources, including materials and electricity during the construction and operation of the Submarine Construction Yard. A resultant increase in emissions would input to the overall regional contribution of atmospheric gas concentrations. In consideration of the size and scale of construction, and industrial activities to be undertaken, the contributions to the greenhouse effect and ozone damage resulting from the Actions and Classes of Actions proposed under The Plan, would not be likely to be significant.
Substantially disturb contaminated or acid sulphate soils	The soils within the Strategic Assessment Area have been substantially disturbed above natural ground layer as a result of previous filling and levelling. Contamination levels above the human health criteria have not been identified in soil or ground water assessments, although some soil characteristics have detections of metals that reflect known fill material and the industrial history of the area. Based upon mapping and field assessments of the Strategic Assessment Area, acid sulfate soils are expected to occur at depths below the fill layer. There is a risk of potential exposure and oxidation of acid sulfate soils during excavations.

4.5.4 Mitigation measures

Measures to be implemented to avoid or reduce the potential for impacts from pollutants, chemicals and toxic substances are provided in Table 4-16. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-16 SMART measures for potential impacts associated with pollutants, chemicals and toxic substances

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Waste Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Identification of waste types – Collection and storage procedures – Disposal methods – Reuse of waste-derived fill processes outlined in the *Standard for the production and use of Waste Derived Fill* (EPA SA 2013) – Roles and responsibilities – Timelines – Reporting and documentation requirements	– Monitor compliance – Report any pollution events	– Standard established mitigation measure – State government requirement	– Mobilisation of gross pollutants	**During construction:** – For works involving the use and disposal of gross pollutants **During operation:** – For works involving the use and disposal of gross pollutants
Prepare a Remediation Strategy to address source areas of contamination. This strategy will detail: – Remediation options assessment – Key endpoints for remediation – Timeframes	– Monitor compliance – Report remediation status	– Standard established mitigation measure – State government requirement	– Changes to soil chemistry	**During construction:** – For works involving remediation activities **During operation:** – For works involving remediation activities
Prepare an Acid Sulfate Soil Management Plan (if acid sulfate soil is found to be present), which is to be included in the Construction Environmental Management Plan. This plan will detail: – Mitigation measures for excavation and disturbance of acid sulfate soil materials – Mitigation measures for oxidation – Treatment plans – Disposal procedures (to an appropriate facility) – Stockpile management measures	– Implement an inspection and monitoring program – Measure against performance indicators	– Standard established mitigation measure – State government requirement	– Changes to soil chemistry	**During construction:** – For works involving bulk earthworks below imported fill – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

4.5.5 Conclusion

Based upon the assessment in Section 4.5.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan has potential to result in impacts from pollutants, chemicals and toxic substances. The implementation of mitigation measures outlined in Section 4.5.4 are intended to avoid and reduce the potential for impacts. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, potential impacts, and mitigation measures, impacts of The Plan from pollutants, chemicals and toxic substances are likely to be acceptable.

4.6 Plants

4.6.1 Description

Plants within the Strategic Assessment Area have predominantly been planted along roadsides and stormwater embankments or have opportunistically established / regenerated on areas of fill. Six vegetation associations (groups of similar plant species that occur together in similar conditions) were recorded from across the onshore and marine areas of the Strategic Assessment Area (Table 4-17). Plants identified are mostly salt tolerant species such as samphires and mangroves. Two naturally occurring vegetation associations occur in the Strategic Assessment Area, these being mangroves that have established along the tidal interface near Mutton Cove, and seagrass in the shallow marine area.

Table 4-17 Vegetation associations within the Strategic Assessment Area

Vegetation	Type	Description	Dominant plant species
Low shrubland	Regenerated	A novel ecosystem that was previously cleared and has since regenerated with saltmarsh, small shrubs and freshwater rushland species.	Shrubby samphire *(Tecticornia halocnemoides*), blackseed samphire (*T. pergranulata*), brown-headed samphire (*T. indica*), and austral sea-blite (*Suaeda australis*). Small wetland area characterised by *Typha spp*.
Low shrubland	Planted	Planted native and non-native shrubland present on road edges and on the outer boundaries of Falie Reserve and around buildings.	Saltbushes (*Atriplex spp.*) and she oak (*Allocasuarina spp.*).
Saltmarsh shrubland	Planted	Planted native saltmarsh species along Falie Reserve drainage line.	Shrubby samphire, blackseed samphire, brown-headed samphire, and austral sea-blite.
Mangrove shrubland	Natural	Small patches of a mangrove monoculture present on the foreshore of the assembly and testing area with some saltmarsh species present.	Grey mangrove (*Avicennia marina*).
Sedgeland wetland	Regenerated	Sedgeland wetland present along the dredge spoil lagoon in the assembly and testing area.	Salt club-rush (*Bolboschoenus caldwellii*), spiny flat-sedge (*Cyperus gymnocaulos*) and less commonly, sea rush (*Juncus kraussii*).
Seagrass meadow	Natural	Seagrass meadows present in the shallow tidal area of the Port Adelaide River.	At least two species of *Zostera* seagrass: *Z. nigricaulis* (previously *Heterozostera tasmanica*) and *Z. muelleri.*

No listed threatened flora species were identified during field surveys during targeted surveys (GHD 2024a).

No threatened ecological communities were identified within the Strategic Assessment Area, although the vulnerable threatened ecological community ‘Subtropical and Temperate Coastal Saltmarsh’ is mapped to occur in Mutton Cove adjacent to the Strategic Assessment Area, as well as on low lying areas on Torrens Island and the surrounding region.

Some plant communities, that had similar assemblages of species to the threatened ecological community, were identified and mapped. The vegetation is not considered to constitute the threatened ecological community as it does not align with the conservation advice criteria due to the lack of tidal influence (GHD 2024a).

Ten noxious weed species declared under the *Landscape South Australia Act 2019* were recorded within the Strategic Assessment Area. Four of these are also listed as Weeds of National Significance (GHD 2024a).

Other non-listed local flora that have been planted in the region, or may naturally occur in some areas, include:

– Chaffy saw-sedge (*Gahnia filum*) – known to be planted in Falie Reserve
– Bitterbush (*Adriana quadripartita*) – known to be planted in Biodiversity Park
– Nitre bush (*Nitraria billardierei*) – known to be planted for stabilisation on Bird Island

These native plant species provide potential habitat for local butterfly species.

4.6.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to plants include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to plants, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-18.

Table 4-18 Potential impacts of The Plan on plants

Impact	Description
Direct potential impacts	Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) – Low open shrubland (24.33 ha) – Seagrass meadow (3.49 ha) Mobilisation of pollutants Changes to landforms and landscapes
Indirect potential impacts	Habitat degradation caused by: – Sedimentation and turbidity – Changing water quality – Changes to the coastal shoreline
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

4.6.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on plants within and surrounding the Strategic Assessment Area, with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-19.

Table 4-19 Significant impact assessment of plants within the Strategic Assessment Area

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Involve medium or large-scale native vegetation clearance	Most of the vegetation within the Strategic Assessment Area is planted or has established after filling and levelling of the Lefevre Peninsula. The onshore area of Strategic Assessment Area is not considered to comprise 'native vegetation' and contains a mix of non-native (weeds) and native species. Site establishment and preparation works would remove the plants that have been planted and plants that have established naturally in fill material. Clearing of native vegetation would occur to establish maritime infrastructure: – Approximately 3.49 ha of seagrass (note this is also described and assessed in Section 4.2.3) – Approximately 0.35 ha of mangroves within the tidal flat habitat The Actions and Classes of Actions proposed under The Plan would not involve medium or large-scale vegetation clearance.
Involve any clearance of any vegetation containing listed threatened species which is likely to result in long-term decline in a population of which threatens the viability of the species	No listed threatened flora species have been recorded in the Strategic Assessment Area. The Actions and Classes of Actions proposed under The Plan would not involve clearance of vegetation containing a listed threatened species.
Introduce potentially invasive species	Several weed species occur within the Strategic Assessment Area, including Weeds of National Significance and weeds declared as noxious under state legislation. The development of the Submarine Construction Yard would reduce potential habitat for introduced weed species within the Strategic Assessment Area. It is not likely that the Actions and Classes of Actions proposed under The Plan would cause the introduction of potentially invasive species.
Involve the use of chemicals which substantially stunt the growth of native vegetation	Transport, storage, handling and use of chemicals and other hazardous materials would occur during construction and operation, some of which could potentially substantially stunt the growth of native vegetation. Such chemicals would be subject to licencing and permit conditions as well as national health and safety legislation. It would not be likely that quantities of hazardous materials or other toxic substances could be released in a way that would stunt the growth of native vegetation.
Involve large-scale controlled burning or any controlled burning in sensitive areas, including areas which contain listed threatened species	Large-scale controlled burning would not be undertaken within the Strategic Assessment Area.

4.6.4 Mitigation measures

Measures to be implemented to avoid or reduce the potential for impacts to plants are provided in Table 4-20. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-20 SMART mitigation measures for potential impacts associated with plants

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented?	How will this be measured?	Is this a realistically achievable and well-established approach?	How is this relevant to The Plan?	When will this be implemented?
Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of sediment – Dust generation – Hydrological changes	**During construction:** – For works involving bulk earthworks below imported fill level – For works involving piling at the onshore area, near the marine environment – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Prepare a Dredge Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Scope, methodology, environmental management, contingency and incident response – Potential impacts on the environment, public health and amenity – Mitigation measures – Water quality monitoring plan – Community consultation / communication	– Measured by the EPA when acquiring a dredge licence – Conduct mandatory water quality monitoring	– Standard established mitigation measure – State government requirement	– Mobilisation of sediment – Geomorphological changes	**During construction:** – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Waste Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Identification of waste types – Collection and storage procedures – Disposal methods – Reuse of waste-derived fill processes outlined in the *Standard for the production and use of Waste Derived Fill* (EPA SA 2013) – Roles and responsibilities – Timelines – Reporting and documentation requirements	– Monitor compliance – Report any pollution events	– Standard established mitigation measure – State government requirement	– Mobilisation of gross pollutants	**During construction:** – For works involving the use and disposal of gross pollutants **During operation:** – For works involving the use and disposal of gross pollutants
Prepare an Acid Sulfate Soil Management Plan (if acid sulfate soil is found to be present), which is to be included in the Construction Environmental Management Plan. This plan will detail: – Mitigation measures for excavation and disturbance of acid sulfate soil materials – Mitigation measures for oxidation – Treatment plans – Disposal procedures (to an appropriate facility) – Stockpile management measures	– Implement an inspection and monitoring program – Measure against performance indicators	– Standard established mitigation measure – State government requirement	– Changes to soil chemistry	**During construction:** – For works involving bulk earthworks below imported fill – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

4.6.5 Conclusion

Based upon the assessment in Section 4.6.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on plants. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

4.7 Animals

4.7.1 Description

There is limited natural habitat in the onshore area of the Strategic Assessment Area as a result of historic filling and levelling. Six distinct habitat types were recorded in the Strategic Assessment Area (Table 4-21), four that broadly correspond to the vegetation associations (Table 4-17).

Table 4-21 Fauna habitat types

Habitat	Description
Low open shrubland	Sandy substrate with low saltmarsh ground cover vegetation
Constructed wetlands	Human-made drainage wetlands located in the manufacturing and fabricating, and testing and assembly area including Falie Reserve
Mangrove shrubland	Tidally inundated patch of mangrove vegetation
Tidal flats	Tidally inundated, sparsely vegetated flats located in the assembly and testing area
Seagrass meadows	Located in the shallow, intertidal areas of the Port Adelaide River
Estuarine river	Industrialised river encompassing the marine area of the Strategic Assessment Area

The predominant fauna group recorded in the Strategic Assessment Area was birds. This included 13 birds protected under the *National Parks and Wildlife Act 1974* (GHD 2024b), along with several common birds including the Australian white ibis (*Threskiornis moluccus*), willie wagtail (*Rhipidura leucophrys*) and magpie-lark (*Grallina cyanoleuca*).

A limited number of other native species were recorded. These included reptiles the shingleback (*Tiliqua rugosa*) and eastern brown snake (*Pseudonaja textilis*); one amphibian, the spotted marsh frog (*Limnodynastes tasmaniensis*); and one native mammal, the water rat (*Hydromys chrysogaster*).

Six non-native fauna species have been introduced to the Lefevre Peninsula, including the fox (*Vulpes vulpes*) and rabbit (*Oryctolagus cuniculus*) which were recorded on multiple occasions.

Development of the Lefevre Peninsula has reduced the extent of natural habitats available for animals, with some species that were previously readily recorded now in decline or potentially locally extinct, due to historic removal of or deterioration of their preferred habitat. Important local fauna values relevant to the Strategic Assessment Area and surrounding area include:

– Bitter-bush blue butterfly (*Theclinesthes albocincta*)
– Yellow-sedge skipper butterfly (*Hesperilla flavescens*)

These two butterfly species have been identified by the local community as species in decline. Plants known to be important to these species' survival have been planted by the community in reserves, including Biodiversity Park and Falie Reserve, with the aim to provide food and a breeding place for the butterfly species.

4.7.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to animals include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to animals, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-22.

Table 4-22 Potential impacts of The Plan on animals

Impact	Description
Direct potential impacts	Mortality or injury of fauna Clearing of vegetation / habitat loss: – Tidal flat (2.58 ha) – Constructed wetland (2.54 ha) – Low open shrubland (24.33 ha) Mobilisation of pollutants Altered behaviour of a species
Indirect potential impacts	Habitat degradation
Cumulative effects	Incremental cumulative effect: – Increased number of vehicle movements in the region – Reduction in potential habitat from future development along Port Adelaide River and sea level rise Successive cumulative effect

4.7.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on animals within and surrounding the Strategic Assessment Area, with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-23.

Table 4-23 Significant impact assessment for animals

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Cause long-term decrease in, or threaten the viability of, a native animal population or populations, through death, injury or other harm to individuals	Several native animals were recorded from within the Strategic Assessment Area. Most species recorded were birds, including common species as well as listed threatened, migratory and marine birds. Ground dwelling species, including brown snakes, shinglebacks, swamp rat and spotted marsh frog were also recorded. The Actions and Classes of Actions proposed under The Plan would involve the removal of plants that have established on the onshore area following its filling and levelling. The low shrubland that has established across the reclaimed land of the Strategic Assessment Area may provide secondary habitat for several bird species, however, generally provides limited nesting or roosting opportunities. Other vegetated areas would persist on the Lefevre Peninsula, such as Mutton Cove, Biodiversity Park and Lady Ruthven Park, as well as extensive wetlands in the surrounding region. These areas would continue to provide foraging habitat in the region, and death, injury or other harm would be unlikely to result from the reduction in foraging resources caused by the Actions and Classes of Actions proposed under The Plan. Death, injury or other harm to individual native species as a result of vehicle strike would not be likely as a result of construction or operation, as most of the species recorded are mobile. In consideration of the above, The Plan is not expected to cause a long-term decrease in, or threaten the viability of, a native animal population or populations.

Criteria	Assessment
Displace or substantially limit the movement or dispersal of native animal populations	Terrestrial habitats within the Strategic Assessment Area are already separated from other areas of habitat by the Port Adelaide River and industrial development, including road and rail infrastructure along the western boundary of the Strategic Assessment Area. The Actions and Classes of Actions proposed under The Plan would not be likely to substantially change the existing opportunities for native animals to move or disperse across the Lefevre Peninsula. Most species recorded in surveys of the Strategic Assessment Area were birds, which are able to fly and would not be limited by Actions and Classes of Actions proposed under The Plan. The Strategic Assessment Area is located on land that has been historically levelled and filled. It contains areas of potential habitat for migratory species including 2.54 ha of constructed wetland, some of which is landscaped for stormwater and recreation purposes (Falie Reserve), and 2.58 ha of tidal flats (exposed at low tide only) where the Port Adelaide River meets the shore in the Assembly and Testing Area. Therefore, while habitats within the Strategic Assessment Area would contribute to the cumulative availability of habitat within the region for shorebird species, extensive alternate habitat is available within the region surrounding the Strategic Assessment Area.
Substantially reduce or fragment available habitat for native species	Habitat within the Strategic Assessment Area is already separated from other areas of habitat by the Port Adelaide River and industrial development, including road and rail infrastructure. The removal of 2.54 ha of constructed wetland and 2.58 ha of tidal flats under The Plan will reduce available habitat for native species. However, this habitat is located on the edge of Lefevre Peninsula, so is unlikely to fragment habitat for land based native species. Extensive habitat for shorebirds is available within Mutton Cove and the surrounding region. Therefore, habitat available for native shorebirds would not be substantially reduced or fragmented as a result of The Plan.
Reduce or fragment available habitat for listed threatened species, which is likely to displace a population, result in a long-term decline in a population, or threaten the viability of the species	Habitats known to be used, at least an occasional basis, by listed threatened species (individual birds from a small number of shorebird species) within the Strategic Assessment Area include: – 2.54 ha of constructed wetlands within the stormwater management areas – 2.58 ha of tidal flats along the shoreline (exposed at low tide only) These areas of habitat contribute to the cumulative availability of threatened species habitat within the region. Substantial habitat occurs within the Adelaide International Bird Sanctuary, which is made up of wetland reserves that extend along the eastern edge of Gulf St Vincent for approximately 60 km. Habitats within the Strategic Assessment Area are not anticipated to be depended on by listed threatened species for their long-term survival or population viability. Clearing associated with the Actions and Classes of Actions proposed under The Plan is not likely to reduce or fragment available habitat in a way that a species would be displaced, or that would cause a long-term decline or threaten the viability of the species.
Introduce exotic species which will substantially reduce habitat or resources for native species	Introduced species including rabbits and foxes were recorded in the Strategic Assessment Area. In addition, several weed species occur within the Strategic Assessment Area, including Weeds of National Significance and weeds declared as noxious under State legislation. The development of the Submarine Construction Yard would reduce the potential habitat for introduced pest and weed species within the Strategic Assessment Area. It is not likely that construction or operation of the Submarine Construction Yard would introduce exotic species that could notably affect resource availability for native species.
Undertake large-scale controlled burning or any controlled burning in areas containing listed threatened species	No controlled burning would take place under The Plan.

4.7.4 Mitigation measures

Measures to be implemented that would avoid or reduce the potential for impacts to animals are provided in Table 4-24. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-24 SMART mitigation measures for potential impacts associated with animals

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
– Prepare a Construction Noise and Vibration Framework, so that the Contractor can prepare a Construction Noise and Vibration Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: • Noise level targets • Noise and vibration monitoring plan (including locations, timing, methodology and reporting) • Mitigation measures • Notification requirements – Prepare a Night Works Management Plan, as needed – Where practicable, conduct vibration producing work during standard construction hours of the EPA, or as approved, where works are within 50 m of sensitive receivers – The Contractor is responsible for appropriate vibration management, including making sure that construction and maintenance activities do not cause vibration-induced damage to structures, buildings or services • Conduct all relevant works in consideration of the procedures included in section 5.4, page 13 of the *Environment and Heritage Technical Manual – Attachment 7D* (DIT 2021b)	– Conduct building condition (dilapidation) assessments, as required, including: • Visual inspection of buildings and structures • Photographs and records of cracks / defects • Close-out surveys that record changes from initial survey conditions – Implement a monitoring regime in accordance with *DIN4150-3 Structural Vibration Part 3 – Effects of vibration on structures* to enable post-construction verification that vibration levels at potentially affected structures did not exceed the relevant guideline values – Maintain records of vibration related non-compliance	– Standard established mitigation measure – State government requirement	– Vibration	**During construction:** – For works within 50 m of sensitive receivers – For night works **During operation:** – For works within 50 m of sensitive receivers – For night works

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Dredge Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Scope, methodology, environmental management, contingency and incident response – Potential impacts on the environment, public health and amenity – Mitigation measures – Water quality monitoring plan – Community consultation / communication	– Measured by the EPA when acquiring a dredge licence – Conduct mandatory water quality monitoring	– Standard established mitigation measure – State government requirement	– Vibration – Noise – Mobilisation of sediment – Geomorphological changes	**During construction:** – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of sediment – Dust generation – Hydrological changes	**During construction:** – For works involving bulk earthworks – For works involving piling at the onshore area, near the marine environment – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Waste Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Identification of waste types – Collection and storage procedures – Disposal methods – Reuse of waste-derived fill processes outlined in the *Standard for the production and use of Waste Derived Fill* (EPA SA 2013) – Roles and responsibilities – Timelines – Reporting and documentation requirements	– Monitor compliance – Report any pollution events	– Standard established mitigation measure – State government requirement	– Mobilisation of gross pollutants	**During construction:** – For works involving the use and disposal of gross pollutants **During operation:** – For works involving the use and disposal of gross pollutants
– Implement all reasonable and practicable measures to minimise disturbance and prevent injury to fauna (including marine mammals and other marine fauna) – Prior to the removal of vegetation / other activities identified to have the potential to impact fauna, the area to be affected should be checked for fauna species by a suitably qualified person – Under the supervision of a suitably qualified specialist, relocate any native fauna to a similar habitat if that species' habitat will be destroyed – Implement work practices which allow avian and marine fauna that are sensitive to noise, to depart without the risk of harm – Implement any conditions of environmental approvals relevant to the protection of fauna during all Project works	– Measure against performance outcomes, including avoidance of injury or impact to fauna (including birds)	– Standard established mitigation measure – State government requirement	– Mortality or injury of native animals	**During construction:** – For all works **During operation:** – For all works

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Biosecurity Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: – Identified Weeds of National and State Significance relevant to the Strategic Assessment Area – Identified Marine Pests of National Significance relevant to the Strategic Assessment Area – Performance indicators – Mitigation measures – Roles and responsibilities – Potential impacts on the environment – Monitoring plan	– Implement an inspection and monitoring program – Measure against performance indicators	– Standard established mitigation measure – State and federal government requirement	– Clearing of vegetation	**During construction:** – For works involving clearing of vegetation – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Utilise lighting design standards to reduce light pollution and minimise the effects on wildlife. This includes: – Only add light to natural darkness for specific purposes, where practical – Use adaptive light controls to manage light timing, intensity and colour – Direct light to cover only the object or area required – Use the lowest intensity lighting appropriate for the task	– Measure against performance indicators	– Standard established mitigation measure – State government requirement	– Light generation	**During construction:** – For works involving temporary or permanent light generation **During operation:** – For works involving temporary or permanent light generation

4.7.5 Conclusion

Based upon the assessment in Section 4.7.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on animals. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

4.8 People and communities

4.8.1 Description

The Strategic Assessment Area is located on the Lefevre Peninsula within the City of Port Enfield Local Government Area. The peninsula supports industrial uses on the east and north, and residential uses on its west with supporting commercial and recreational areas.

The closest residential properties to the Strategic Assessment Area are:

– North Haven, south of Victoria Road within 0.3 km of the southern boundary of the onshore area of the Strategic Assessment Area
– Osborne, within 1 km south of the southern boundary of the onshore area of the Strategic Assessment Area
– Taperoo, within 1.9 km south of the southern boundary of the onshore area of the Strategic Assessment Area

Osborne Naval Shipyard is located to the south of the Strategic Assessment Area and provides for full servicing capability to the Collins Class Submarines and construction of Naval ships. Two power stations, Pelican Point and Snapper Point Power Station, are located on the northern extent of the Lefevre Peninsula.

There are five key public open spaces within the Lefevre Peninsula (Renewal SA 2024). These include:

– Mutton Cove (directly adjacent to the Strategic Assessment Area)
– Biodiversity Park
– Falie Reserve (within the Strategic Assessment Area)
– Kardi Yarta Playground (also known as the North Haven Adventure Playground)
– Lady Ruthven Reserve

4.8.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to people and communities include:

– Construction of the Submarine Construction Yard
– Operation of the Submarine Construction Yard

Potential impacts

Potential impacts to people and communities, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-25.

Table 4-25 Potential impacts of The Plan on people and communities

Impact	Description
Direct potential impacts	Changes to environmental amenity
Indirect potential impacts	Increased resource demand
Cumulative effects	Successive cumulative effect Incremental cumulative effect

4.8.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on people and communities within and surrounding the Strategic Assessment Area, with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-26.

Table 4-26 People and communities significant impact assessment

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Substantially increase demand for, or reduce the availability of community services or infrastructure which have direct or indirect impacts on the environment, including water supply, power supply, roads, waste disposal and housing	There would be a substantial increase in vehicle movements and traffic to and from the Submarine Construction Yard, as well as an increased demand for water, power and waste disposal during construction and operation. The change in traffic demand on roads has potential impacts for people and communities due to an increase in the frequency of maintenance and repair of main transport corridors and impacts to travel times due to the capacity of arterial roads. Increased demand for employment and services generated by the Submarine Construction Yard has the potential to increase demand for housing and accommodation on the Lefevre Peninsula and surrounding region.
Affect the health, safety, welfare or quality of life of the members of a community, through factors such as noise, odours, fumes, smoke or other pollutants	Dust, noise, light and vibration would be generated during construction and operation of the Submarine Construction Yard. The closest suburbs to the Submarine Construction Yard are North Haven (300 m south-east of the Strategic Assessment Area) and Osborne (1 km south of the Strategic Assessment Area). The separation distance of sensitive receivers from the Strategic Assessment Area would reduce the potential for impact from noise, odours, fumes, smoke or other pollutants. Low-level radioactive waste will be managed and temporarily stored in a licenced facility (known as a controlled industrial facility), in accordance with regulatory requirements. This facility would be subject to future licensing and approvals processes and is excluded from the scope of the Strategic Assessment. Depending on the location, timing, types of construction activities, or environmental conditions, there exists potential for nuisance or minor amenity disturbance. It would not be likely that the community health, safety, welfare or quality of life would be significantly impacted as a result of The Plan.
Cause physical dislocation of individuals or communities	The Submarine Construction Yard is to be developed and operated within the Strategic Assessment Area. This area does not contain existing residences and is sited on land that was planned for industrial development. The Actions and Classes of Actions proposed under The Plan would not cause physical dislocation of communities or individuals.
Substantially change or diminish cultural identity, social organisation or community resources	The Submarine Construction Yard would be sited in the existing industrial area on the Lefevre Peninsula. Several other industrial activities, including shipbuilding and other manufacturing already occur on the Lefevre Peninsula. It is not anticipated that the Actions and Classes of Actions proposed under The Plan would substantially change or diminish cultural identity, social organisation or community resources.

4.8.4 Mitigation measures

Measures to be implemented that would avoid or reduce the potential for impacts to people and communities are provided in Table 4-27. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-27 SMART mitigation measures for potential impacts associated with people and communities

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented?	How will this be measured?	Is this a realistically achievable and well-established approach?	How is this relevant to The Plan?	When will this be implemented?
– Prepare a Construction Noise and Vibration Framework, so that the Contractor can prepare a Construction Noise and Vibration Management Plan, which is to be included in the Construction Environmental Management Plan. This plan will detail: • Noise level targets • Noise and vibration monitoring plan (including locations, timing, methodology and reporting) • Mitigation measures • Notification requirements – Prepare a Night Works Management Plan, as needed – Where practicable, conduct vibration producing work during standard construction hours of the South Australian Environmental Protection Authority, or as approved, where works are within 50 m of sensitive receivers – The Contractor is responsible for appropriate vibration management, including making sure that construction and maintenance activities do not cause vibration-induced damage to structures, buildings or services • Conduct all relevant works in consideration of the procedures included in section 5.4, page 13 of the *Environment and Heritage Technical Manual – Attachment 7D* (DIT 2021b)	– Conduct building condition (dilapidation) assessments, as required, including: • Visual inspection of buildings and structures • Photographs and records of cracks / defects • Close-out surveys that record changes from initial survey conditions – Implement a monitoring regime in accordance with *DIN4150-3 Structural Vibration Part 3 – Effects of vibration on structures* to enable post-construction verification that vibration levels at potentially affected structures did not exceed the relevant guideline values – Maintain records of vibration related non-compliance	– Standard established mitigation measure – State government requirement	– Vibration – Noise	**During construction:** – For works within 50 m of sensitive receivers – For night works **During operation:** – For works within 50 m of sensitive receivers – For night works

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of sediment – Dust generation	**During construction:** – For works involving bulk earthworks below imported fill level – For works involving piling – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth
Prepare a Waste Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Identification of waste types – Collection and storage procedures – Disposal methods – Reuse of waste-derived fill processes outlined in the *Standard for the production and use of Waste Derived Fill* (EPA SA 2013) – Roles and responsibilities – Timelines – Reporting and documentation requirements	– Monitor compliance – Report any pollution events	– Standard established mitigation measure – State government requirement	– Mobilisation of gross pollutants	**During construction:** – For works involving the use and disposal of gross pollutants **During operation:** – For works involving the use and disposal of gross pollutants

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
Prepare an Air Quality Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Sensitive receivers – Assessment of ambient odour concentrations – Estimated odour emission rates – Mitigation measures for odour creation – Reporting methodology	– Implement a monitoring and reporting program – Maintain records of air quality related non-compliance	– Standard established mitigation measure – State government requirement	– Odour	**During construction:** – For works involving bulk earth works **During operation:** – For works involving manufacturing and assembly
Utilise lighting design standards to reduce light pollution and minimise the effects on wildlife. This includes: – Only add light to natural darkness for specific purposes, where practical – Use adaptive light controls to manage light timing, intensity and colour – Direct light to cover only the object or area required – Use the lowest intensity lighting appropriate for the task	– Measure against performance indicators	– Standard established mitigation measure – State government requirement	– Light generation	**During construction:** – For works involving temporary or permanent light generation **During operation:** – For works involving temporary or permanent light generation
Buildings and structures are to be designed and constructed with a similar aesthetic and materials to the existing Osborne Naval Shipyard, to minimise additional visual disturbance	– Measure against existing building design	– Standard established mitigation measure	– Changes to landscape and visual amenity	– During the design phase – Prior to construction
Prepare a Traffic Management Plan, which is to be included in the Construction Environmental Management Plan.	– Measure against performance outcomes, including compliance records	– Standard established mitigation measure – State government requirement	– Increased demand for resources and facilities	**During construction:** – For all works **During operation:** – For all works

4.8.5 Conclusion

Based upon the assessment in Section 4.8.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan has the potential for a significant impact on people and communities within the Strategic Assessment Area and surrounding region. This is due to the potential cumulative impact of increased traffic and to amenity during construction.

In parallel to The Plan, a master planning process has been initiated by the South Australian Office for AUKUS. This process will work towards the provision of services appropriate to The Plan, requirements for the Submarine Construction Yard, and other infrastructure on the Lefevre Peninsula. Through planning and investment in infrastructure at the appropriate level, potential deficits in services provision to the community, with respect to community facilities or other critical infrastructure would be avoided in the long-term. These peripheral changes would be subject to separate state assessments that would consider water, power, waste and housing.

In consideration of the potential direct and cumulative impacts associated with the Actions and Classes of Actions proposed under The Plan, mitigation measures, and masterplan processes, the impact of The Plan on this Protected Matter has been assessed as likely to be acceptable.

4.9 Indigenous heritage

4.9.1 Description

The Port Adelaide region was a favoured location for Aboriginal people prior to European settlement due to its proximity to intertidal creek and mangrove resources, which were available year-round.

The Lefevre Peninsula has a strong Aboriginal history, and has cultural, scientific, social, association and traditional values. The Kaurna people utilised it as a rich marine and estuarine landscape resource and it has intangible heritage values linked to the Tjilbruke dreaming, a creation story to the Kaurna people.

There are no registered Aboriginal heritage sites within the Strategic Assessment Area, and no artefacts were identified within the Strategic Assessment Area as a result of site assessments. There remains the potential for subsurface Aboriginal cultural heritage and ancestral remains (such as mounds and associated burials) to be present in the natural ground below the fill layer.

4.9.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to Indigenous heritage include:

– Site establishment and preparation
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to Indigenous heritage, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-28.

Table 4-28 Potential impacts of The Plan on Indigenous heritage

Impact	Description
Direct potential impacts	Interaction with a heritage place or heritage values Changes to landforms and landscapes Changes to environmental amenity
Indirect potential impacts	None identified
Cumulative effects	Incremental cumulative effect

4.9.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on Indigenous heritage within and surrounding the Strategic Assessment Area, with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-29.

Table 4-29 Indigenous heritage significant impact assessment

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Permanently destroy, remove, or substantially alter the fabric (physical material including structural elements and other components, fixtures, contents, and objects) of a heritage place	There are no listed or documented tangible Indigenous heritage places within the Strategic Assessment Area. Therefore, the Actions and Classes of Actions proposed under The Plan would not cause the permanent destruction, removal or substantial alteration of a known tangible heritage place. Undisturbed soils of the natural ground layer below the fill layer still have potential to contain Aboriginal cultural material. Due to the highly disturbed condition of the Strategic Assessment Area, historic landfilling, the pre-European site conditions and the absence of evidence recorded during past development and monitoring, it is considered that the overall risk of adversely impacting archaeological and ethnographic sites is low and not likely to result in a significant impact.
Involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place	As above, there are no listed or documented tangible Indigenous heritage places within the Strategic Assessment Area. As such, the Actions and Classes of Actions proposed under The Plan would not involve extension, renovation, or substantial alterations that would be inconsistent with tangible heritage values.
Involve the erection of buildings or other structures adjacent to, or within important sight lines of a heritage place which are inconsistent with the heritage values of the place	There are no documented heritage places with tangible Aboriginal heritage values within the Strategic Assessment Area. Additionally, there are no documented important sight lines associated with the surrounding natural areas. The infrastructure to be developed within the Submarine Construction Yard would be consistent in terms of size and scale with other industrial developments on the Lefevre Peninsula, including the existing Osborne Naval Shipyard. The Actions and Classes of Actions proposed under The Plan would not result in the erection of buildings or other structures adjacent to or within important sight lines of a heritage place.
Substantially diminish the heritage value of a heritage place for a community or group for which it is significant	The Lefevre Peninsula has intangible values that are important to the Kaurna people. Infrastructure to be sited within this region would be consistent in terms of size and scale with other industrial developments on the Lefevre Peninsula, including the existing Osborne Naval Shipyard. The development on the Lefevre Peninsula would not be likely to diminish the intangible values to the Kaurna People, as such values are inherent to them.
Substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place	There are no documented heritage places with Aboriginal heritage values within the Strategic Assessment Area. The infrastructure to be associated with the Submarine Construction Yard would be consistent in terms of size and scale with other industrial developments on the Lefevre Peninsula and would not be inconsistent with its existing setting.
Substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site	Based on discussion with Kaurna representatives, there are no cultural or ceremonial sites currently used by the Kaurna community within the Strategic Assessment Area.

4.9.4 Mitigation measures

Measures to be implemented that would avoid or reduce the potential for impacts to Indigenous heritage are provided in Table 4-30. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-30 SMART mitigation measures for potential impacts associated with Indigenous heritage

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
– Works must cease immediately in the event of a potential discovery of Aboriginal sites, objects or ancestral remains – Works must not recommence in the affected area until clearance has been provided by the relevant authority – Follow the discovery procedure flow charts, as relevant to authorisations, under the South Australian *Aboriginal Heritage Act 1988*	– Measure against performance requirements, including avoiding and minimising impacts to heritage values and heritage sites – Maintain records of heritage related non-compliance	– Standard established mitigation measure – State government requirement	– Interaction with a heritage place or heritage values	**During construction:** – For works involving bulk earthworks – For works involving piling methodologies where spoil is generated – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

4.9.5 Conclusion

Based upon the assessment in Section 4.9.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on Indigenous heritage. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

4.10 Historic heritage

4.10.1 Description

No historic heritage sites listed on the National Heritage List, Commonwealth Heritage List, South Australian Heritage Register or Port Adelaide Enfield Council Development Plan, are located within the Strategic Assessment Area. No heritage places or items were identified within the onshore area of the Strategic Assessment Area during 2023 site investigations.

A search of the Australasian Underwater Cultural Heritage Database and the South Australian Register of Historic Shipwrecks was undertaken on 19 April 2024 and identified four shipwrecks to be within the Strategic Assessment Area and another two located nearby in Mutton Cove. It should be noted that the registered location of shipwrecks on the Australasian Underwater Cultural Heritage Database may not be accurate, and the registered location may differ from the actual location.

The ships located in the Strategic Assessment Area include:

– The *Napperby* (1928)
– The *Wildflower* (1877)
– The *Enchantress* (1903)
– The *Corsair* (1865)

The ships located in Mutton Cove include:

– The *Jupiter* (1954)
– The *Excelsior* (1945)

It is noted that shipwreck locations based on anecdotal descriptions can be inaccurate and changes in the riverbed may alter underwater topography, creating uncertainties and inaccuracies in records. While the survey did not uncover shipwrecks or related artefacts, it is important to recognise that only selected areas were surveyed, and artefacts could be buried within in the Strategic Assessment Area and not able to be picked up by sonar.

4.10.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to historic heritage include:

– Site establishment and preparation
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to historic heritage values, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-31.

Table 4-31 Potential impacts of The Plan on historic heritage

Impact	Description
Direct potential impacts	Interaction with a heritage place or heritage values
Indirect potential impacts	None identified
Cumulative effects	Incremental cumulative effect

4.10.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on historic heritage within and surrounding the Strategic Assessment Area, with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-32.

Table 4-32 Historic heritage significant impact assessment

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Permanently destroy, remove, or substantially alter the fabric (physical material including structural elements and other components, fixtures, contents, and objects) of a heritage place	No listed historic heritage places are documented on the onshore area of the Strategic Assessment Area. Four shipwrecks are documented in the marine area within the Strategic Assessment Area, although the registered location of shipwrecks on the Australasian Underwater Cultural Heritage Database may not be accurate, and the registered location may differ from their actual location. Substantial dredging has historically occurred within the Port Adelaide River shipping channel. Based upon mapping in the Australasian Underwater Cultural Heritage Database hosted by DCCEEW, the shipwreck closest to the area in which capital dredging would occur, *Wildflower*, which sank in 1877, is mapped to be within the shipping channel which has been subject to several historical dredging campaigns. Under The Plan, capital dredging would occur between the Port Adelaide River shipping channel and the Strategic Assessment Area shoreline for maritime infrastructure, as well as within the shipping channel, if required. Indications from the Underwater Cultural Heritage Database suggest that the wreck could be sited within the existing channel and may be unlikely to be found. The potential for impact to a shipwreck is low. The wreck of *Excelsior* is sited in the northern portion of Mutton Cove. This wreck is exposed to the elements, including tidal influences and oxidation, and it is naturally deteriorating over time. Construction in proximity to *Excelsior* could cause vibration that may accelerate the existing degradation of the wreck. In consideration of the existing condition of the wreck and natural degradation, the potential for impacts associated with the Actions and Classes of Actions proposed under The Plan is not likely to be significant. Based upon the above, The Plan is unlikely to permanently destroy, remove, or substantially alter the fabric of a historic heritage place.
Involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place	There are no aspects of the Actions or Classes of Actions proposed under The Plan that relate to extension, renovation, or substantial alteration of a heritage place.
Involve the erection of buildings or other structures adjacent to, or within important sight lines of a heritage place which are inconsistent with the heritage values of the place	The infrastructure to be developed within the Submarine Construction Yard would be consistent in terms of size and scale with other industrial developments on the Lefevre Peninsula, including the existing Osborne Naval Shipyard. Such structures are consistent with the existing view shed associated with the shipwrecks, including the *Excelsior*. Existing views of the wreck are from the north to south and southeast. These sight lines would not be affected by infrastructure. That is, the infrastructure to be constructed under The Plan would not be inconsistent with the heritage values of the place and would not affect sight lines associated with the place. A significant impact is therefore not anticipated.
Substantially diminish the heritage value of a heritage place for a community or group for which it is significant	As noted above, the wreck of *Excelsior* is sited in the northern portion of Mutton Cove. This wreck is exposed to the elements, including tidal influences and oxidation, and it is naturally deteriorating over time. While construction in proximity to it could cause vibration that may accelerate the existing degradation of the wreck, the wreck will persist in situ. As such, the Actions and Classes of Actions proposed under The Plan would not be likely to substantially diminish the heritage value of *Excelsior* for the community.

Criteria	Assessment
Substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place	*Excelsior* is sited within Mutton Cove, a natural area, in the immediate vicinity of industrial developments. The development of The Plan is consistent with the existing industrial setting and would not be inconsistent with the heritage values of the place.
Substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site	There are no cultural or ceremonial sites located within the Strategic Assessment Area.

4.10.4 Mitigation measures

Measures to be implemented that would avoid or reduce the potential for impacts to historic heritage are provided in Table 4-33. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-33 SMART mitigation measures for potential impacts associated with historic heritage

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented? 	How will this be measured? 	Is this a realistically achievable and well-established approach? 	How is this relevant to The Plan? 	When will this be implemented? 
– Where interaction with a registered heritage place or item cannot be avoided, consultation with the relevant authority should be undertaken to confirm any permits or approvals that may be required – Where a heritage impact statement is required, this is to be prepared by a suitably qualified heritage specialist, in accordance with any guidance provided by the Department of Environment and Water – Prepare a Conservation Management Plan (as required) for each non-Aboriginal heritage item or place that has been identified as being potentially impacted by The Plan – Where unexpected archaeological artefacts are identified during construction activities, the South Australian Heritage Council is to be notified	– Measure against performance requirements, including avoiding and minimising impacts to heritage values and heritage sites – Maintain records of heritage related non-compliance	– Standard established mitigation measure – State government requirement	– Interaction with a heritage place or heritage values	**During construction:** – For works involving bulk earthworks – For works involving piling – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

4.10.5 Conclusion

Based upon the assessment in Section 4.10.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on historic heritage. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

4.11 Natural heritage

4.11.1 Description

There are no heritage places with documented natural heritage values within the Strategic Assessment Area.

The onshore area of the Strategic Assessment Area is located on disturbed land that has been subject to substantial modification since reclamation activities began in 1916 and has limited natural heritage values.

The Port Adelaide River, including the Adelaide Dolphin Sanctuary, nationally important wetlands, and Adelaide International Bird Sanctuary possess natural values.

4.11.2 Nature and extent of impacts

Relevant Actions

Actions proposed under The Plan, that may cause impacts to natural heritage include:

– Site establishment and preparation
– Construction – onshore area
– Construction – maritime infrastructure
– Capital dredging – maritime infrastructure
– Capital dredging – Port Adelaide River channel
– Routine maintenance dredging

Potential impacts

Potential impacts to natural heritage values, associated with the Actions and Classes of Actions proposed under The Plan, are summarised in Table 4-34.

Table 4-34 Potential impacts of The Plan on natural heritage

Impact	Description
Direct potential impacts	None identified
Indirect potential impacts	None identified
Cumulative effects	None identified

4.11.3 Assessment of significance

An assessment of the potential impacts associated with the Actions and Classes of Actions proposed under The Plan on natural heritage within and surrounding the Strategic Assessment Area, with respect to the significant impact criteria from the *Significant impact guidelines 1.2* (Commonwealth of Australia 2013b), is provided in Table 4-35.

Table 4-35 Natural heritage significant impact assessment

Criteria	Assessment
Is there a real chance or possibility that the action will:	
Permanently destroy, remove, or substantially alter the fabric (physical material including structural elements and other components, fixtures, contents, and objects) of a heritage place	There are no documented heritage places with natural heritage values within the Strategic Assessment Area. Because of this, natural heritage values would not be subject to destruction, removal or substantial alteration as a result of the Actions and Classes of Actions proposed under The Plan.

Criteria	Assessment
Involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place	As above, there are no documented heritage places with natural heritage values within the Strategic Assessment Area. The Actions and Classes of Actions proposed under The Plan do not involve the alteration of a heritage place.
Involve the erection of buildings or other structures adjacent to, or within important sight lines of a heritage place which are inconsistent with the heritage values of the place	There are no documented heritage places with natural heritage values within the Strategic Assessment Area. Additionally, there are no documented important sight lines associated with surrounding natural areas, and the infrastructure to be developed within the Submarine Construction Yard would be consistent in terms of size and scale with other industrial developments on the Lefevre Peninsula, including the existing Osborne Naval Shipyard. The Actions and Classes of Actions proposed under The Plan would not result in the erection of buildings or other structures adjacent to or within important sight lines of a heritage place.
Substantially diminish the heritage value of a heritage place for a community or group for which it is significant	There are no documented heritage places with natural heritage values within the Strategic Assessment Area. As such, the Actions and Classes of Actions proposed under The Plan would not diminish the heritage value of a heritage place for a community or group.
Substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place	There are no documented heritage places with natural heritage values within the Strategic Assessment Area. The infrastructure to be associated with the Submarine Construction Yard would be consistent in terms of size and scale with other industrial developments on the Lefevre Peninsula. The Actions and Classes of Actions proposed under The Plan are unlikely to alter the setting of a heritage place.
Substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site	There are no documented heritage places with natural heritage values within the Strategic Assessment Area. The area is not used for cultural or ceremonial uses.

4.11.4 Mitigation measures

Measures to be implemented that would avoid or reduce the potential for impacts to natural heritage are provided in Table 4-36. This table provides Specific, Measurable, Achievable, Relevant and Timebound mitigations.

Table 4-36 SMART mitigation measures for potential impacts associated with natural heritage

Specific	Measurable	Achievable	Relevant	Timebound
What are the specific measures that should be implemented?	How will this be measured?	Is this a realistically achievable and well-established approach?	How is this relevant to The Plan?	When will this be implemented?
Prepare a Soil Erosion and Drainage Management Plan, which is to be to be included in the Construction Environmental Management Plan. This plan will detail: – Controls for surface runoff – Controls for dust generation – Controls for erosion, and installation – Controls for sediment, and installation	– Implement an inspection and monitoring program – Measure against performance indicators – Measure against legislative compliance requirements	– Standard established mitigation measure – State government requirement	– Mobilisation of sediment	**During construction:** – For works involving bulk earthworks below imported fill level – For works involving piling – For works involving dredging to create a deeper channel **During operation:** – For works involving dredging to maintain river depth

4.11.5 Conclusion

Based upon the assessment in Section 4.11.3 and in consideration the extent, duration and magnitude of expected impacts, The Plan is not likely to have a significant impact on natural heritage. In consideration of the existing environment and the Actions and Classes of Actions proposed under The Plan, it was assessed that the potential impacts would be likely to be acceptable.

5. References

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Appendix I

Climate Review Report

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CLIMATE REVIEW REPORT

SUBMARINE CONSTRUCTION YARD STRATEGIC ASSESSMENT

OSBORNE, SOUTH AUSTRALIA

29 November 2024

www.asa.gov.au

Project name	Submarine Construction Yard Strategic Assessment
Document title	Climate Review Report | Submarine Construction Yard
This document has been prepared by GHD Pty Ltd for the Australian Submarine Agency	

Acknowledgement of Country

The Australian Submarine Agency acknowledges the Kaurna Meyunna people of Kaurna Country, the Traditional Custodians on whose land the Submarine Construction Yard is sited. We recognise their continuing connection to traditional lands and waters and would like to pay respect to their Elders both past and present.

Executive Summary

Overview

The Australian Submarine Agency and the Commonwealth Minister for the Environment and Water ('the Minister') entered into a Strategic Assessment Agreement in November 2023 (the 'Strategic Assessment Agreement'). The pathway for assessment and approvals, agreed upon under the Strategic Assessment Agreement, for the construction and operation of the proposed Submarine Construction Yard, is under Part 10 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The preferred site for the construction and operation of the Submarine Construction Yard (the 'Strategic Assessment Area') is located on the Lefevre Peninsula, approximately 19 km north of Adelaide in South Australia.

The Submarine Construction Yard would be developed to enable the building of nuclear-powered, conventionally armed submarine SSN-AUKUS; and would contain a range of facilities in which the fabrication and manufacturing of submarine parts and components, as well as testing and commissioning of submarines, would occur.

The Lefevre Peninsula has undergone significant alteration and industrial development since 1881; including an area that has been filled historically to depths of approximately 3.3 m below the ground level, within the Strategic Assessment Area. Additionally, the Port Adelaide River has been subject to dredging operations since the onset of industrialisation in the region.

This climate review considers the climatic hazards that are predicted to impact the Strategic Assessment Area and surrounding region; which would affect the functioning of the Submarine Construction Yard in the future. These hazards include sea level rise, extreme temperatures and heatwaves, drought, extreme rainfall and flooding, and bushfires.

This report also considers climatic hazards that have the potential to impact matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* ('Protected Matters'). This includes unique plants, animals, habitats, and places that hold ecological or cultural significance to people and communities. This climate review provides an overview of potential future climate change related impacts on Protected Matters within the Strategic Assessment Area and the surrounding region, including:

– Listed threatened species habitats within the Strategic Assessment Area and surrounding area
– Listed migratory species habitats within the Strategic Assessment Area and surrounding area
– The environment

Approach

Representative Concentration Pathways (RCPs) are the internationally agreed, scientific climate models. This climate review assessed high emission (RCP8.5) and moderate emission (RCP4.5) scenarios to project future climatic conditions in the Strategic Assessment Area and surrounding region. It also considered Shared Socioeconomic Pathways (SSPs) to refine models; accounting for future developments in society, economy, and environment. RCPS and SSPs are internationally agreed-upon standard for climate modelling set by the Intergovernmental Panel on Climate Change (IPCC).

The climate review considered the RCP4.5 and SSP2-4.5 (intermediate scenario), and RCP8.5 and SSP5-8.5 (worst-case climate change scenarios), over mid-term (2050) and long-term (2100) timeframes.

A summary of the climate change projections for the intermediate and worst-case scenarios is found in Table E.1. While the area is very likely to be affected by climate change, it should not impact the function of the Submarine Construction Yard.

Table E.1 Comparing climate projection data (1986-2005) against RCPs to understand potential climate outcomes in 2100

Climatic hazard	Intermediate scenario (RCP4.5)	Worst-case scenario (RCP 8.5)
Sea level	Sea level rise of up to +0.57 m by 2100 (SSP2-4.5)	Sea level rise of up to +0.73 m by 2100 (SSP5-8.5)
Temperature	Higher temperatures, with 27.5 days over 35°C by 2100	Higher temperatures, with 36.2 days over 35°C by 2100
Drought	Precipitation levels decrease by an average of 6.7 mm	Precipitation levels decrease by an average of 9.3mm
Extreme rainfall / flooding	Percentage change of extreme rainfall events increase by an average of 9.1%	Percentage change of extreme rainfall events increase by an average of 22.9%
Bushfire risk	Increase in bushfire risk to 2.9 severe fire danger days per annum by 2100	Increase in bushfire risk to 5.4 severe fire danger days per annum by 2100

The Protected Matters in the region are vulnerable to inundation from rising sea levels and erosion of coastal areas, shifts in species distributions, and exacerbation of habitat loss and fragmentation.

Document navigation

This report is an Appendix to the Biodiversity Values Report, which provides a review of the predicted climate conditions within the Strategic Assessment Area and the surrounding region. An assessment of the impact of the construction and operation of the Submarine Construction Yard on matters protected under the EPBC Act, is provided in the Strategic Impact Assessment Report.

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Acronyms and Abbreviations

Acronym / abbreviation	Meaning
AR5	Assessment Report 5
AR6	Assessment Report 6
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
IPCC	Intergovernmental Panel on Climate Change
RCP	Representative Concentration Pathway
SSN	Submersible Ship Nuclear
SSP	Shared Socioeconomic Pathway

Glossary

Term or phrase	Meaning
Assessment Report 5	Assessment Report 5 (AR5) – the fifth assessment report on global climate science and projections released in released in 2014 by the International Panel on Climate Change.
Assessment Report 6	Assessment Report 6 (AR6) – the sixth assessment report on global climate science and projections released in released in 2021 by the International Panel on Climate Change.
AUKUS	Trilateral security partnership between Australia, the United Kingdom, and the United States of America.
Baseline climate trends	A specific time interval in the past against which current and future climate data are compared. This period is used as a reference point to measure and assess changes in climate variables, such as temperature, precipitation, sea level, and atmospheric concentrations of greenhouse gases.
Climate impact	A threat or an opportunity that may arise as a result of either the weather or climate change both in the short and long-term.
Climate projection	The simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, derived using climate models.
Climate variable	Commonly measured meteorological trends. For example, temperature, rainfall, wind, humidity.
Emissions scenario	Representative estimates of future emissions of greenhouse gases, aerosols, and other pollutants. Emissions scenarios are used in combination with climate models to produce future climate projections. See also Representative Concentration Pathways.
the Environment	Means 'environment' as defined in Section 528 of the EPBC Act. It includes: a. Ecosystems and their constituent parts including people and communities ('ecosystem' is defined in the EPBC Act as 'a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functioning unit'); and b. Natural and physical resources; and c. The qualities and characteristics of locations, places and areas; and d. Heritage values of places ('heritage value' is defined in the EPBC Act as including 'the place's natural and cultural environment having aesthetic, historic, scientific or social significance, or other significance, for current and future generations of Australians.' 'Indigenous heritage value' is defined as meaning 'a heritage value of the place that is of significance to Indigenous persons in accordance with their practices, observances, customs, traditions, beliefs or history'); and e. The social, economic and cultural aspects of a thing mentioned in paragraph a), b), c) or d).
Intergovernmental Panel on Climate Change (IPCC)	The United Nations body for assessing the science related to climate change.
Long-term timeframe	The year 2100, which refers to projections from the period between 2081-2100
Mid-term timeframe	The year 2050, which refers to projections from the period between 2041 and 2060
The Plan	The Strategic Assessment Plan which describes: – The Actions and Classes of Actions that are to be undertaken to construct and operate the Submarine Construction Yard in the Strategic Assessment Area. – The outcomes that will be achieved for Protected Matters, to which Actions proposed under The Plan relate, in accordance with the requirements of the EPBC Act.
Protected Matter	Means a matter protected by a provision of Part 3 of the EPBC Act. The specific matter protected by each provision is set out in Section 34 of the EPBC Act.
The Report	The Impact Assessment Report assesses the potential environmental impacts associated with the development of the Submarine Construction Yard, and includes: – A description of the environment to which Actions proposed under The Plan relate – An assessment of the potential impacts of implementing The Plan on Protected Matters – Details of how likely or potential impacts will be avoided, mitigated and offset (where necessary or appropriate) to make sure that Protected Matters are protected and managed in the long-term.

Term or phrase	Meaning
Representative Concentration Pathway (RCP)	An emissions scenario that includes concentrations of the full suite of greenhouse gases and land use over time. These are used as inputs to climate models.
Strategic Assessment Area	Means the area displayed within the Strategic Assessment Area in Attachment 1 of the Agreement.
Surrounding region	The Strategic Assessment Area is surrounded by a variety of natural and manmade infrastructure. It sits in the greater context of the Lefevre Peninsula in Adelaide, South Australia. – North: natural reserves and ecosystems line the coast. This includes the Adelaide International Bird Sanctuary National Park, and Torrens Island – South: The Osborne Naval Shipyard and residential areas – East: Torrens Island, Barker Inlet and St Kilda – West: industrial zoning, and Gulf St Vincent
Shared Socioeconomic Pathway (SSP)	An emissions scenario that describes possible future developments in society, economy, and environment. There are five shared socioeconomic pathways endorsed by the International Panel on Climate Change associated with five emissions scenarios that reflect ways in which the world may evolve with different climate policies (mitigation scenarios) in place.
Vulnerable	The propensity or predisposition to be adversely affected. The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.

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1. Introduction

1.1 Overview

Australia, the United Kingdom, and the United States announced the AUKUS trilateral security partnership in September 2021. The AUKUS partners agreed to support Australia to construct conventionally-armed nuclear-powered submarines (known as 'submersible ship nuclear', or SSN) in South Australia. The conventionally-armed nuclear-powered submarines built under AUKUS will meet Australia's defence requirements in future decades.

The approach for Australia to develop a conventionally-armed nuclear-submarine capability (the 'Optimal Pathway') was announced on 13 March 2023. Under AUKUS, it is planned to build up to five conventionally-armed nuclear-powered submarines in Australia (to be known as SSN-AUKUS), by the early 2040s.

The preferred site for construction of SSN-AUKUS submarines (the 'Submarine Construction Yard') is located at Osborne on the Lefevre Peninsula, approximately 19 km north of Adelaide, in South Australia. The Submarine Construction Yard would be developed to contain a range of facilities in which the fabrication and manufacturing of submarine parts and components, as well as testing and commissioning of submarines, would occur (

Figure 1).

The Australian Submarine Agency and the Commonwealth Minister for the Environment and Water ('the Minister') entered into a Strategic Assessment Agreement in November 2023 (the 'Strategic Assessment Agreement'). This Section 146 agreement, made under Part 10 of the EPBC Act, sets out the content that is required for inclusion within the Strategic Assessment Plan for the construction and operation of the Submarine Construction Yard ('The Plan'), as well as the requirement to develop relevant Terms of Reference for a Strategic Impact Assessment Report ('The Report').

The area agreed to be designated as the 'Strategic Assessment Area', in which Actions and Classes of Actions outlined under the Plan can be endorsed and approved by the Minister, is shown in

Figure 1.

1.2 Purpose of this report

The purpose of this report is to provide a review of the predicted climate conditions within the Strategic Assessment Area and the surrounding region. The predicted climate conditions have been based upon two plausible, but conservative, future climate scenarios (RCP4.5 and RCP8.5). This report is designed to support The Report, and address the Terms of Reference relating to future climatic conditions, as summarised in Table 1-1.

Table 1-1 Terms of Reference from The Report

Terms of Reference clause	Section of Climate Review Report
5.6. The Report must detail the plausible future climatic conditions of the Strategic Assessment Area in the assessment of impacts on Protected Matters of implementing The Plan (where such data exists). This should include, but not be limited to:	
a) How changes in climate would affect the impacts of implementing the Plan on Protected Matters over time, and what (if any) effect this would have on the outcome for Protected Matters.	Section 4
b) Discussion of loss, fragmentation, or drying of potential climate refugia for threatened species or communities as a result of the proposed Plan – consider the potential impacts of removing or otherwise impacting this climate refugia for the long-term survival of the species in the region.	Section 4
c) Discussion of increased risk of fire as a result of The Plan under drier conditions and periods of extreme heat.	Section 3.2
d) Discussion of changes in the frequency and intensity of extreme weather events that may exacerbate impacts to Protected Matters within and downstream of the Strategic Assessment Area.	Section 3.2
e) Inclusion of different climate scenarios in any site water management modelling, including flooding, storm surge events and sea level rise.	Section 3.2 Section 3.2.1

STRATEGIC ASSESSMENT AREA

Legend

- Railway
- Strategic assessment area
- Marine area
- Onshore area

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FIGURE 1
Rev 0
29/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_301_AssessmentAreasAgreement

Torrens Island Conservation Park
Port Adelaide River
Pelican Point
Power Stations
Container Terminal
Grain Terminal
Snapper Point
Lefevre Peninsula
Pelican Point Road
Mutton Cove
Falie Reserve
Oliver Rogers Road
North Haven Golf Course
Biodiversity Park
Victoria Road
Power Station
Lady Ruthven Drive
Gulf St Vincent
Port Adelaide
Osborne Naval Shipyard
North Haven Marina
Osborne Road

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area (2023). nearmap.com:

1.3 Understanding uncertainties in climate projections

Uncertainties in predictive scenarios of future climate change stem from several sources, and pose challenges to the precise projection of future climate change.

There are typically three main sources of uncertainty in climate projections:

– **Natural climate variability**. This includes local variability in daily weather, seasonal climate, and climate differences over decades. This is the primary source of uncertainty over the next 10 years
– **How regional weather and climate respond to changing greenhouse gas and aerosols concentrations**. This information is derived from climate models, each of which provides a different simulation of future weather and climate at a given location
– **How greenhouse gas and aerosol concentrations may change in response to socio-economic change, technological change, energy transitions, and land use change**. This is the largest source of long-term uncertainty.

These uncertainties in projecting future climate variables also extend to more specific environmental metrics, such as sea level projections. In sea level projections, the likely sea level ranges are evaluated by considering uncertainties related to temperature changes associated with emissions scenarios. Uncertainties exist in the relationships between temperature and the factors driving projected sea level changes, including thermal expansion, ocean dynamics, and glacier and ice sheet loss (Fox-Kemper *et al.* 2021).

Because of the uncertainties inherent in projections of future climate, scenarios should be regarded as representations of a plausible future (what **may** happen in the future) and not as forecasts or predictions (what **will** happen in the future). Many forms of uncertainty exist in climate modelling, including uncertainty in future emission scenarios and within global climate models themselves.

2. Approach

2.1 Overview

This Climate Review Report includes a review of projected climate trends and is based on current practices from the International Panel on Climate Change (IPCC). It considers how the climate is expected to change over time and what the implications could be to Protected Matters within the Strategic Assessment Area and the surrounding region.

2.1.1 What is the IPCC?

The IPCC is an intergovernmental body of the United Nations. It focuses on furthering the scientific understanding on how climate change is influenced by human activities. The IPCC releases reports outlining global climate projections, climate change impacts and future risks (IPCC 2014). The Fifth Assessment Report (AR5) included four scenarios for global climate projections, each a different interpretation of how the world may respond to the challenge of a changing climate, the need to continue to produce and use energy and resources, and the global greenhouse gas emissions that may occur given alternative economic, globalisation and environmental pathways (IPCC 2014). These factors are named as 'Representative Concentration Pathways' (RCPs) in AR5, and other subsequent reports. A high RCP represents future climate conditions, if a small amount of effort was made to reduce emissions; and a low RCP represents future climate conditions, if a significant amount of effort was made to reduce emissions, and have a generally less severe outcome.

It should be noted that the IPCC released the Sixth Assessment Report (AR6) in 2021, to provide an overview of the state of knowledge on the science of climate change and updated data since the publication of AR5; however, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Bureau of Meteorology (BOM) climate projection data has not yet been updated to reflect AR6 (Lee et al. 2021).

2.2 Climate parameters

2.2.1 Timeframe

Climate models provide an output of potential future climate states over several timeframes. To reduce variation in the models' data outputs, timeframes are commonly presented as an average over a 20-year period; for example 2050 which encompasses 2041-2060, and 2100 which encompasses 2081-2100.

The timeframes selected for this climate review are:

– Mid-term timeframe of 2050
– Long-term timeframe of 2100.

These timeframes are considered to be appropriate, as the Submarine Construction Yard is proposed to be operational by the mid-term timeframe, with the infrastructure anticipated to remain in place beyond the long-term timeframe.

2.2.2 Climate scenarios

This Climate Review Report has utilised climate scenarios from two different pathways from the IPCC's Fifth and Sixth Assessment Reports. Representative Concentration Pathways (RCPs) provide plausible descriptions for potential future climate states, whereas Shared Socioeconomic Pathways (SSPs) further refine the RCP emission scenarios; referring to scenarios in the context of potential future developments in society, economy, and the environment.

RCP 8.5 is often recommended for climate projection assessments to account for a worst-case, but plausible, scenario (Schwalm *et al.* 2020); and ensures that our analysis considers the upper bounds of potential climatic conditions. RCP 4.5 provides a comparison to this worst-case scenario; representing a stabilisation of greenhouse gas concentrations by 2100, if moderate global action is taken towards mitigating greenhouse gas emissions (Climate Change in Australia 2019).

The two RCPs comply with the Terms of Reference for this assessment. Details of each climate scenario are provided in Table 2-1.

Table 2-1 Details of climate scenarios

Scenario	IPCC report	Purpose	Assessment / description
RCP4.5	Assessment Report 5	Including both RCP scenarios allows a conservative assessment of how climatic conditions might impact the execution of The Plan on Protected Matters and assess the potential outcomes under different climate futures.	Assumes a stabilisation scenario where global emissions peak around 2040 and then decline.
RCP8.5			Represents a high-emission pathway where emissions continue to rise throughout the 21st century.
SPP5-8.5	Assessment Report 6	SPP scenarios were used to provide different climate projections for water management modelling that might affect the impacts of implanting The Plan on Protected Matters. This includes projected sea-level rise scenarios for the Strategic Assessment Area and surrounding region.	Society prioritises rapid and unconstrained growth in economic output and energy use.
SPP2-4.5			Represents a more stable scenario where development and emissions levels continue throughout the 21st century.

3. Climate change projections

3.1 Baseline climate trends – 1986 to 2005

Weather data from the period between 1986 to 2005 (BOM 2024) was obtained from the Bureau of Meteorology Parafield Airport (Station number 023013) and Torrens Island (Station number 023018) weather stations for the following parameters:

– 9 am and 3 pm wind data
– Rainfall
– Minimum and maximum daily temperature
– Prevailing wind and other wind data

The data was reviewed and used as the basis for the baseline data for the Strategic Assessment Area, typical trends for this period are summarised in Figure 2.The baseline weather data is provided in Appendix A.

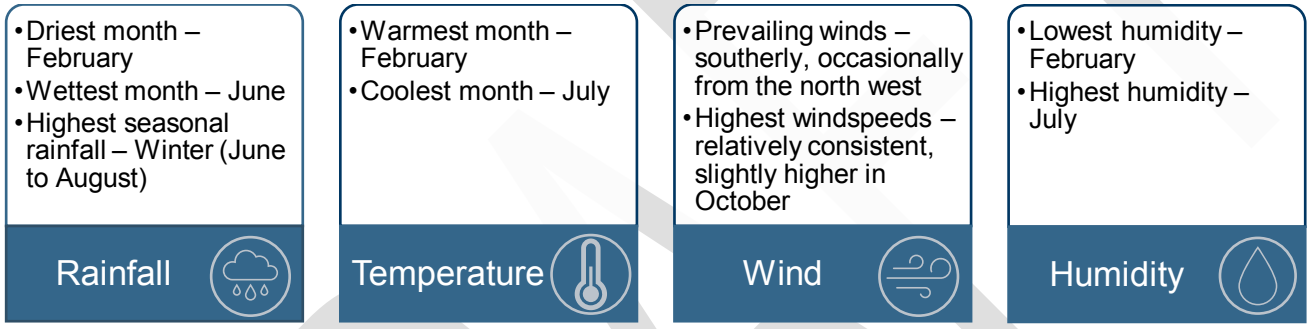

Figure 2 Baseline climate trends – Adelaide

3.2 Projected climate change trends – 2050 and 2100

Projected climate change trends for the Adelaide region under the RCP4.5 and RCP 8.5 scenarios are summarised below.

1. Sea level: Continued increase in sea level is projected for the Adelaide region.
2. Extreme temperature: By 2050, the Adelaide region is expected to experience warmer temperatures across all seasons. Spring is projected to experience the greatest warming.
3. Rainfall: Rainfall is projected to decline, especially in spring. This rainfall decline may lead to more prolonged drought periods. Despite a predicted overall decline in rainfall, the intensity of rainfall during extreme weather events is projected to increase.
4. Drought: The Strategic Assessment Area and surrounding region is likely to continue to get drier in the future.
5. Bushfires: The frequency of hot days (days over 35°C and 40°C) and heatwaves is expected to increase. This will increase harsher bushfire risk to the surrounding region. Frosts are projected to decrease over time.

The climate projection data under RCP4.5 and RCP8.5 scenarios for the Strategic Assessment Area are detailed in Appendix A.

3.2.1 Projected sea level rise

Indicative sea level rise under the RCP4.5 scenario for the Strategic Assessment Area and surrounding region is shown in Figure 3. The mapping shows the projected inundation of 0.21 m (shaded in light blue) for the 2050 timeframe, and 0.57 m (shaded in dark blue) for the 2100 timeframe.

Figure 4 shows the indicative sea level rise under the RCP8.5 emission scenario. The mapping shows the projected inundation of 0.23 m (shaded in light blue) for the 2050 timeframe and 0.73 m (shaded in dark blue) for the 2100 timeframe.

3.2.2 Extreme temperatures and heatwaves

Climate modelling for the Strategic Assessment Area and surrounding region suggests that the climate will continues to warm, with maximum and minimum temperatures increases over this century. In the long-term higher temperatures will tend to prevent frost leading to a decrease in their occurrence.

Under scenario RCP4.5, by 2050, average temperatures in the region are projected to increase between 0.8°C and 1.6°C when compared with to 1986-2005, by 2100 the increase may be between 1.1°C and 2.2°C. The increase in average temperatures also translates to an increase in extreme temperatures and more frequent hot days (days of over 35°C and 40°C), average hot days could increase by 25 days over 35°C and 6.5 days over 40°C by 2050 and increase to 27.5 days over 35°C and 7.5 days over 40°C by 2100. In the long-term higher temperatures will tend to prevent frost leading to a decrease in their occurrence.

Under scenario RCP8.5, by 2050, average temperatures in the region are projected to increase between 1.2°C and 2°C when compared to 1986-2005, by 2100 the increase may be between 2.6°C and 4.1°C. The increase in average temperatures also translates to an increase in extreme temperatures and more frequent hot days (days of over 35°C and 40°C), average hot days could increase by 26.8 and 7.4 days by 2050 and increase to 36.2 and 12.9 days by 2100.

Climate extremes are rare events, so accurately determining their current and future frequency and intensity is difficult and highly dependent on having a long record of climate observations.

Urban heat Island effect

Annual average temperatures in South Australia are increasing and so are the number and duration of extreme hot weather events. Higher temperatures are observed in large cities than compared to rural areas. The severity of heat experienced in cities during hot weather varies across the urban landscape. Areas with hard surface such as bitumen and concrete which absorb more heat compared to vegetated areas or parklands. This phenomenon is called the urban heat island effect (Seed Consulting Services 2017).

The South Australia's trend and condition report card for 2023 states that urban heat intensity in metropolitan Adelaide has increased by 0.2°C between 2014 and 2023 (Government of South Australia 2023a). There is significant variation within Local Government Areas, showing localised areas of warming and cooling between 2014 and 2023 (Figure 5). The Strategic Assessment Area is located with the Port Adelaide Enfield Local Government Area and depicts an increase of 0.5-1°C between 2014 and 2023 (Government of South Australia 2023b).The greatest warming occurred in Local Government Areas of Campbelltown and Norwood (Government of South Australia 2023a).

The Strategic Assessment Area is located in an industrial zone with extensive land use, resulting in an increase in hard surfaces when compared to rural South Australia. The construction of the Submarine Construction Yard is expected to lead to an expansion of hard surface areas within the Strategic Assessment Area. These hard surfaces include roads, pavements and carparks. Temperatures in the region are likely to increase as described in Section 3.2.2.

3.2.3 Extreme rainfall/flooding

While the Strategic Assessment Area and surrounding region is projected to likely receive less overall total rainfall in the future, extreme rainfall events and flash flooding events are projected to increase. By 2050 the percentage change of extreme rainfall events in projected to increase by an average of 11.8% under RCP4.5 and 7.2% under RCP8.5, when compared with 1986-2005.

By 2100 the percentage change of extreme rainfall events is projected to increase by an average of 9.1% under RCP4.5 and 22.9% under RCP8.5.

3.2.4 Drought

The Strategic Assessment Area and surrounding region is likely to continue to get drier in the future. The mid-term 2050 projections suggest that rainfall is projected to continue to decline under both RCP4.5 and RCP8.5 scenarios when compared with 1986-2005. Precipitation levels are projected to decrease by an average of 4.2 mm under RCP4.5 and 5.9 mm under RCP8.5.

By 2100 precipitation levels are projected to decrease even further, precipitation levels are projected to decrease by an average of 6.7 mm under RCP4.5 and 9.3 mm under RCP8.5.

3.2.5 Bushfires

The number of high fire danger days (bushfire days) in the region surrounding the Strategic Assessment Area is expected to increase in the future. By 2050 under RCP4.5 the surrounding region is likely to observe an increase in bushfire days by 1.9 to 3.5 days. Under RCP8.5 bushfire days will increase by 1.9 to 2.3 days, when compared with 1986-2005.

By 2100 under RCP4.5 bushfire days are likely to increase by 2.2 to 2.9 days and 2.3 to 5.4 days under RCP8.5. Figure 6 depicts the risk rating for properties as indicated by the South Australian Planning and Design Code and the Country Fire Service South Australia (Government of South Australia 2024, Country Fire Service South Australia 2024). As noted, the Strategic Assessment Area and surrounding suburbs is graded as low risk (safer place, shaded in pink) from bushfires.

INDICATIVE SEA-LEVEL RISE SCENARIO (2050, 2100) (SSP2-4.5)

Legend

- Railway
- Strategic assessment area
- Moderate (SSP2-4.5) sea-level rise scenario - 2050
- Moderate (SSP2-4.5) sea-level rise scenario - 2100

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FIGURE 3
Rev 0
29/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_304_SeaLevelRise2_45

Gulf St Vincent
Lefevre Peninsula
Port Adelaide River
Torrens Island Conservation Park
Pelican Point
Power Stations
Container Terminal
Grain Terminal
Snapper Point
Mutton Cove
Falie Reserve
Pelican Point Road
Oliver Rogers Road
North Haven Golf Course
Biodiversity Park
Victoria Road
Lady Ruthven Drive
North Haven Marina
Osborne Road
Osborne Naval Shipyard
Port Adelaide
Power Station

INDICATIVE SEA-LEVEL RISE SCENARIO (2050, 2100) (SSP5-8.5)

Legend

- Railway
- Strategic assessment area
- Moderate (SSP5-8.5) sea-level rise scenario - 2050
- Moderate (SSP5-8.5) sea-level rise scenario - 2100

Australian Government
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GHD

FIGURE 4
Rev 0
29/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_305_SeaLevelRise5_85

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area (2023). NASA/GHD - Indicative sea-levels rises (2024) nearmap.com:

TREND RESULTS SHOWING CHANGE IN URBAN HEAT INTENSITY (FROM 1 JANUARY 2014 TO 1 JANUARY 2023) FOR EACH LGA

Legend

- Strategic assessment area
- Local Government Area

Change in heat intensity

- 1.0 - 1.5 ^{0}C decrease
- 0.5 - 1.0 ^{0}C decrease
- 0.0 - 0.5 ^{0}C decrease
- No change
- 0.0 - 0.5 ^{0}C increase
- 0.5 - 1.0 ^{0}C increase
- 1.0 - 1.5 ^{0}C increase
- 1.5 - 2.0 ^{0}C increase

Australian Government
Australian Submarine Agency

GHD

FIGURE 5
Rev 0
29/11/2024

0 2.5 5 7.5 10
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_302_UrbanHeatMapping

TWO WELLS
GAWLER
LYNDOCH
TOWN OF GAWLER
ANGLE VALE
VIRGINIA
CITY OF PLAYFORD
WILLIAMSTOWN
SPRINGTON
MOUNT PLEASANT
CITY OF SALISBURY
CITY OF TEA TREE GULLY
KERSBROOK
Gulf St Vincent
CITY OF PORT ADELAIDE ENFIELD
HOUGHTON
GUMERACHA
BIRDWOOD
CAMPBELLTOWN CITY COUNCIL
MOUNT TORRENS
CITY OF CHARLES STURT
THE CORPORATION OF THE TOWN OF WALKERVILLE
LOBETHAL
THE CITY OF NORWOOD PAYNEHAM AND ST PETERS
CITY OF PROSPECT
CITY OF WEST TORRENS
ADELAIDE
WOODSIDE
CITY OF BURNSIDE
CITY OF HOLDFAST BAY
CITY OF UNLEY
OAKBANK
CITY OF MITCHAM
STIRLING
HAHNDORF
NAIRNE
CITY OF MARION
ECHUNGA
CALLINGTON
MACCLESFIELD
CITY OF ONKAPARINGA
MEADOWS
MASLIN BEACH
MCLAREN VALE
STRATHALBYN
WILLUNGA
ALDINGA BEACH
SELLICKS BEACH
MOUNT COMPASS

Data source: GA - Roads, place names, State boundaries (2015). DE - Heat Intensity (2023). GHD - Strategic assessment area (2023). World Imagery: Earthstar

BUSHFIRE RISK FOR THE STRATEGIC ASSESSMENT AREA

Legend

- Railway
- Strategic assessment area
- Bushfire - General
- Bushfire - Urban Interface
- Bushfire - Safer Places

Australian Government
Australian Submarine Agency

GHD

FIGURE 6
Rev 0
29/11/2024

0 0.5 1 1.5 2
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_303_BushfireMapping

Bolivar
St Kilda
Port Adelaide River
Outer Harbor
Yerlo
North Haven
Lefevre Peninsula
Midlunga
Taperoo
Draper

4. Protected Matters vulnerable to climate impacts

Based upon the projected climate change impacts described in Section 3.2, Protected Matters in and around the Strategic Assessment Area are vulnerable from the following climate change-related hazards and extreme weather events:

- Sea level rise
- Extreme temperatures and heatwaves
- Severe storms (including lightning strike)
- Extreme rainfall/flood
- Drought and earth movement
- Bushfire.

Table 4-1 outlines the Protected Matters within the Strategic Assessment Area and surrounding region that are more vulnerable to climate change impacts. A summary of the potential climate impacts on Protected Matters within the Strategic Assessment Area and surrounding region are summarised in Table 4-2.

Table 4-1 Protected Matters summary

Protected Matter	Description
Listed threatened species	The Strategic Assessment Area contains areas of habitat suitable for listed threatened species. Observations from field surveys conducted within in the Strategic Assessment Area (**Chapter 5 of The Impact Assessment Report**) included: – Three EPBC Act listed threatened species Habitat types included low open shrubland, tidal flats, seagrass meadows, mangrove shrubland and constructed wetlands.
Migratory species	The Strategic Assessment Area contains areas of habitat suitable for migratory species. Observations from migratory shorebird surveys conducted within the Strategic Assessment Area (**Chapter 5 of The Impact Assessment Report)** included: – Seven EPBC Act listed migratory species Habitat types included tidal flats and constructed wetlands.
The environment	Climate change impacts have the potential to affect environmental, social and economic values within the Strategic Assessment Area. Factors of the environment have been grouped into the following: – Physical environment – Biological environment – Social environment. Further detail on these environmental factors is described in **Chapter 5 of The Impact Assessment Report**.

Table 4-2 Potential climate impacts on Protected Matters within the Strategic Assessment Area

Climate impact	Protected Matter		
	Threatened species	**Migratory species**	**The environment**
Sea level rise	– **Loss** of intertidal feeding habitat for birds due to inundation, affecting shorebird populations – Habitat fragmentation and loss of potential climate refugia	– **Loss** of intertidal feeding habitat for birds due to inundation, affecting shorebird populations and their migratory patterns – Habitat fragmentation and loss of potential climate refugia	– Increase in erosion and flooding of important foreshore areas and affect water quality as salt water is pushed further upstream into freshwater ecosystems – Increase in damage costs to infrastructure – Habitat fragmentation and loss of potential climate refugia
Extreme temperature	– Increased risk of mortality – Habitat fragmentation and loss of potential climate refugia – Disruption of food cycle	– Increased risk of mortality. Change in migratory patterns – Habitat fragmentation and loss of potential climate refugia – Disruption of food cycle	– Increasing temperatures lead to increased health risks, especially in vulnerable populations, including heat stress and heat-related illnesses resulting in ill-health and or death.
Extreme rainfall / flooding	– Flooding from extreme rainfall events disrupts nesting sites and reduces food availability leading to loss of population	– Flooding from extreme rainfall events disrupts nesting sites and reduces food availability leading to loss of population	– Increase in damage costs to infrastructure – Temporary decrease in water quality – Disturbance to vulnerable habitats
Drought	– Drought may lead to the drying of wetlands and mudflats causing habitat fragmentation and loss of critical feeding and breeding areas reducing the population of threatened species.	– Drought may lead to the drying of wetlands and mudflats causing habitat fragmentation and loss of critical feeding and resting areas, reducing the population of migratory species.	– Decrease in water supply due to drought conditions leads to economic hardships – Drying of potential climate refugia – Disruption of food cycle
Bushfire	– Increased risk of mortality – Loss of potential climate refugia	– Increased risk of mortality – Loss of potential climate refugia	– Decrease in air quality – Loss of potential climate refugia – Increased risk of mortality – Increase in damage costs to infrastructure – Long term disturbance to soil and water quality

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Appendices

Appendix A

Climate projection data

Table 1 Climate projection data for the Strategic Assessment Area and surrounding region under RCP 8.5 (2050 and 2090-2100)

Variable		Current climate		Climate change projections			
	Climate variable	Annual historical trend Parafield Airport (023013) and Torrens Island (023018) (from site)	Baseline period	General trend	Mid-century, very high scenario 2050, RCP 8.5	Late century, very high scenario 2090, RCP 8.5	Source
Temperature	Mean maximum daily temperature (°C) - Annual	22.6	1986 to 2005	↑	+1.5°C (1.2 to 2) i.e. 24.1°C (23.8 to 24.6)	+3.3°C (2.6 to 4.1) i.e. 26°C (25.2 to 26.7)	2,7
	Days p.a. over 35 °C	19.4	1986 to 2005	↑	26.8 days	36.2 days	2,7
	Days p.a. over 40 °C	3.9	1986 to 2005	↑	7.4 days	12.9 days	2,7
Rainfall	Mean Rainfall (mm) - Annual	446.5	1986 to 2005	↑↓ Seasonal variation	-5.9% (-17.8 to 4.4) i.e. 420 mm (367.2 to 466.3)	-9.3% (-36.9 to 5.8) i.e. 404.8 mm (281.5 to 472.5)	2,7
	Mean Rainfall (mm) - Spring (SON)	117.6	1986 to 2005	↓	-7.6% (-34.9 to 14.2) i.e. 108.7 mm (76.6 to 134.4)	-18.9% (-49.9 to 8.5) i.e. 95.5 mm (59 to 127.6)	2,7
	Mean Rainfall (mm) - Summer (DJF)	62.6	1986 to 2005	↓	-5.8% (-22.8 to 16.6) i.e. 59 mm (48.3 to 73)	-3.3% (-26 to 22.3) i.e. 60.6 mm (46.4 to 76.6)	2,7
	Mean Rainfall (mm) - Autumn (MAM)	90.1	1986 to 2005	↑	+0.3% (-22.7 to 18.1) i.e. 90.4 mm (69.7 to 106.5)	+1.7% (-33.3 to 33.1) i.e. 91.7 mm (60.1 to 120)	2,7
	Mean Rainfall (mm) - Winter (JJA)	176.1	1986 to 2005	↓	-9.2% (-19.3 to 4.3) i.e. 159.8 mm (142.1 to 183.7)	-19.1% (-42.8 to -2.6) i.e. 142.5 mm (100.8 to 171.5)	2,7
	Maximum 1 day rainfall for a 20 year ARI event	n/a	n/a	↑	+7.2% (-10.5 to 34.5)	+22.9% (-2.8 to 42)	3
Extreme events	Severe fire danger days per year	1.7	1981-2010	↑	1.9 to 2.3 days	2.3 to 5.4 days	4
Sea conditions	Sea level rise (m)	n/a	1986-2005	↑	+0.22 m (0.18 to 0.31)	+0.73 m (0.56 to 1.00)	NASA AR6

Table 2 *Climate projection data for the Strategic Assessment Area and surrounding region under RCP 4.5 (2050 and 2090-2100)*

Variable		Current climate		Climate change projections			
Climate variable		Annual historical trend Parafield Airport (023013) and Torrens Island (023018) (from site)	Baseline period	General trend	Mid century, moderate scenario 2050, RCP 4.5	Late century, moderate scenario 2090, RCP 4.5	Source
Temperature	Mean maximum daily temperature (°C) - Annual	22.6	1986 to 2005	↑	+1.2°C (0.8 to 1.5) i.e. 23.8°C (23.4 to 24.2)	+1.7°C (1.1 to 2.2) i.e. 24.3°C (23.7 to 24.8)	2,7
	Days p.a. over 35 °C	19.4	1986 to 2005	↑	25 days	27.5 days	2,7
	Days p.a. over 40 °C	3.9	1986 to 2005	↑	6.5 days	7.5 days	2,7
Rainfall	Mean Rainfall (mm) - Annual	446.5	1986 to 2005	↓	-4.2% (-16.8 to 2.4) i.e. 427.9 mm (371.7 to 457.3)	-6.7% (-18.3 to 2.6) i.e. 416.8 mm (364.8 to 458)	2,7
	Mean Rainfall (mm) - Spring (SON)	117.6	1986 to 2005	↓	-6.4% (-23.1 to 4.9) i.e. 110.1 mm (90.5 to 123.4)	-13.6% (-26.3 to 2.9) i.e. 101.7 mm (86.7 to 121)	2,7
	Mean Rainfall (mm) - Summer (DJF)	62.6	1986 to 2005	↓	-2% (-18.7 to 16) i.e. 61.3 mm (50.9 to 72.6)	-2.7% (-19.6 to 13.3) i.e. 60.9 mm (50.3 to 71)	2,7
	Mean Rainfall (mm) - Autumn (MAM)	90.1	1986 to 2005	↓	-1.4% (-20 to 23) i.e. 88.9 mm (72.1 to 110.8)	-1.8% (-26.4 to 16.5) i.e. 88.5 mm (66.4 to 105)	2,7
	Mean Rainfall (mm) - Winter (JJA)	176.1	1986 to 2005	↓	-9.4% (-18.9 to 3.4) i.e. 159.5 mm (142.8 to 182.1)	-9.4% (-24 to 2.2) i.e. 159.6 mm (133.9 to 180)	2,7
	Maximum 1 day rainfall for a 20 year ARI event	n/a	n/a	↑	+11.8% (-7.3 to 22)	+9.1% (-4.4 to 39.3)	3
Extreme events	Severe fire danger days per year	1.7	1981-2010	↑	1.9 to 3.5 days	2.2 to 2.9 days	4
Sea conditions	Sea level rise (m) (2100 not 2090)	n/a	1986-2005	↑	+0.22 m (0.18 to 0.31)	+0.73 m (0.56 to 1.00)	NASA AR6

Source references:
1. CSIRO BOM (2015). Climate Change in Australia Projections Cluster Report - Southern and South-Western Flatlands, Appendix Table 1, pg 50 SSWF East (2050 projection not available, 2030 scenario used in place)
2. CSIRO BOM (2015). Climate Change in Australia Summary Data Explorer, Southern and SW Flatlands (East) Sub-Cluster Projections
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Appendix J

Heritage Summary Report

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HERITAGE SUMMARY REPORT

SUBMARINE CONSTRUCTION YARD STRATEGIC ASSESSMENT

OSBORNE, SOUTH AUSTRALIA

29 November 2024

www.asa.gov.au

Project name	Submarine Construction Yard Strategic Assessment
Document title	Heritage Summary Report
This document has been prepared by GHD Pty Ltd for the Australian Submarine Agency	

Acknowledgement of Country

The Australian Submarine Agency acknowledges the Kaurna Meyunna people of Kaurna Country, the Traditional Custodians on whose land the Submarine Construction Yard is sited. We recognise their continuing connection to traditional lands and waters and would like to pay respect to their Elders both past and present.

Executive summary

Overview

The Australian Submarine Agency and the Commonwealth Minister for the Environment and Water ('the Minister') entered into a Strategic Assessment Agreement in November 2023 (the 'Strategic Assessment Agreement'). The pathway for assessment and approvals, agreed upon under the Strategic Assessment Agreement, for the construction and operation of the proposed Submarine Construction Yard, is under Part 10 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The preferred site for the construction and operation of the Submarine Construction Yard (the 'Strategic Assessment Area') is located on the Lefevre Peninsula, approximately 19 km north of Adelaide in South Australia.

The Submarine Construction Yard would be developed to enable the building of nuclear-powered, conventionally armed submarine SSN-AUKUS; and would contain a range of facilities in which the fabrication and manufacturing of submarine parts and components, as well as testing and commissioning of submarines, would occur.

The Lefevre Peninsula has undergone significant alteration and industrial development since 1881; including an area that has been filled historically to depths of approximately 3.3 m below the ground level, within the Strategic Assessment Area. Additionally, the Port Adelaide River has been subject to dredging operations since the onset of industrialisation in the region.

This heritage review, informed by a heritage desktop assessment and previous site assessments including with Kaurna Traditional Owner representatives, documents the Indigenous, natural, and historic heritage values located within the Strategic Assessment Area.

Aboriginal heritage

The Lefevre Peninsula is a place of significant cultural importance to the Kaurna people, beyond spiritual and mythological connections. This place is intricately connected to the Tjilbruke dreaming, which overlaps with the land and waters within the Strategic Assessment Area. Tjilbruke is a Kaurna ancestral being who taught lessons about survival, and imparted rules for living in harmonious relationships with one another and the land (Wood 2007). The Lefevre Peninsula holds additional heritage significance to the Kaurna community due to its location near the intertidal creek and mangroves, that provide the natural resources needed to sustain the Kaurna people. The intangible heritage values encompass traditions, knowledge, ties to the land and natural resources, and living expressions that are inherited from ancestors and passed on to descendants.

Surface artefacts or Aboriginal heritage sites relevant to the Strategic Assessment Area were not identified by the cultural heritage desktop assessment or field surveys. However, due to the characteristic dunes and coastal landscape of the Lefevre Peninsula, there is a strong correlation with ancestral remains and burials. As such, despite substantial previous ground disturbance during European settlement, there is potential for burials to be present within areas of undisturbed soils, below the disturbed upper fill layers.

Historic heritage

No historic heritage sites listed on the World Heritage List, National Heritage List, Commonwealth Heritage List or the South Australian Heritage Register are located within the Strategic Assessment Area.

Five shipwrecks were identified within the marine area of the Strategic Assessment Area, and an additional two shipwrecks located within Mutton Cove. Of the five shipwrecks within the Strategic Assessment Area, one is not protected under State legislation (*Sigrid*), while the other four are protected (*Corsair, Wildflower, Enchantress* and *Napperby*). All five of these shipwrecks, located within the Port Adelaide River, have unknown locations; meaning that they have not yet been found. Of the two shipwrecks located in Mutton Cove, adjacent to the Strategic Assessment Area, one is exposed (*Excelsior*), while the other is covered in silt (*Jupiter*).

Natural heritage

Whilst the waterways of the Port of Adelaide are an important economic and environmental region, and contain a range of natural heritage values (including the Adelaide International Bird Sanctuary, and the Adelaide Dolphin Sanctuary); the Strategic Assessment Area itself has been impacted by significant modifications for industrial land-use, and does not contain any documented natural heritage values.

Document navigation

This report is an Appendix to the Submarine Construction Yard Strategic Assessment Impact Assessment Report ('The Report'), which provides an overview of the heritage values present within the Strategic Assessment Area and surrounding region. An assessment of the impact of the construction and operation of the Submarine Construction Yard on matters protected under the EPBC Act, including heritage values, is provided in The Report.

Acronyms and Abbreviations

Acronym / abbreviation	Definition
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
MNES	Matters of National Environmental Significance
SSN	Submersible Ship Nuclear
The Convention	Convention concerning the Protection of the World Cultural and Natural Heritage
UNESCO	United Nations Educational, Scientific and Cultural Organization

Glossary

Term / phrase	Definition
Actions or Classes of Actions	An 'Action' is a grouping of similar activities.
Assembly and testing area	The area within the onshore area of the Strategic Assessment Area north of Pelican Point Road and east of Mersey Road North as shown in pink on Figure 2.
Intangible heritage value	The practices, expressions, knowledge, and skills that communities, groups and sometimes individuals recognise as part of their cultural heritage. It is usually expressed in one of the following forms: oral traditions; performing arts; social practices, rituals, and festive events; knowledge and practices concerning nature and the universe; and traditional craftsmanship.
Marine area	A portion of the Strategic Assessment Area located within the Port Adelaide River (shown in Figure 2).
Manufacturing and fabricating area	The area within the onshore area of the Strategic Assessment Area south of Pelican Point Road and west of Mersey Road North as shown in yellow on Figure 2.
the Minister	The Commonwealth Minister for the Environment and Water, who is responsible for the administration of the EPBC Act. As per the Terms of Reference, this may include a person to whom that Minister's power, under Section 146(1) of the EPBC Act, has been delegated.
Onshore area	Any area of land within the shore area that is not included in the territorial sea or within the Port Adelaide River.
Optimal Pathway	The Optimal Pathway is the approach for Australia to develop a conventionally-arm nuclear powered submarine capability as announced on 13 March 2023.
The Plan	The Strategic Assessment Plan which describes: – The Actions and Classes of Actions that are to be undertaken to construct and operate the Submarine Construction Yard in the Strategic Assessment Area. – The outcomes that will be achieved for Protected Matters, to which Actions proposed under The Plan relate, in accordance with the requirements of the EPBC Act.
The Report	This document – the Impact Assessment Report, assesses the potential environmental impacts associated with the development of the Submarine Construction Yard, and includes: – A description of the environment to which Actions proposed under The Plan relate – An assessment of the potential impacts of implementing The Plan on Protected Matters – Details of how likely or potential impacts will be avoided, mitigated and offset (where necessary or appropriate) to make sure that Protected Matters are protected and managed in the long-term.
SSN-AUKUS	A planned class of nuclear-powered fleet submarine intended to enter service with the United Kingdom's Royal Navy in the late 2030s and Royal Australian Navy in the 2040s.
Strategic Assessment	A process where The Minister may approve taking an Action or Class of Actions in accordance with an endorsed policy, plan or program. A Strategic Assessment Agreement provides for this kind of assessment. It's often used for landscape-scale assessments of developments and programs.
Strategic Assessment Area	Means the area displayed within the Strategic Assessment Area in Attachment 1 of the Agreement.
Surrounding region	The Strategic Assessment Area is surrounded by a variety of natural and manmade infrastructure. It sits in the greater context of the Lefevre Peninsula in Adelaide, South Australia. – North: natural reserves and ecosystems line the coast. This includes the Adelaide International Bird Sanctuary National Park, and Torrens Island – South: The Osborne Naval Shipyard and residential areas – East: Torrens Island, Barker Inlet and St Kilda West: industrial zoning, and Gulf St Vincent

Term / phrase	Definition
Tangible heritage value	The *Aboriginal Heritage Act 1988* defines Aboriginal heritage into three categories: Aboriginal site: an Aboriginal site is an area of land that is of significance according to Aboriginal tradition, or of significance to Aboriginal archaeology, anthropology, or history. Aboriginal object: an object that is of significance according to Aboriginal tradition, or of significance to Aboriginal archaeology, anthropology, or history. Aboriginal remains: the whole or part of the skeletal remains of an Aboriginal person, not including remains that have been buried in accordance with the law of the state.
Terms of Reference	Means the Terms of Reference finalised on 25 March 2024, which details how the impacts from the proposed Actions and activities are to be assessed.

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1. Introduction

1.1 Overview

Australia, the United Kingdom, and the United States announced the AUKUS trilateral security partnership in September 2021. The AUKUS partners agreed to support Australia to construct conventionally-armed nuclear-powered submarines (known as 'submersible ship nuclear', or SSN) in South Australia. The conventionally-armed nuclear-powered submarines built under AUKUS will meet Australia's defence requirements in future decades.

The approach for Australia to develop a conventionally-armed nuclear-submarine capability (the 'Optimal Pathway') was announced on 13 March 2023. Under AUKUS, it is planned to build up to five conventionally-armed nuclear-powered submarines in Australia (to be known as SSN-AUKUS), by the early 2040s.

The preferred site for the construction of SSN-AUKUS submarines (the 'Submarine Construction Yard') is located in Osborne on the Lefevre Peninsula, approximately 19 km north of Adelaide, in South Australia. The Submarine Construction Yard would be developed to contain a range of facilities in which the fabrication and manufacturing of submarine parts and components, as well as testing and commissioning of submarines, would occur (Figure 1 and Figure 2).

The Australian Submarine Agency and the Commonwealth Minister for the Environment and Water ('the Minister') entered into a Strategic Assessment Agreement in November 2023 (the 'Strategic Assessment Agreement'). This Section 146 agreement, made under Part 10 of the EPBC Act, sets out the content that is required for inclusion within the Strategic Assessment Plan for the construction and operation of the Submarine Construction Yard ('The Plan'); as well as the requirement to develop relevant Terms of Reference for a Strategic Impact Assessment Report ('The Report').

The area agreed to be designated as the 'Strategic Assessment Area', in which the Actions and Classes of Actions outlined under The Plan can be endorsed and approved by the Minister, is shown in Figure 2.

1.2 Purpose of this report

The purpose of this report is to provide an overview of the heritage values present within the Strategic Assessment Area and surrounding region, to address the Terms of Reference relating to heritage values, as summarised in Table 1–1.

Table 1–1 Terms of Reference from The Report

Terms of Reference clause	Section of this report
4.2. The Report must identify and describe Protected Matters to which actions under The Plan relate. This must include:	
a) The location of any declared World Heritage properties and/or National Heritage places within or relevant to the Strategic Assessment Area, including a description of the associated heritage values (Part 3, Division 1, Subdivision A and AA).	Section 3.1.1, *Environment Protection and Biodiversity Conservation Act 1999*
g) A description of, including the location, any heritage values, or sites.	Section 5.3, Indigenous values summary Section 6.4, Historic values summary Section 7.5, Natural values summary

STRATEGIC ASSESSMENT AREA

Legend

- Railway
- Strategic assessment area
- Marine area
- Onshore area

Australian Government
Australian Submarine Agency

GHD

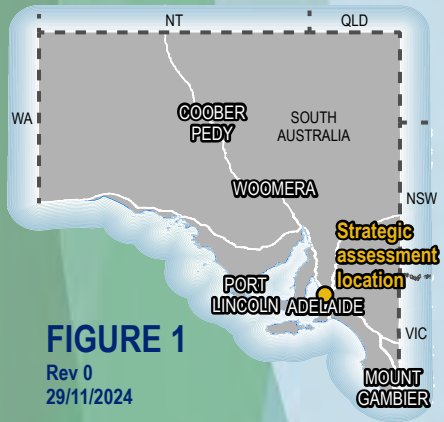

FIGURE 1
Rev 0
29/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_201_AssessmentAreasAgreement

MAIN OPERATIONAL AREAS

Legend

- Railway
- Strategic assessment area
- Marine area
- Manufacturing and fabricating area
- Assembly and testing area

Australian Government
Australian Submarine Agency

GHD

FIGURE 2
Rev 0
29/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_204_AssessmentArea

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment areas (2023). nearmap.com:

2. Strategic Assessment Area context

This chapter outlines and provides images of the following areas located within the Strategic Assessment Area:

– Falie Reserve (which sits within the manufacturing and fabricating area)
– Manufacturing and fabricating area
– Assembly and testing area

The photos were taken during field surveys undertaken in 2023-2024 to provide context for the land uses and condition of the land within the Strategic Assessment Area (Figure 3).

STRATEGIC ASSESSMENT AREA PHOTO POINTS

Legend

- Photo locations
- Railway
- Strategic assessment area

FIGURE 3
Rev 0
29/11/2024

0 100 200 300 400
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_206_HeritagePhotos

Australian Government
Australian Submarine Agency

GHD

Torrens Island Conservation Park
Port Adelaide River
Pelican Point
Power Stations
Plate 6
Plate 5
Container Terminal
Grain Terminal
Snapper Point
Plate 4
Plate 3
Lefevre Peninsula
Pelican Point Road
Fuel Terminal
Mutton Cove Conservation Reserve
Plate 1
Plate 2
Falie Reserve
Oliver Rogers Road
Victoria Road
Biodiversity Park
Lady Ruthven Drive
Sir Keith Smith Drive
Osborne Naval Shipyard

2.1 Falie Reserve

Located in the centre of the manufacturing and fabricating area, Falie Reserve (Photo 1) is a constructed stormwater basin, containing recreational facilities including shelters and walking paths.

The area has been highly disturbed and there are little to no areas of natural ground level visible. To the south of the stormwater basin is an open grassed area with a footpath for access (Photo 2). All vegetation observed in this area has been replanted.

Photo 1 *Falie Reserve facing southwest*

Photo 2 *Grassed area and structure within Falie park facing south*

2.2 Manufacturing and fabricating area

The manufacturing and fabricating area has undergone significant land clearance and there are large informal dirt tracks throughout this area. Salt bush regrowth was observed over much of this area (Photo 3). Across the ground surface there was evidence of the disturbance of the topsoil. Shell material was highly scattered across this area (Photo 4).

Photo 3 *Looking east across the manufacturing and fabricating area*

Photo 4 *Shell material scattered across the manufacturing and fabrication area*

2.3 Assembly and testing area

A large portion of this area has had its topsoil removed and there is no remnant vegetation within the southern portion. Land disturbing activities were being undertaken within the southern portion during the March 2023 site assessment (Photo 5). The northwestern portion of this area has been subject to vehicle movements but maintains a moderate level of vegetation (Photo 6). An informal dirt vehicle track runs down the eastern side of the area and traverses south. To the west of the track are large dirt piles from the land disturbing activities. Large built-up mounds run the length of the track.

Photo 5 *The southern portion of the assembly and testing area, facing west*

Photo 6 *Northwest portion of the assembly and testing area facing north*

3. Legislative framework

3.1 Commonwealth legislation

3.1.1 *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act encapsulates the listing of natural, historic, or Indigenous heritage values on Commonwealth lands, lands under Australian Government control or that are of outstanding heritage value. These listings include sites listed under the World Heritage, National Heritage, and Commonwealth Heritage lists.

The key sections of the EPBC Act that are of direct relevance to the Strategic Assessment Area are outlined in Table 3–1.

Table 3–1 Key sections of the EPBC Act applicable to the Strategic Assessment Area

Section	Relevance
Section 26: Requirements for approval of activities involving Commonwealth land with the potential to have a significant impact on the environment. **Section 28:** Requirements for approval of activities undertaken by a Commonwealth agency with the potential to have a significant impact on the environment.	Section 26 is relevant to actions that are untaken on Commonwealth Land and will or are likely to significantly impact the environment. Section 28 relates to actions undertaken by a Commonwealth Agency (such as the client) which will or are likely to significantly impact the environment. These sections include heritage places that are not otherwise listed (including Commonwealth Heritage Places, State and local registered places, and other heritage values), as well as other general environmental issues.
Section 341ZC: Requirements to minimise adverse impacts on the heritage values of a place included on the National and/or Commonwealth Heritage List.	This section requires Commonwealth agencies to minimise adverse impacts to heritage values of a National Heritage List or Commonwealth Heritage List place. Adverse impacts include direct impacts from physical disturbance or secondary impacts in the event of activities that would impact on visual aspect, cultural importance, landscaping, and curtilage of adjacent listed property.
Section 146, Part 10: Strategic Assessment: Requirements for strategic assessment approval pathway, which allows for the consideration of multiple MNES and cumulative impacts.	This section allows the Minister to agree to the adoption of implementation of a plan, policy or program on matters protected by a provision of Part 3 of the EPBC Act. This section requires the preparation of a suite of documents including a Strategic Assessment Plan and Strategic Assessment Report. A public notification is required that presents the Terms of Reference for the strategic assessment, the Terms of References specifies what must be included in The Impact Assessment Report.

World Heritage List

To ensure, as far as possible, the proper identification, protection, conservation, and presentation of the world's heritage, the Member States of the United Nations Educational, Scientific and Cultural Organization (UNESCO) adopted the *Convention Concerning the Protection of the World Cultural and Natural Heritage* ('the Convention') in 1972. The goals of the Convention are implemented by State Parties to the Convention, and the World Heritage Committee, who oversee and maintain the World Heritage List.

The Protected Matter Search Tool was accessed on 31 May 2024, and did not identify any World Heritage Listed properties within the Strategic Assessment Area. The nearest World Heritage Property to the Strategic Assessment Area is the Willandra Lakes Region, located over 400 km to the north-east, in New South Wales

National Heritage List

The National Heritage List, established under the EPBC Act, encompasses outstanding natural, Indigenous, and historic heritage sites. The Minister identifies these places as having significant heritage values for Australia.

The Protected Matter Search Tool was accessed on 31 May 2024, and did not identify any National Heritage Listed properties within the Strategic Assessment Area. The nearest National Heritage Place, the South Australian Old and New Parliament Houses; the Adelaide Park Lands and City Layout, is situated 15 km south-east of the Strategic Assessment Area.

Commonwealth Heritage List

The Commonwealth Heritage List, established under the EPBC Act, encompasses natural, Indigenous, and historic heritage sites. These sites are either wholly situated within Commonwealth areas, or lie outside of Australian jurisdiction but are owned or leased by the Commonwealth or a Commonwealth Authority. The Minister identifies these places as having significant Commonwealth heritage values. The Commonwealth Heritage List can include locations associated with defence, communication, customs, and other government activities.

The Protected Matter Search Tool was accessed on 31 May 2024, and did not identify any Commonwealth Heritage Listed properties within the Strategic Assessment Area.

3.1.2 *Native Title Act 1993*

Native Title describes the rights and interests of Aboriginal and Torres Islander people in land and waters, according to their traditional laws and customs. The *Native Title Act 1993* was passed following the *Mabo v the State of Queensland* decision by the High Court in 1992. Its purpose is to facilitate effective dealings in the recognition and protection of Native Title, specifically in the interests of Aboriginal and Torres Strait Islander peoples (AIATSIS 2022).

A Native Title Determination was established on 16 November 2018 for the Kaurna Yerta Aboriginal Corporation (SCD2018/001), which intersects with the Strategic Assessment Area. However the Strategic Assessment Area sits within freehold land, therefore Native Title is extinguished.

3.1.3 *Underwater Cultural Heritage Act 2018*

The *Underwater Cultural Heritage Act 2018* came into effect on 1 July 2019, replacing the previous *Historic Shipwrecks Act 1976*. The *Underwater Cultural Heritage Act 2018* is designed to safeguard shipwrecks, sunken aircraft and other forms of Australian underwater cultural heritage, that are over 75 years old. Its primary objective is to ensure the protection of these submerged artefacts for their heritage value; while allowing for their use in recreational, scientific, and educational contexts.

The *Underwater Cultural Heritage Act 2018* establishes the Australasian Underwater Cultural Heritage Database, which includes underwater cultural sites in Australian waters. The waters within the marine area of the Strategic Assessment Area are neither Australian nor Commonwealth waters; and therefore, the provisions of the *Underwater Cultural Heritage Act 2018* have not been considered applicable under this report.

3.2 South Australia

3.2.1 *Aboriginal Heritage Act 1988*

Aboriginal heritage in South Australia is managed under the *Aboriginal Heritage Act 1988*, and is administered by the Aboriginal Affairs and Reconciliation Division and the Department of Premier and Cabinet. All Aboriginal sites, objects and/or remains, whether previously recorded or not, are provided with statutory protection under the *Aboriginal Heritage Act 1988*. The definition of an Aboriginal site is provided under Section 3 of the Act:

> *Aboriginal Site means an area of land:*
>
> *a) That is of significance according to Aboriginal tradition; or*
>
> *b) That is of significance according to Aboriginal archaeology, anthropology, or history.*

Under Section 23 of the Act, it is an offence to damage, disturb or interfere with Aboriginal sites, objects or remains unless written authorisation from the Minister for Aboriginal Affairs and Reconciliation has been obtained. Penalties apply for offences committed under Section 23 of the *Aboriginal Heritage Act 1988*. It is an offence to divulge information relating to an Aboriginal site, object, remains or tradition without authorisation from the relevant Aboriginal group or groups.

3.2.2 *Heritage Places Act 1993*

Places of State heritage significance in South Australia are protected under the *Heritage Places Act 1993*. The *Heritage Places Act 1993* defines the parameters for determining a place or object's State heritage significance, as well as the methods for safeguarding state heritage sites. The *Heritage Places Act 1993* establishes the South Australian Heritage Register, which lists places of State heritage significance; and the South Australian Heritage Council, which is responsible for providing advice on heritage matters to the Minister. The Department of Environment and Water administers the South Australian Heritage Register on behalf of the Heritage Council.

A search of the South Australian Heritage Register was undertaken on 31 May 2024. No State Heritage Places were identified within the Strategic Assessment Area.

3.2.3 *Historic Shipwrecks Act 1981*

Historic shipwrecks in South Australia are protected under the *Historic Shipwrecks Act 1981*. All shipwrecks and shipwreck relics that are 75 years or older are automatically protected under this legislation. The *Historic Shipwrecks Act 1981* has similar protection provisions to the Commonwealth *Underwater Cultural Heritage Act 2018*. Legislative protection is based upon whether the object is located within Commonwealth or State waters. In State waters, only historic shipwrecks are protected; with historic shipwrecks, aircraft and relics registered on the South Australian Register of Historic Shipwrecks.

A search of the South Australian Register of Historic Shipwrecks on 31 May 2024, indicates that there are four protected shipwrecks within the Strategic Assessment Area: the *Corsair, Wildflower*, *Napperby* and *Enchantress*.

There are two exposed protected shipwrecks located adjacent to the Strategic Assessment Area, within Mutton Cove; the *Excelsior* and *Jupiter*. The *Sigrid* shipwreck is located within the Strategic Assessment Area; but is not protected under the Act, as it does not meet the criteria of being over 75 years old, therefore it does not require further assessment.

3.2.4 *Planning Development and Infrastructure Act 2016*

Heritage places of local heritage significance in South Australia are protected under the *Planning Development and Infrastructure Act 2016.* It is supported by subordinate regulations, in addition to practice directions and guidelines, issued by the State Planning Commission. The *Planning Development and Infrastructure Act 2016* defines what constitutes a local heritage place and provides matters that are relevant to the use, development and management of relevant land and buildings. This includes a planning system to regulate development within the State, a suite of design regulations, guidelines for construction and the use of buildings; and other initiatives to facilitate the development of infrastructure, facilities and environments that will benefit the community.

A search of the City of Port Adelaide Enfield Council City Plan 2023 (PAE 2016) was undertaken on 31 May 2024. No local heritage places were identified within the Strategic Assessment Area.

3.3 Non-statutory considerations

3.3.1 Register of the National Estate

The Register of the National Estate was established under the *Australian Heritage Commission Act 1975* (repealed); and retained under the *Australian Heritage Council Act 2003.* The Register of the National Estate is a list of important natural, Indigenous, and historic places throughout Australia. The register was closed in 2007 and stopped listing new places, but continued as a statutory register until February 2012. The Register of the National Estate currently functions as an archive of information that may continue to be current and relevant to statutory decisions about the protection of heritage places.

A search of the Register of the National Estate was undertaken on 31 May 2024. No National Estate sites were identified within the Strategic Assessment Area.

3.3.2 The National Trust of South Australia

The National Trust of South Australia is a not-for-profit organisation and member-based registered charity. It was established by State legislation in 1963, and transitioned to a public company in 2014. The organisation seeks to conserve and promote South Australia's Indigenous, natural, built, and historic heritage and culture.

A search of the National Trust of South Australia sites was undertaken on 31 May 2024. No National Trust sites were identified within the Strategic Assessment Area.

3.4 Future listing of heritage places

While there are no listed heritage places within the Strategic Assessment Area, there is potential for future listings of heritage properties in the area.

There are no places registered as nominated, but unlisted, on the Australian Heritage Database; therefore it is not expected that there will be any impacts to future heritage sites from this Project.

3.5 Summary of heritage searches and listings

The heritage listing search results occurring within the Strategic Assessment Area are summarised in Table 3–2.

Table 3–2 Heritage database search summary

Heritage database	Registered places within the Strategic Assessment Area (yes/no)	Date searched
World Heritage List	No	31 May 2024
National Heritage List	No	31 May 2024
Commonwealth Heritage List	No	31 May 2024
National Native Title Tribunal	No	31 May 2024
Australasian Underwater Cultural Heritage Database	Yes	31 May 2024
South Australian Register of Historic Shipwrecks	Yes	31 May 2024
Aboriginal Affairs and Reconciliation Division Register	No	31 May 2024
South Australian Heritage Register	No	31 May 2024
Register of National Estate	No	31 May 2024
National Trust	No	31 May 2024
South Australian Planning and Design Code	No	27 Nov 2024

4. Methods

4.1 Overview

The methodology for this review has been developed with regards to legislative requirements and heritage best practice. Consultation with the Kaurna Yerta Aboriginal Corporation was not proposed within the scope of this assessment.

4.2 Desktop assessment

European and Indigenous heritage values were identified from the desktop assessment. The results of the desktop assessment supported the Indigenous cultural landscape mapping and fieldwork strategy adopted for this assessment.

A review of publicly available databases and websites, reports and guidance, and spatial datasets is summarised in Table 4–1.

Table 4–1 Desktop assessment sources

Source	Details / relevant reference
Databases searches	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Search Tool	10 km search area Extracted 31 May 2024
South Australian Heritage Register	Extracted 31 May 2024
NatureMaps, which provides GIS mapping, maintained by Department of Environment and Water South Australia, including whether a shipwreck is protected and whether or not it has been found.	Extracted 31 May 2024
Australasian Underwater Cultural Heritage Database	Extracted 31 May 2024
Technical studies reviewed	
Osborne Preliminary Environmental and Heritage Impact Assessment Ecological Investigation Report	GHD 2023
Osborne Preliminary Environmental and Heritage Impact Assessment Planning Study Report	GHD 2023
Port River Historical Shipwreck Study	Hydro Survey 2023
Kaurna Cultural Heritage Survey	Wood 2007
Kaurna Meyunna Cultural Mapping: A People's Living Cultural Landscape	Telfer & Malone 2012
City of Port Adelaide Enfield Heritage Review	McDougall & Vines 2014
Archaeological Assessment: Future submarine Program, Mersey Road North, Osborne South Australia	Dash Architects 2019

4.3 Site assessments

4.3.1 Aboriginal heritage

A preliminary cultural heritage site assessment was undertaken by a GHD heritage consultant between 7 March and 8 March 2023. The preliminary site assessment covered the entirety of the Strategic Assessment Area; including Snapper Point, Falie Reserve and Archie Badenoch Circuit North.

An Aboriginal heritage site survey with the Kaurna Yerta Traditional Owners, was conducted on 3 July 2023 to inform a referral under the EPBC Act (Referral number 2023/09662), which encompasses part of the Strategic Assessment Area. The purpose of this site survey was to identify areas of disturbance, potential archaeological and anthropological sites, and any areas of Aboriginal heritage value. The field survey also supported a Heritage Impact Assessment report, completed on 25 September 2023; the findings of which were shared with Kaurna Yerta Aboriginal Corporation.

A site walk of the Submarine Construction Yard with the Kaurna people was undertaken on 5 August 2024.

4.3.2 Historic Heritage

A hydrographic survey was undertaken by HydroSurvey Australia in 2023. The purpose of the survey was to identify the extent, location and likelihood of survival of Historic Shipwrecks within the Port Adelaide River. Research was undertaken to narrow the search parameters for the surveys. The survey included a sonar and dive survey of the plotted shipwreck locations. Of relevance to the Strategic Assessment Area, were the surveys of the plotted sites for the Napperby and Enchantress shipwrecks (Hydro Survey 2023).

4.4 Consultation

Consultation with Traditional Owners has been informed by the Commonwealth Guidelines *Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act 1999* (DCCEEW 2023), as well consultation processes under the *Aboriginal Heritage Act 1988* (South Australia). Aboriginal community involvement in decision making and the management of their heritage is an important part of self-determination, as outlined under those guidelines and legislation. A search of Recognised Aboriginal Representative Bodies and Aboriginal Groups with Interests (including native title bodies) identified the Kaurna Yerta Aboriginal Corporation as an Aboriginal Group with Interest in the Strategic Assessment Area.

Consultation will continue to be undertaken consistent with guidance under Commonwealth and State guidelines. A consultation summary, including engagement with First Nations people, is provided in the Community and Stakeholder Engagement Report (**Appendix F Community and Stakeholder Engagement Report**).

5. Aboriginal heritage

5.1 Aboriginal ethnohistory

Ethnohistory is the study of cultures and Indigenous peoples' customs through historical records and other sources such as maps, music, art, oral tradition, enduring customs, language, and place names.

It is believed, through oral traditions, that the Kaurna people and their ancestors have lived in the Yerta Bulti (Port Adelaide) region from the time when light first came into the world. The Lefevre Peninsula holds a significant and rich Aboriginal history. Prior to European settlement, the Kaurna people populated a vast region extending from Port Wakefield to Cape Jervis, and to the western edge of the Mount Lofty Ranges. The term 'Kaurna' does not feature prominently in the primary sources of the Kaurna language. It is believed to have originated from the Ramindjeri or Ngarrindjeri word 'Konar,' which translates to 'men; people' (Amery 2000).

> *Cape Jervis to Port Wakefield along eastern shore of Gulf St. Vincent; inland to near Crystal Brook, Snowtown, Blyth, Hoyleton, Hamley Bridge, Clarendon, Gawler, and Myponga; from the east side of the Hummock Range to Red Hill where northern hordes were sometimes known as Nantuwara. Inland the Jultiwira or stringybark forests of the Mount Lofty Ranges marked their boundary. The Kaurna were the southernmost tribe to perform the initiatory rite of circumcision. Their territory was very correctly indicated as 2,800 square miles (7,200 sq. km.) with a population of 650 in the South Australian Register of 30 January 1842. Ivaritji, the last woman survivor, who died in 1929, provided much of our scanty knowledge of the Kaurna. A southern horde spoke a slight dialect at Rapid Bay. Tunkalilla Beach, 12 miles (20km) east of Cape Jervis, was given as the actual ['keinari] or boundary with the Ramindjeri. East (1989) incorrectly included the related Yorke Peninsula people, the Narangga, under his term Padnayndie. This is in the form Padnaindi, a hordal term for the folk living between Hamley Bridge and Crystal Brook* (Tindale 1974).

The Yerta Bulti region made up the western-most territory, which belonged to the *Wirra Kaurna* (northern Kaurna nation). This territory is believed to have stretched between Angaston, Lyndoch, Port Adelaide, Yatala, and Tea Tree Gully. This region consists of a range of landscapes; including the Para fault block, alluvial plain, estuarine plain, and coastal dunes. Over the course of history, the Kaurna people have occupied each of these landscapes (Wood 2007). Of note, the Gillman dune system was an important feature within this landscape and is evidenced by numerous sites discovered along its length during the survey undertaken by Wood (2007). These sites include camps that were actively used well into recent history in and around Port Adelaide.

Early historical accounts suggest that the Kaurna people inhabited coastal areas during summer and sought refuge inland during winter. When the Yerta Bulti Kaurna journeyed south to the Fleurieu Peninsula to visit relatives, they traced the Tjilbruke trail, which extended as far as the Coorong region (Owen & Pate 2004).

Like many Aboriginal peoples, corroborees; ceremonies and gatherings hold great significance to the Kaurna people. These vital practices took place along the Port Adelaide River banks including at Mutton Cove (Wood 2007).

The Kaurna people maintain a profound connection to their ancestral lands and burial sites. When visiting these sacred places, which were often located near water sources; they would retrace ancestral pathways, kindle fires, and sleep at these sites in communion with their ancestors (Wood 2007). These locations, known as yawandi yerta, or camp places, hold deep cultural significance for the Kaurna community (Telfer & Malone 2012).

Tartanya (Adelaide) was established in 1836, marking a period of profound impact on the Kaurna people. Over the following 25 years, they faced dispossession of their lands; leading to devasting consequences for their population and culture. Some Kaurna individuals became fringe dwellers, while others were relocated to missions. Despite these challenges, the traditional camping areas of Yerta Bulti remained occupied by the Kaurna people (Telfer & Malone 2012).

The flora and fauna that inhabit the Lefevre Peninsula hold potential cultural significance to the Kaurna people. The black swans in the Port Adelaide River were a protected totem for the Kaurna people (Brodie 2002). On land they hunted sand goanna, snakes, kangaroo rats and various birds. The waterways of the Lefevre Peninsula provided fishing grounds for catching a range of fish, sea snails, abalone, and crabs.

Vegetable foods, medicines, and resins were harvested for use and trade. Important flora species that grew in region included the native pigface (*Carpobrotus rossii*), wild cherry (*Exocarpos cupressiformis*), muntrie (*Kunzea pomifera*), quandong (*Santalum acuminatum*) and nitre bush (*Nitraria billardierei*) (Telfer & Malone 2012). Two of these flora species were observed within the Strategic Assessment Area; the native pigface, and the nitre bush. Sources of raw material for stone working were available locally; as were reeds for making baskets, mats, cloaks, and hunting nets (Ellis & Houston 1976).

Rebecca Lartelare

Rebecca Lartelare was born in 1851 along the waterfront of the Port Adelaide River at Glanville (Kurita 2011) and lived in the Port Adelaide River area. She held a special bond as the tribal sister to Ivaritji, a full-blooded Kaurna woman (Wood 2007). Rebecca worked under Captain John Hart's wife, Mary, at the Glanville Hall. Captain Hart's compassionate treatment of the Kaurna people left an impression on her. He employed them on wood and sugar boats, fostering goodwill between cultures. In honour of Captain Hart's mother, Rebecca named her daughter after her. Lartelare was the keeper of the black swans in the Port Adelaide River (Brodie 2002).

Rebecca, having a Kaurna background, frequently spoke about the numerous camps that dotted the coastline from Glanville to Outer Harbor. As a young girl, she explored many of these camps and would often take walks along the River Torrens to visit her relatives who were camped there (Brodie 2002).

Tjilbruke dreaming

Tjilbruke is a dreaming that extends geographically from the Adelaide Plains; down the Fleurieu Peninsula, south of Adelaide; across to Rosetta Head and back up through parts of the Adelaide hills. The Tjilbruke narrative explains the peace lore through to the creation of many sacred places and species within Kaurna Country. This narrative is now a core value for Kaurna people (Amery 2000). The dreaming is 6,000 years old and is an extremely sacred story to the Kaurna people.

> *"Destroying the Tjilbruke story is like knocking down the pyramids… it would be inconceivable, absolutely sacrilegious."* – Lewis O'Brien, Elder (Wood 2007)

The dreaming holds its strongest connection to the coastal regions of the Fleurieu Peninsula and the Lefevre Peninsula. Within this spiritual framework, Tjilbruke, an ancestral being in Kaurna culture, imparted vital lessons about survival (Wood 2007). According to belief, Tjilbruke shaped the physical features of the Port Adelaide area, including waterholes, the river, the coast, inland watercourses, wetlands, mangroves, and sand dunes. The dreaming continues to recount an emu hunt, during which the birds were skilfully driven toward the Lefevre Peninsula where they would ultimately be ensnared (Telfer & Malone 2012). This specific portion of the Lefevre Peninsula is known as Mudlangga, signifying 'the place of the nose', situated between the Port and the sea at the Port Adelaide River (Wood 2007).

To the Kaurna people, the dreaming provides an outline of their morals. These principles encompass not killing more than you need to eat, leaving the female creatures to reproduce, not having any more children that need to support you in old age, not taking other people's things and not interfering with the order of life (Wood 2007). The dreaming also represents the renewal of a dormant culture, who had their land dispossessed and were forced to move away from the lands in which they were born and had lived on for generations. It also represents an expression of good faith, cultural heritage, and a future by and for Aboriginal people (Telfer & Malone 2012).

5.2 Regional archaeological context

Previous studies have documented various types of Aboriginal heritage sites on the Lefevre Peninsula and surrounding areas. These sites include burials, campsites, mounds, scarred trees, ceremonial grounds, isolated finds, water sources, and events (Cook & Coleman 2003, Wood 2007, Telfer & Malone 2012). Notably, Bowman and Harvey (1986) conducted carbon dating on sediments using organic materials such as shells and seagrass. Their findings revealed that the oldest areas of human use on the Peninsula, dating back to 6,500 to 7,000 years ago, were located in a raised sand dune feature on the southwest side (Bowman & Harvey 1986).

According to Wood (2007), discovery of Aboriginal heritage sites tends to result from trenching, excavation, or land disturbance as a consequence of development. Burial sites tend to dominate the finds while other cultural materials, such as stone artefacts or fauna material may be overlooked.

In 1970, Hodges (1973) conducted the initial excavations of the Gillman dune system on the Adelaide Plains. These excavations were prompted by the discovery of human remains during development. A total of 22 individuals were recovered from the mound, with an additional 16 burials found in the Wingfield area (Hodges 1973). The dating of these burials places them between 1,100 and 600 years before present. The Gillman Mound itself was a sand hill, approximately 12 m in diameter and 3.5 m high. It was situated to the south of the mangrove woodlands near the reaches of the Port Adelaide River (Figure 4) (Littleton *et al.* 2013).

During the excavations, over half of the Gillman Mound had already been destroyed, resulting in the recovery of human remains. The deposit from which these remains were unearthed consisted of two distinct layers. The upper layer, composed of 2–3 m of light calcareous sand, contained the burials. Beneath the surrounding ground level, the lower layer consisted of red sand, revealing an ancient remnant dune. The burials were specifically located within the lower zone of the upper layer. Due to erosion and disturbance, the recovered individuals represent the minimum number ever buried at this site (Littleton *et al.* 2013).

Littleton *et al.* (2013) highlighted compelling evidence of Aboriginal occupation at the Gillman site, which occurred after its use for burial. This distinguishing evidence sets the Gillman site apart from other burials excavated along the Murray River and the Coorong. Additionally, alongside the identified burials, an assortment of diverse and extensive artefacts was discovered. This collection included unmodified flakes and a variety of flaked and ground materials (Westell & Wood 2014).

Approximately 12.25 km east of the Strategic Assessment Area, a burial site was discovered during work in Salisbury at Royal Australian Air Force Base Edinburgh in 2011 (Owen & Pate 2004). A subsequent archaeological excavation identified a burial in a deep alluvial context that was located under an existing road at a depth of 1.2 m below the modern ground surface. The burial contained a bone point, several binding hearths, a range of quartz manuports, a quartz core and a hammerstone (Owen & Pate 2004).

As discussed above, the land of the Lefevre Peninsula has been raised and levelled. Whilst surface finds are unlikely, the soils below the fill layers still have potential for Aboriginal cultural material. Subsurface material may include ancestral remains, midden material or artefact scatters.

5.2.1 Submerged landscapes

Over the past 7,000 years there has been a northward movement of sand, evidenced by the northward growth of the Lefevre Peninsula. The growth of the Lefevre Peninsula has been accompanied by the development of a beach ridge system, which is noted as being the widest in the north where the ridges recurve inland and interlock with estuarine and mangrove muddy sediments (Bowman & Harvey 1986).

Between 2.59 million years to 11.7 thousand years ago, during the Pleistocene epoch, coastal regions such as the Lefevre Peninsula were impacted by seal level fluctuations. Major fluctuations in sea level saw the present area of Gulf St Vincent periodically exposed as dry land (Bourman *et al.* 2016). The sea level at this time stood as much as 125 m below the present shoreline. The dry expanse of Gulf St Vincent spread from the Adelaide Plains across the continental shelf as a wide and shallow valley (Hasenohr & Corbett 1986).

There is potential for submerged landscapes and Aboriginal sites to be located on Australia's continental shelves. Stone artefact scatters, quarries and stone walled fish traps have been recorded in intertidal zones around Australia (Dortch *et al.* 2019).

MAP OF GILLMAN MOUND IN RELATION TO THE ADELAIDE PLAINS

Legend

- Mound containing burial
- Strategic assessment area
- Sandy shoreface
- Mangrove
- Inland dune
- Samphire marsh

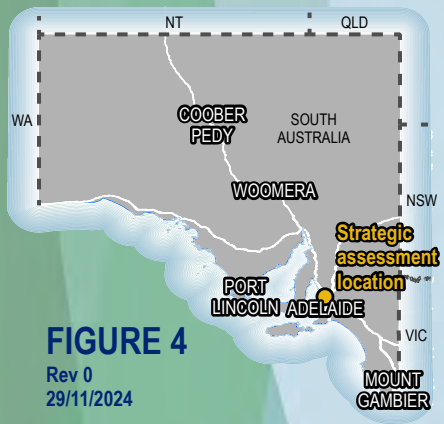

FIGURE 4
Rev 0
29/11/2024

0 0.5 1 1.5 2
Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_205_GillmanMoundBurialSites

Australian Government
Australian Submarine Agency

GHD

St Kilda
Burton
Salisbury
Outer Harbor
Yerlo
North Haven
Lefevre Peninsula
Midlunga
Taperoo
Draper
Largs
Peterhead
Exeter
Semaphore
Glanville
Ethelton
Port Adelaide
Rosewater
Alberton
Cheltenham
Junction Road
Tube Mills
Kilburn
Eastern Parade
North Arm Road
Wingfield
Dry Creek
Cavan
Pooraka
Northfield
Green Fields

Data source: GA - Roads, place names, rail, waterways, State boundaries (2015). GHD - Strategic assessment area (2023). Wood - Landscape mapping (2007). Littleton et al - Mounds (2013) nearmap.com:

5.3 Indigenous heritage summary

Indigenous heritage value is that which is of significance to Indigenous persons in accordance with their practices, observances, customs, traditions, beliefs, or history. In relation to heritage, Indigenous peoples are recognised as the primary source of information on the value of their heritage. The sensitivity and value of Indigenous heritage are identified through consultation with the Indigenous people that are potentially affected.

The Kaurna People have a deep spiritual connection to and partnership with the land, and the rich and diverse ecosystem of the Port Adelaide (Yerta Bulti) region prior to European settlement, provided them with food, shelter, and areas of spiritual significance. The Port Adelaide region encompasses diverse landscapes such as the Para fault block, alluvial plain, estuarine plain, and coastal dunes. The Gillman dune system holds cultural significance, with numerous sites actively used by the Kaurna people throughout history. Traditional practices, including corroborees and ceremonies, occurred along the banks of the Port Adelaide River, emphasizing their profound connection to ancestral lands. Despite dispossession, the Kaurna people maintained their presence in traditional camping areas.

The Port Adelaide region was a favoured location for the Kaurna people due to its proximity to the intertidal creek and mangrove resources which were available year-round. Food sources consisted of vegetables, fish, shellfish, crabs, birds, reptiles, and small marsupials. Sources of raw material for stone working was available locally, as were reeds for basketry, mats, cloaks, and hunting nets. The Black Swan was also an important species to the Kaurna People as it was the totem and was protected and cared for.

The Strategic Assessment Area sits in a portion of the Lefevre Peninsula that is knowns as Mudlangga which means ‘the place of the nose’. The Lefevre Peninsula is closely tied to the Tjilbruke dreaming which provides a set of rules to live by and shows people how to live in right relationships with each other and the land. According to the dreaming, Tjilbruke shaped the physical features of the Port Adelaide region and details an important emu hunt that trapped the birds towards the Lefevre Peninsula.

The Lefevre Peninsula may also hold cultural significance from the connection to Rebecca Lartelare who was the tribal sister to Ivaritji, a full-blooded Kaurna woman, who had been born on the Peninsula. Lartelare was the keeper of the black swans in the Port Adelaide River, which is a protected bird and totem for the Kaurna People.

While a search of the Central Archive did not identify any registered or recorded archaeological sites located within the Strategic Assessment Area, regional archaeological investigations indicate that there is potential for mounds, burials, campsites, scarred trees, ceremonial grounds, and water sources within natural landforms. Deposits with potential to contain Aboriginal cultural material are likely to be discovered below the current ground surface and have the potential to informal on traditional and historical Kaurna activities and land uses.

Due to the highly disturbed condition of the Strategic Assessment Area, historic landfilling , the pre-European site conditions and the absence of evidence recorded during past development and monitoring, it is considered that, overall, the risk of adversely impacting archaeological and ethnographic sites is low. In the unlikely event of unknown subsurface finds would be managed in accordance with the mitigation measures outlined in the **Impact Assessment Report Chapter 7**. These mitigation measures are considered to be suitable to apply to the Strategic Assessment Area.

6. Historic heritage

6.1 European land use history

6.1.1 Early settlement

In 1831 Outer Harbor was settled on the Lefevre Peninsula as a possible site for a harbour. A river-based port was preferred due to the challenging road conditions to Glenelg, especially after heavy rainfall. In January 1837, the first legal port, located at West Lakes on the Port Adelaide River, was established (McDougall & Vines 2014). Subsequently a move to deeper waters led to the opening of the New Port in Port Adelaide in October 1840 (Hammond 1978).

European settlers initiated commercial development in the Port Adelaide region, leading to increased land subdivisions and development. Subdivisions continued along the Peninsula's River side, including plans for Osborne in 1881. In the early 20th century, development persisted with the construction of Outer Harbor at the trip of the Lefevre Peninsula. The railway was extended to the peninsula's end, and by January 1908, Outer Harbor became operational. In 1916, new dredges acquired by the South Australian Harbours Board widened and deepened the shipping channel, to allow greater depth for newer vessels to access the Port. Over the subsequent years, deposited soil was used to reclaim mangrove swamps and marshland areas on the Lefevre Peninsula; as depicted in the chronological sequence of aerial images in Photo 7 and Photo 8 (McDougall & Vines 2014).

As ship building continued along the Port Adelaide River, gas production ceased at Rosewater in 1920 and a new plant opened in Osborne in 1925. As with the opening of a new gas plant, a new electric power station was constructed in Osborne in 1923.

The historical aerial images (Photo 7 and Photo 8) of Lefevre Peninsula provide a glimpse into the transformation over time. In 1959, the Peninsula remained untouched, characterised by sand dunes, intertidal saltmarshes, and mangroves. Significant changes occurred in 1979 with the introduction of a seawall along the shoreline from Mutton Cove downstream towards the Outer Harbor Marina, dredging and waste disposal, and reclaiming the saltmarsh and mangrove areas. The most striking transformation is observed in the photos from 1999 and 2009, when extensive fill was introduced across the majority of the Strategic Assessment Area, resulting in a notable and stark change. The 2024 aerial shot further demonstrates the increase in industrialised development on the Peninsula within the last 15 years when extensive fill was introduced across the majority of the Strategic Assessment Area, resulting in a notable and stark change. These arial snapshots serve as valuable records, shedding light on the dynamic evolution of Lefevre Peninsula over the years.

Photo 7 *Lefevre Peninsula in 1959, 1979 and 1999 (Source: Government of South Australia, Mapland)*

Photo 8 *Lefevre Peninsula in 2009 and 2024 (Source: NearMap 2024)*

6.1.2 Industrial development

The Outer Harbor Pilot Station and its associated harbour facilities symbolised the State's responsibility for shipping control. During the late 19th century, ships grew in size, making it challenging for them to navigate the pass to Port Adelaide. To address this, the construction of Outer Harbor commenced in 1902, with the extension of the railway from Largs Bay up to Lights Passage.

The concept of an outer harbour had been proposed for years, and by January 1908, Outer Harbor was officially opened. At that time, the shipping channel measured 60 m wide and 10 m deep, featuring a swinging basin spanning 900 m by 300 m. The new port situated closer to the estuary entrance, gradually diverted some activity away from the inner harbor; although initially, it primarily accommodated larger vessels. In 1916, the South Australian Harbours Board introduced new dredges to further widen and deepen the shipping channel (McDougall & Vines 2014).

In 1918, shipbuilding activities continued primarily in the Osborne area. This period witnessed the establishment and growth of the Poole and Steele shipyards (as depicted in Photo 9). The shipyard's initial purpose was to construct three E-class ships for the Australian Government. By the early 1920s, as contracts dwindled, the site shifted its focus to manufacturing railway rolling stock. Eventually, in 1937, the shipyard ceased operations, and the state government became its owner (Couper-Smartt 2003, Preiss 2019). Containerisation was introduced in the 1960s and had a major impact on the Port, changing cargo handling methods and significantly reducing the size of the local workforce (McDougall & Vines 2014).

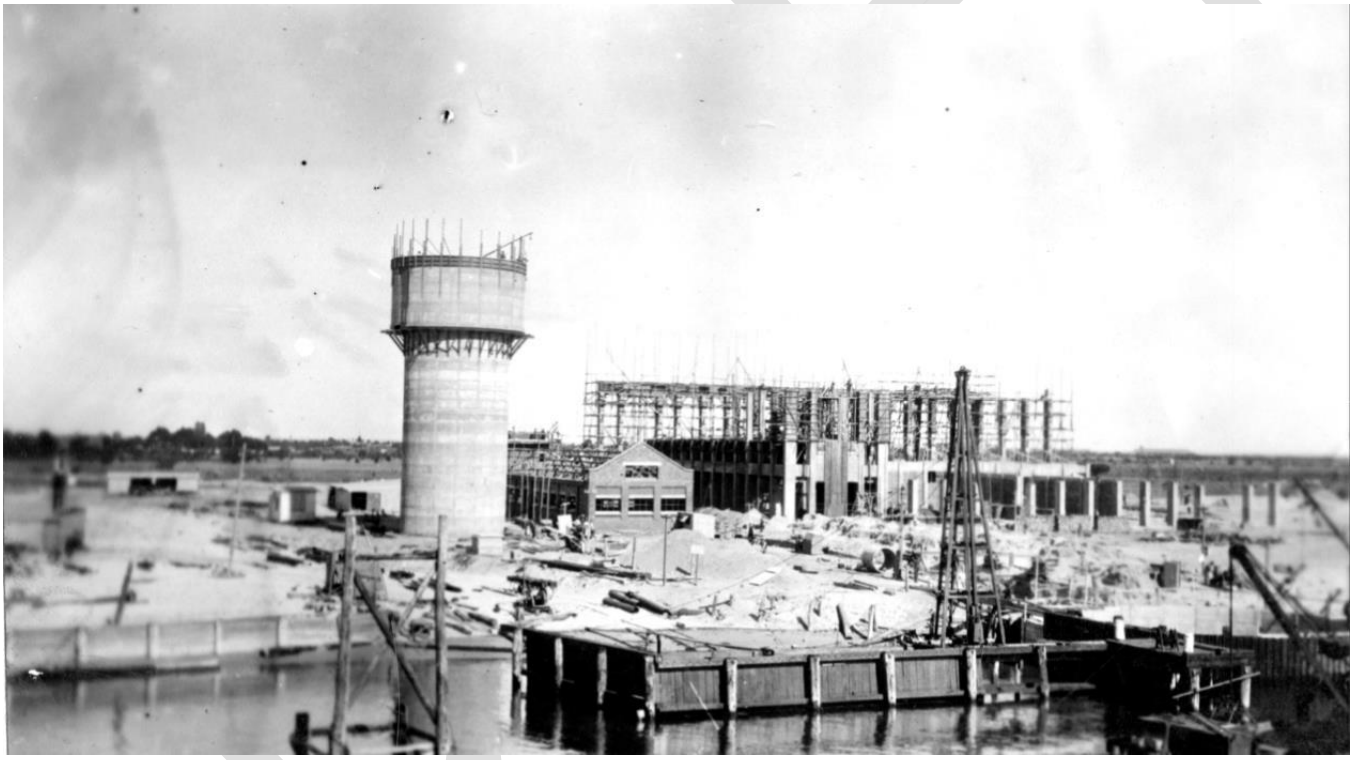

Photo 9 *Poole and Steele shipyard under construction at Osborne circa 1920 (Source: State Library South Australia, Searcy Collection)*

6.1.3 Osborne Naval Shipyard

The Australian Submarine Corporation established its facilities at Osborne in 1989 in order to design, manufacture and support the Royal Australian Navy's fleet of six Collins Class submarines. Construction of the first HMAS *Collins* commenced in 1990 and was delivered to the Royal Australian Navy in 1996; with the final five submarines constructed and delivered through the subsequent seven years. The Osborne Naval Shipyard was also the site for submarine maintenance, before the construction of a second maintenance facility in Western Australia in 2008. Submarine maintenance returned to Osborne in 2014 after the construction of a Maintenance Support Tower at the Osborne Naval Shipyard that increased maintenance efficiencies (ASA 2024).

6.2 Underwater cultural heritage

6.2.1 Historic Shipwrecks

The remains of Historic Shipwrecks are an important part of South Australia's heritage; and are valuable educational, recreational and tourism assets. They offer a unique insight into the past and the lives of people who travelled by sea.

Data from State and Commonwealth databases identified five Historic Shipwrecks within the Strategic Assessment Area, and two historic shipwrecks (the *Excelsior* and *Jupiter* located in Mutton Cove) adjacent to the Strategic Assessment Area (refer to Figure 5). Previous hydrographic and dive surveys were conducted by HydroSurvey Australia within the Port Adelaide River; requiring that research be undertaken to narrow the search parameters for the surveys, removing the need to survey the locations of the *Corsair, Wildflower, Sigrid, Jupiter,* and *Excelsior.*

The survey covered the approximate plotted areas of the *Enchantress* and *Napperby* shipwrecks to identify and assess the likelihood of survival of the shipwrecks, artefacts, and articles (Dash Architects 2023, Hydro Survey 2023). These shipwrecks are summarised in Table 6–1.

Table 6–1 Historic Shipwrecks relevant to the Strategic Assessment Area

Shipwreck (date)	Protected under *Historic Shipwrecks Act 1981* (yes/no)	Relevance to Strategic Assessment Area	Likelihood of survival assessment
Excelsior (1945)	Yes	Exposed shipwreck located in Mutton Cove, adjacent to the Strategic Assessment Area (Figure 5).	– Shipwreck visually extant – Artefacts and articles (likely)
Jupiter (1945)	Yes	Exposed shipwreck located in Mutton Cove, adjacent to the Strategic Assessment Area (Figure 5).	– Shipwreck currently covered in silt – Artefacts and articles (likely)
Napperby (1928)	Yes	Plotted location is within the marine area of the Strategic Assessment Area (Figure 5). A hydrographic survey and dive survey of the plotted location and surrounding area failed to locate the wreckage.	– Historical records suggest the vessel caught fire and sank near Snapper Point, it was then towed closer to shore outside near Torrens Island and the old quarantine station. Shipwreck site is outside the shipping channel – Shipwreck (likely) – Artefacts and articles (likely)
Wildflower (1877)	Yes	Plotted location is within the marine area of the Strategic Assessment Area (Figure 5).	– Vessel was sighted near Whiting Flat, between Gawler and St Kilda beaches. Location of wreck may be inaccurate and is likely located further north than plotted location. The site has been subject to dredging operation on multiple occasions for existing shipping operations – Shipwreck (unlikely) – Artefacts and articles (unlikely)
Enchantress (1903)	Yes	Plotted location is within the marine area of the Strategic Assessment Area (Figure 5). A hydrographic survey of the plotted location and surrounding area failed to locate the wreckage.	– Wreckage was washed ashore between Semaphore and Grange and at the mouth of the Port Adelaide River. Debris were found south of Port Gawler. Shipwreck site is outside the shipping channel – Shipwreck (unlikely) – Artefacts and articles (unlikely)

Shipwreck (date)	Protected under *Historic Shipwrecks Act 1981* (yes/no)	Relevance to Strategic Assessment Area	Likelihood of survival assessment
Corsair (1865)	Yes	Plotted location is within the marine area of the Strategic Assessment Area (Figure 5).	– Wreckage was washed ashore, and debris deposited along the beach – Wreckage has been impacted by dredging numerous times, channel widened, land reclamation and coastal development – Shipwreck (unlikely) – Artefacts and articles (unlikely)
Sigrid (1974)	No	Plotted location within the marine area of the Strategic Assessment Area (Figure 5).	– Unknown location not mentioned in newspapers. Shipwreck plotted site is outside the shipping channel. – Shipwreck (likely) – Artefacts and articles (likely)

The hydrographic survey revealed several visible features; which were subsequently examined during a visual diving inspection conducted by J Diversity (2023). The inspection confirmed the presence of small concrete lumps, a timber beam, and old jetty piles (Hydro Survey 2023). The survey report concluded that the concrete and jetty piles are unrelated to shipwreck material. The timber beam could have originated form a number of sources, such as old wharves or jetties in the Port Adelaide River, and is also unlikely to have come from a shipwreck (Dash Architects 2023).

It is important to note that shipwreck locations based on anecdotal descriptions can be inaccurate; and changes to the riverbed can alter underwater topography, creating uncertainties and inaccuracies in records. Shipwrecks located within the Port Adelaide shipping channel have been subject to disturbance from dredging activities on multiple occasions over time. While previous surveys did not uncover any Historic Shipwrecks or related artefacts, only selected areas were surveyed; and artefacts could be buried under sediment within in the Strategic Assessment Area, that are not able to be picked up by sonar (Hydro Survey 2023).

SHIPWRECK LOCATIONS WITHIN STRATEGIC ASSESSMENT AREA

Legend

- Shipwreck
- Railway
- Strategic assessment area

Australian Government
Australian Submarine Agency

GHD

FIGURE 5
Rev 0
29/11/2024

0 150 300 450 600
Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_202_ShipwreckLocations

6.3 Heritage significance assessment

In South Australia, heritage significance is established and regulated by the *Heritage Places Act 1993*. A place qualifies for entry into the South Australian Heritage Register as a State Heritage Place if it satisfies one or more of the following criteria:

– Demonstrates important aspects of the evolution or pattern of the state's history
– Possesses rare, uncommon, or endangered qualities of cultural significance

The archaeological significance of a site is typically evaluated based on its capacity to provide new insights into substantial research inquiries, beyond what is already known from existing sources. Additionally, this significance is tied to the use, age, and how these aspects relate to the site's historical context.

The five shipwrecks identified within the Strategic Assessment Area are not listed under the South Australian Heritage Register as having State significance. No other sites were identified within the Strategic Assessment Area.

6.4 Historic values summary

No listed historic heritage sites are located within the Strategic Assessment Area, with no heritage places identified during the 2023 site assessments.

Five shipwrecks were identified within the marine area of the Strategic Assessment Area. Of the five, one is not protected under legislation (*Sigrid*); one is currently unfound but likely to remain, and has the potential to be discovered (*Napperby*); whilst the other three are not likely to be located in their plotted sites (*Enchantress, Wildflower, Corsair*).

7. Natural heritage

7.1 Overview

Natural heritage include parts of the natural environment that have aesthetic, historic, scientific, or social significance or other special values for future generations and the present community. This includes:

– The biological environment (flora, fauna, habitats, and ecosystems)
– The geological and geomorphological environments (landforms, landscapes, and geosystems)

Natural heritage protection in Australia is achieved by:

– Listing it as a World Heritage, Natural Heritage, or Commonwealth Heritage site
– Preserving it via marine and terrestrial protected areas

7.2 Environmental Context

Prior to European colonisation, the eastern side of the Lefevre Peninsula and its beach-ridges were covered by swamps and mangroves. Along the western side were the most recent dune formation and along the northwestern side were the Peninsula tidal sand flats that would be exposed at low tide (Hall 1997).

> *When the first settlers arrived on the Adelaide Plains, coastal dunes up to 10 metres high lined the shores of Gulf St Vincent from Brighton to Outer Harbor, broken only by the outlet of Patawalonga Creek. The fore-dunes were vegetated with coastal heath and spinifex, while the more sheltered dunes inland were covered with acacia and tea-tree scrub* – Gara, The Destruction of the Aborignal Heirtage of the Reedbeds 2008

The dune system stretched from the coastal dunes, traversing the southern areas of the Port Adelaide region, the Port Adelaide River and surrounding estuary. This dune system was renamed the Gillman dune system (Telfer & Malone 2012). The Gillman dune system offered elevated locations extending well into the low lying, flood prone environments (Figure 6).

The landforms of the Lefevre Peninsula before European settlement were clearly defined by ridges, and spits were visible which divided and recurved to the east. The eastern side consisted of marshes, mangrove swamps and supratidal deposits associated with the estuary of the Port Adelaide River. The original northern shoreline has been modified by land reclamation to form the industrial land of the Outer Harbor. As a result of land reclamation, the Port Adelaide River would flow into the Gulf St Vincent through artificial breakwaters (Bowman & Harvey 1986).

Since European settlement, the Lefevre Peninsula has undergone significant disturbance with the establishment of infrastructure and industrial activity, with exception to Mutton Cove on the eastern side of the Peninsula, which conserves the last remaining intact biodiverse area of samphire and mangrove woodland on the Peninsula. The area of Mutton Cove is one of the few areas along the edges of the Peninsula that remains at natural surface level (Cook & Coleman 2003). To the east, west and north of Victoria Road and Lady Gowrie Drive was originally intertidal swamp, mudflats, dunes, chenier ridges and subtidal seabed. These areas have all been raised and levelled with hydraulic fill or industrial dumping (Cook & Coleman 2003). It is likely that the natural soils below the fill have been left relatively undisturbed.

LANDSCAPE MAPPING OF THE LEFEVRE PENINSULA

Legend

- Strategic assessment area
- Alluvial Slopes
- Gillman Dune
- Intertidal (mangroves)
- Killburn Sand
- Para Fault Block
- Rosewater Dunes
- Supratidal (Samphire flats)

FIGURE 6
Rev 0
29/11/2024

0 0.5 1 1.5 2
Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 54

12621796_203_LandscapeMapping

Australian Government
Australian Submarine Agency

GHD

St Kilda
Burton
Hilra
Nurlutta
Salisbury
Chidda
Parafield
Outer Harbor
Yerlo
North Haven
Lefevre Peninsula
Midlunga
Taperoo
Draper
Green Fields
Para Hills
Largs
Peterhead
Exeter
Semaphore
Glanville
Ethelton
Port Adelaide
Rosewater
Junction Road
Alberton
North Arm Road
Eastern Parade
Wingfield
Dry Creek
Cavan
Pooraka
Northfield
Tube Mills
Kilburn
Islington Works
Islington
Cheltenham
Holdens
Hendon
Woodville
Albert Park
Woodville Park
Kilkenny
Dudley Park
Seaton Park
West Croydon
Croydon
Ovingham
Rostrevor
East Grange
Grange
Bowden
North Adelaide
Mile End
Victoria Square

7.2.1 Flora and fauna

The land within Strategic Assessment Area is presently dominated by saltmarsh shrubland. This vegetation has either been planted or become established following activities like filling, leveling, and construction of stormwater infrastructure.

Six vegetation communities were recorded within the Strategic Assessment Area (following National Vegetation Information System nomenclature):

- Shrubby samphire (*Tecticornia halocnemoides*), blackseed samphire (*T. pergranulata*), brown-headed samphire (*T. indica*) and Austral sea-blite (*Suaeda australis*) open samphire shrubland.
- Vegetation present along lagoon. Common species included: salt club-rush (*Bolboschoenus caldwellii*) and spiny flat-sedge (*Cyperus gymnocaulos*). Other native species included: sea rush (*Juncus kraussii*).
- Rushland dominated by Cumbungi (*Typha domingensis*) and hairy willowherb (*Epilobium hirtigerum*).
- Grey mangrove shrubland dominated by *Avicennia marina*.
- Planted vegetation, vegetated drainage lines, road reserves and parks. Common planted species include saltbushes (*Atriplex* spp.) and she-oak (*Allocasuarina* spp).
- Marine seagrass meadows (*Zostera nigricaulis* and *Z. muelleri*).

Low to moderate weed coverage was observed across the Strategic Assessment Area. No EPBC Act listed, or *National Parks and Wildlife Act 1972* (South Australia) listed flora species were recorded in the Strategic Assessment Area, despite targeted surveys.

As previously mentioned the Strategic Assessment Area has been historically subjected to extensive disturbance, in preparation for its projected industrial use. The manufacturing and fabricating area encompasses Falie Reserve, which is characterized by planted vegetation along an embankment. In areas where hard stand is absent, vegetation has reestablished in previously cleared areas, potentially serving as habitat for fauna. Adjacent to the assembly and testing area, where it meets the Port Adelaide River, there exists a mangrove and tidal habitat. Sparse seagrass (*Zostera spp.*) populations can be found in the shallower, intertidal regions of the marine area.

Habitat types within the Strategic Assessment Area include constructed wetlands, low open shrubland, tidal flats, seagrass meadows and mangrove shrubland.

Adelaide Dolphin Sanctuary

The marine area of the Strategic Assessment Area sits within the Adelaide Dolphin Sanctuary. The sanctuary is economically, socially, culturally, and historically important. Established in 2005 under the *Adelaide Dolphin Sanctuary Act 2005*, the Adelaide Dolphin Sanctuary encompasses the Port Adelaide River and the surrounding marine area. The Port Adelaide River and surrounding Barker Inlet supports a small resident and larger transient group of the Indo-Pacific bottlenose dolphin (*Tursiops truncatus*). The primary goal of the protected area is to safeguard the dolphin population in their natural environment by preserving and improving the conditions of dolphin habitat. This includes the management of threats to dolphin habitats in the Port Adelaide River, such as destruction of habitat and a decrease in water quality from dredging activities (National Parks South Australia 2006).

Regional and international biodiversity context

The Strategic Assessment Area sits within a region that includes diverse habitats for Commonwealth and internationally recognised migratory bird species. This includes the Adelaide International Bird Sanctuary, Gulf St Vincent, Port Adelaide River, and two nationally significant wetlands the Barker Inlet and St Kilda, and the Port Gawler and Buckland Park Lake.

Gulf St Vincent has been recognised as an internationally significant area for migratory shorebirds and is listed as an internationally significant site within the *Australian national directory of important migratory shorebird habitat* (Weller 2020). The Gulf St Vincent is a destination site for the East Asian-Australasian flyway and regularly hosts an average of over 29,000 shorebirds each year including 14,000 migrants of 13 species (Lees *et al.* 2020).

The Adelaide International Bird Sanctuary sits within the Gulf St Vincent, the habitat of the sanctuary supports at least 263 fauna and flora species; including an estimated 27,000 migratory birds and resident shorebirds (Government of South Australia 2016).

Barker Inlet and St Kilda wetland is identified as nationally important as it exemplifies an extensive mangrove and saltmarsh community, being the largest in the Gulf of St Vincent and in close proximity to a city. Port Gawler and Buckland Park Lake Nationally Important Wetland is located north of the Strategic Assessment Area and contains Buckland Park Lake which is the only substantial freshwater habitat on the Adelaide Plains. The wetlands provide habitat for EPBC Act threatened species observed in the Strategic Assessment Area such as pied oystercatcher (*Haematopus longirostris*), sharp-tailed sandpiper (*Calidris acuminata*) and common greenshank (*Actitis hypoleucos*) (DCCEEW 2019).

7.2.2 Landscape

The landscape within the Strategic Assessment Area has undergone significant changes, with extensive filling and leveling since 1916. It is believed that the fill material consists of a variety of substances, such as dredged material from the Port Adelaide River and industrial waste products like ash, cinders, iron pyrites and Penrice grit (S&G 2006).

7.2.3 Geomorphology

The geomorphology of the Strategic Assessment Area is characterised by flat terrain, with the exception of constructed stormwater basins, drainage swales, or other drainage features. The underlying soils are historic estuarine muds and sands of an area that was historically part of the extensive tidal flats bordering Barker Inlet (Cook & Coleman 2003). The Strategic Assessment Area was below sea level during the period of Holocene marine regression approximately 7,500 years ago (Bowman & Harvey 1986).

The current coastline we see today is a consequence of rising sea levels that occurred after the last ice age (Pleistocene glaciation). As the glaciers melted, the sea level increased, reshaping the coastline. In South Australia, shoreline deposits of this that represent these ancient coastal deposits are termed Saint Kilda Formation (Preiss 2019). The St Kilda Formation, which dates to the Holocene, comprises diverse sedimentary materials sourced from marine beaches, coastal dunes, estuarine areas, and lagoons (Cann & Gostin 1985). The St Kilda soils comprised a highly compressible layer of peat up to approximately 0.6 m thick underlain by shelly and organic sands (Coffey 2007).

A geotechnical report of the surrounding Lefevre Peninsula region (Coffey 2007) revealed that that the fill material has been logged at depths of up to 3.3 m below ground level overlaying natural soil horizons. Two types of fills were identified within the study area, hydraulic fill from historical dredging of the Port Adelaide River system, which comprised of sand and clay, and fill horizons comprised of waste products from the Osborne Power Station. It was also noted that groundwater was present at depths between 2 and 4 m below ground level.

7.3 Condition of natural environment

Exposure to historical land clearing for industry, removal of natural tidal flows and exposure to noise and light impacts have removed diversity of habitat within the strategic assessment area. The Lefevre Peninsula does retain areas of terrestrial and aquatic habitat, because of regrowth or planting, which provides local resources for a range of flora and fauna. Field assessments undertaken in 2023-2024 confirmed the presence of suitable habitat for a range of threatened fauna.

Proximity to the Port Adelaide River, Adelaide International Bird Sanctuary, and Gulf St Vincent means the Strategic Assessment Area would be periodically visited from a range of marine and migratory bird species, with higher levels of migratory shorebird visitations during the non-breeding season.

7.4 Integrity of natural environment

The Strategic Assessment Area has been subject to significant modification via anthropogenic processes, such as the introduction of large amounts of fill material and clearing. While there are indications of regrowth and deliberate replanting observed in Falie Reserve, the integrity of the natural environment in the majority of the Strategic Assessment Area has been altered since the reclamation and development of the area.

7.5 Natural values summary

While the waterways of the Port Adelaide River are an important economic and environmental region and contain a range of natural heritage values (including the Adelaide International Bird Sanctuary, and the Adelaide Dolphin Sanctuary), the Strategic Assessment Area itself has largely been impacted by modifications for industrial land-use. While the Strategic Assessment Area does include some vegetation and habitat for threatened listed species, it has been extensively modified and historically cleared.

8. Commonwealth heritage values

8.1 Commonwealth heritage list criteria

The *Environment Protection and Biodiversity Conservation Regulations 2000* (Section 10.03A) include the criteria for the Commonwealth Heritage List, under which a place can be assessed to determine if the place has Commonwealth heritage values. There are nine criterion in total that are used to assess a place. As well as assessing a place against criteria for its heritage value, the Australian Heritage Council applies a 'significance threshold' test. This test helps the Council to judge the level of significance of a place's heritage value by asking 'just how important are these values?'. To be entered in the Commonwealth Heritage List, a place must have 'significant' heritage value.

The Commonwealth Heritage List criteria are presented in Table 8–1, along with the assessment of the heritage values of the Lefevre Peninsula.

Table 8–1 Assessment against the Commonwealth Heritage List criteria

Criteria	Assessment
The place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history.	Post European settlement, the Kaurna meyunna became fringe dwellers or were relocated to missions. However, the traditional camping areas of Yertabulti (Port Adelaide) continued to be occupied by Kaurna meyunna (and other Aboriginal Peoples) for many decades (Telfer & Malone 2012). While access was likely restricted at times, a historic campsite south of the Strategic Assessment Area, located south of Veitch Road, Osborne, was known to be occupied by the Kaurna meyunna during the 1940s to 1950s. The Lefevre Peninsula has strong historical associations with Kaurna dispossession, seasonal camping, and resource access in the post-settlement era.
The place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.	The Lefevre Peninsula does not meet this criterion as it does not possess uncommon, rare or endangered aspects of Australia's natural or cultural history.
The place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history.	Regional archaeological investigations indicate that there is potential for mounds and associated burials within the natural landforms within the Strategic Assessment Area. However, deposits with potential to contain Aboriginal cultural material are likely to be at least 3.3 m below the current ground surface, based on recent geotechnical investigations (Coffey 2017). Where deposits are present, they may have potential to inform on traditional and historical Kaurna activities and land use.
The place has significant heritage value because of the place's importance in demonstrating the principal characteristics of: – a class of Australia's natural or cultural places; or, – a class of Australia's natural or cultural environments.	The Lefevre Peninsula does not meet this criterion as this place does not demonstrate principal characteristics: i. a class of Australia's natural or cultural places; or ii. a class of Australia's natural or cultural environments.
The place has significant heritage values because of the place's importance in exhibiting particular aesthetic characteristics values by a community or cultural group.	The Lefevre Peninsula does not meet this criterion as this place does not hold heritage value as it does not exhibit particular aesthetic characteristics valued by a community or cultural group.
The place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period.	The Lefevre Peninsula does not meet this criterion as this place does not demonstrate a high degree of creative or technical achievement at a particular period.

Criteria	Assessment
The place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural, or spiritual reasons.	The Lefevre Peninsula has a strong and special association with the Kaurna for social, cultural, and spiritual reasons. Intangible cultural and spiritual knowledge has defined and determined this place's environment, sensory and cultural landscape as a place of cultural significance. The Kaurna used this area for food, ceremony, habitation and socially. The Lefevre Peninsula is located within a landscape that contains burials.
The place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.	The Lefevre Peninsula and the broader Port Adelaide Enfield Council area has a strong connection with the Kaurna Elder, Rebecca Lartelare. Lartelare was the keeper of the black swans in the Port River, which is a protected bird and totem for the Kaurna (Brodie 2002). Lartelare was born in 1851 on the waterfront of the Port River at Glanville (Kurita 2011) and lived in the Port Adelaide River area. She was the tribal sister to Ivaritji, who was a full-blooded Kaurna woman (Wood 2007).
The place has significant heritage value because of the place's importance as part of Indigenous tradition.	The Lefevre Peninsula was the place where the original Kaurna lived, and is a place provided by their spiritual ancestors. The Indigenous culture of the area was supported and determined by the river, estuary, wetlands and coastal system environment. It is an area highly significant for its Aboriginal tradition where the intangible dreaming, ceremonial and creation stories are embedded and pass through this area. The land was seen as a teaching tool to educate Kaurna people about spiritual ancestors, land management, social structures, and family values. The land had to be walked to be learnt, which included walking the Tjilburke dreaming. Memories of the Elders and the earth taught social order and the skills necessary to survive without destroying the ecology of the territory supporting the Port Adelaide / Yertabulti Kaurna. Their protocols regarding behaviour were passed on constantly through everyday activity and through more formal settings during cultural ceremonies, rituals, and meetings.

8.1.1 Summary of Commonwealth heritage list assessment

The Lefevre Peninsula has Commonwealth heritage values as it is a place of significant heritage value. It holds cultural, scientific, social, association and traditional values. It is a place that is connected spiritually to the Kaurna people.

No historic or natural heritage values meet the criteria of Commonwealth Heritage List.

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Appendix K

Environmental Risk Assessment

Table K-1 *Environmental risk assessment*

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Matters of national environmental significance							
Listed threatened fauna species							
Vibration	Changes to behaviour, such as foraging or resting, that affects the health or life cycle of an individual or individuals of a species. This could include: – Avoidance of the area where vibration is being generated – Startle response	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Rare	Minor	Low	Rare	Minor	Low
Noise generation	Changes to behaviour, such as foraging or resting, that affects the health or life cycle of an individual or individuals of a species. This could include: – Avoidance of the area where noise is being generated – Startle response	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species in the marine environment.	Rare	Minor	Low	Rare	Minor	Low
Mobilisation of sediment	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Rare	Minor	Low	Rare	Minor	Low
	Reduced visibility in the marine environment that reduces or restricts foraging to the extent that it affects the health or life cycle of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
Mobilisation of contaminants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Minor	Low	Unlikely	Minor	Low

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Mobilisation of gross pollutants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
	Mortality or injury of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Changes to soil chemistry	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Minor	Low	Unlikely	Minor	Low
	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Dust generation	Degradation of foraging resources (for example, samphires), to the extent that it affects an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Clearing of vegetation	Reduction in habitat for the Protected Matter that affects an individual or individuals of a species. *Approximate areas of habitat that would be likely to be cleared are included below.* **Habitat type** / **Area (ha)** Low open shrubland / 24.33 Constructed wetland / 2.54 Tidal flat / 2.58 Seagrass meadows / 3.49 **Total area** / **32.94**	Highly Likely	Moderate	High	Highly Likely	Moderate	High
	Mortality or injury of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
Light generation	Increased potential for species predation that affects an individual or individuals of a species.	Unlikely	Minor	Low	Rare	Minor	Low
	Changes to behaviour, such as foraging or resting, or disorientation, that affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Rare	Minor	Low

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Changes to landscape and visual amenity	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Interaction with a heritage place or heritage values	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Increased demand for resources and facilities	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Hydrological changes	Degradation of foraging resources (for example, seagrass), to the extent that it affects an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Rare	Negligible	Low	Rare	Negligible	Low
Geomorphological changes	Reduction in habitat for the Protected Matter that affects an individual or individuals of a species. *Approximately 2.58 ha of shoreline containing tidal flat habitat would be likely to be removed.*	Unlikely	Minor	Low	Unlikely	Minor	Low
	Degradation of foraging resources (for example, seagrass), to the extent that it affects an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Rare	Minor	Low	Rare	Minor	Low
Radiation	Mortality or injury of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
Listed migratory species							
Vibration	Changes to behaviour, such as foraging or resting, that affects the health or life cycle of an individual or individuals of a species. This could include: – Avoidance of the area where vibration is being generated – Startle response	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Rare	Minor	Low	Rare	Minor	Low

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Noise generation	Changes to behaviour, such as foraging or resting, that affects the health or life cycle of an individual or individuals of a species. This could include: – Avoidance of the area where noise is being generated – Startle response	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species in the marine environment.	Rare	Minor	Low	Rare	Minor	Low
Mobilisation of sediment	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Rare	Minor	Low	Rare	Minor	Low
	Reduced visibility in the marine environment that reduces or restricts foraging to the extent that it affects the health or life cycle of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
Mobilisation of contaminants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Minor	Low	Unlikely	Minor	Low
Mobilisation of gross pollutants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
	Mortality or injury of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Changes to soil chemistry	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Minor	Low	Unlikely	Minor	Low

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Dust generation	Degradation of foraging resources (for example, samphires), to the extent that it affects an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Clearing of vegetation	Reduction in habitat for the Protected Matter that affects an individual or individuals of a species. *Approximate areas of habitat that would be likely to be cleared are included below.*	Highly Likely	Moderate	High	Highly Likely	Moderate	High
	Mortality or injury of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
Light generation	Increased potential for species predation that affects an individual or individuals of a species.	Unlikely	Minor	Low	Rare	Minor	Low
	Changes to behaviour, such as foraging or resting, or disorientation, that affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Rare	Minor	Low
Changes to landscape and visual amenity	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Interaction with a heritage place or heritage values	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Increased demand for resources and facilities	Not likely to impact this Protected Matter.	–	–	–	–	–	–

Habitat type	Area (ha)
Low open shrubland	24.33
Constructed wetland	2.54
Tidal flat	2.58
Seagrass meadows	3.49
Total area	**32.94**

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Hydrological changes	Degradation of foraging resources (for example, seagrass), to the extent that it affects an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Rare	Minor	Low	Rare	Minor	Low
Geomorphological changes	Reduction in habitat for the Protected Matter that affects an individual or individuals of a species. *Approximately 2.58 ha of shoreline containing tidal flat habitat would be likely to be removed.*	Unlikely	Minor	Low	Unlikely	Minor	Low
	Degradation of foraging resources (for example, seagrass), to the extent that it affects an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Rare	Minor	Low	Rare	Minor	Low
Radiation	Mortality or injury of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
The environment							
Landscapes and soils							
Vibration	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Noise generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Mobilisation of sediment	Water erosion that results in substantial landscape modifications.	Likely	Moderate	High	Unlikely	Minor	Low
Mobilisation of contaminants	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Mobilisation of gross pollutants	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Changes to soil chemistry	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Dust generation	Wind erosion that results in substantial landscape modifications.	Unlikely	Moderate	Medium	Rare	Minor	Low

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Clearing of vegetation	Loss of vegetative cover that causes susceptibility to wind and water erosion that results in substantial landscape modifications.	Likely	Moderate	High	Unlikely	Minor	Low
Light generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Changes to landscape and visual amenity	Landscape modifications that alter landscape features.	Highly likely	Moderate	High	Highly likely	Negligible	Medium
Interaction with a heritage place or heritage values	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Increased demand for resources and facilities	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Hydrological changes	Landscape modifications that cause hydrological changes.	Highly likely	Moderate	High	High Likely	Negligible	Medium
Geomorphological changes	Landscape modifications that cause geomorphological changes.	Highly likely	Moderate	High	High Likely	Negligible	Medium
Radiation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Coastal landscapes and processes							
Vibration	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Noise generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Mobilisation of sediment	Water erosion that results in changes to coastal processes.	Likely	Moderate	High	Unlikely	Minor	Low
Mobilisation of contaminants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Minor	Low	Unlikely	Minor	Low
Mobilisation of gross pollutants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
	Mortality or injury of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Changes to soil chemistry	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Minor	Low	Unlikely	Minor	Low
Dust generation	Wind erosion that results in modifications to coastal processes.	Possible	Moderate	Medium	Rare	Minor	Low
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Clearing of vegetation	Loss of vegetative cover that causes susceptibility to wind and water erosion that results in modifications to coastal processes.	Likely	Moderate	High	Unlikely	Minor	Low
Light generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Changes to landscape and visual amenity	Landscape modifications that alter landscape features and cause changes to coastal processes.	Possible	Minor	Medium	Unlikely	Minor	Low
Interaction with a heritage place or heritage values	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Increased demand for resources and facilities	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Hydrological changes	Landscape modifications that cause hydrological changes in an estuary.	Highly likely	Moderate	High	Likely	Minor	Medium
Geomorphological changes	Dredging that alters coastal processes and results in changes to water flows in an estuary.	Likely	Moderate	High	Possible	Moderate	Medium
Radiation	Not likely to impact this Protected Matter.	–	–	–	–	–	–

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Ocean forms, ocean processes and ocean life							
Vibration	Changes to behaviour, such as foraging or resting, that affects the health or life cycle of an individual or individuals of a species. This could include: – Avoidance of the area where vibration is being generated – Startle response	Possible	Moderate	Medium	Rare	Moderate	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Possible	Material	High	Rare	Material	Medium
Noise generation	Changes to behaviour, such as foraging or resting, that affects the health or life cycle of an individual or individuals of a species. This could include: – Avoidance of the area where noise is being generated – Startle response	Possible	Moderate	Medium	Rare	Moderate	Low
	Mortality or injury of an individual or individuals of a species in the marine environment.	Possible	Material	High	Rare	Material	Medium
Mobilisation of sediment	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Rare	Minor	Low	Rare	Minor	Low
	Reduced visibility in the marine environment that reduces or restricts foraging to the extent that it affects the health or life cycle of an individual or individuals of a species.	Possible	Material	Medium	Rare	Material	Medium
Mobilisation of contaminants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Moderate	Medium	Rare	Moderate	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Moderate	Medium	Rare	Moderate	Low

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Mobilisation of gross pollutants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Moderate	Medium	Rare	Moderate	Low
	Mortality or injury of an individual or individuals of a species.	Unlikely	Moderate	Medium	Rare	Moderate	Low
Changes to soil chemistry	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Minor	Low	Unlikely	Minor	Low
	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Dust generation	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Clearing of vegetation	Reduction in habitat for the Protected Matter that affects an individual or individuals of a species. Approximately 3.49 ha of seagrass meadows would be impacted.	Rare	Minor	Low	Rare	Minor	Low
Light generation	Changes to behaviour, such as foraging or resting, or disorientation, that affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Changes to landscape and visual amenity	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Interaction with a heritage place or heritage values	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Increased demand for resources and facilities	Not likely to impact this Protected Matter.	–	–	–	–	–	–

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Hydrological changes	Degradation of foraging resources (for example, seagrass), to the extent that it affects an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Unlikely	Minor	Low	Unlikely	Minor	Low
Geomorphological changes	Degradation of foraging resources (for example, seagrass), to the extent that it affects an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Unlikely	Minor	Low	Unlikely	Minor	Low
Radiation	Mortality or injury of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
Water resources							
Vibration	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Noise generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Mobilisation of sediment	Changes to surface water quality that affects resource use.	Unlikely	Minor	Low	Unlikely	Minor	Low
Mobilisation of contaminants	Changes to surface water quality that affects resource use.	Unlikely	Minor	Low	Unlikely	Minor	Low
Mobilisation of gross pollutants	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Changes to soil chemistry	Changes to surface water quality that affects resource use.	Unlikely	Minor	Low	Unlikely	Minor	Low
Dust generation	Changes to surface water quality that affects resource use.	Rare	Negligible	Low	Rare	Negligible	Low
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Clearing of vegetation	Changes to surface water quality that affects resource use.	Unlikely	Minor	Low	Unlikely	Minor	Low
Light generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Changes to landscape and visual amenity	Not likely to impact this Protected Matter.	–	–	–	–	–	–

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Interaction with a heritage place or heritage values	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Increased demand for resources and facilities	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Hydrological changes	Changes to surface water quality that affects resource use.	Unlikely	Minor	Low	Unlikely	Minor	Low
Geomorphological changes	Changes to surface water quality that affects resource use.	Unlikely	Minor	Low	Unlikely	Minor	Low
Radiation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Pollutants, chemicals and toxic substances							
Vibration	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Noise generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Mobilisation of sediment	Degradation of the environment to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Mobilisation of contaminants	Degradation of the environment to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Mobilisation of gross pollutants	Degradation of the environment to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Changes to soil chemistry	Degradation of the environment to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Dust generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Clearing of vegetation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Light generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Changes to landscape and visual amenity	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Interaction with a heritage place or heritage values	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Increased demand for resources and facilities	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Hydrological changes	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Geomorphological changes	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Radiation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Plants							
Vibration	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Noise generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Mobilisation of sediment	Degradation of vegetation to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Mobilisation of contaminants	Degradation of vegetation to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Mobilisation of gross pollutants	Degradation of vegetation to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Changes to soil chemistry	Degradation of vegetation to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Dust generation	Degradation of vegetation to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Clearing of vegetation	Reduction in vegetation that affects the health or life cycle of an individual or individuals of a species.	Highly Likely	Moderate	High	Highly Likely	Moderate	High
Light generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Changes to landscape and visual amenity	Not likely to impact this Protected Matter.	-	-	-	-	-	-
Interaction with a heritage place or heritage values	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Increased demand for resources and facilities	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Hydrological changes	Degradation of vegetation to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Geomorphological changes	Degradation of vegetation to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Radiation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Animals							
Vibration	Changes to behaviour, such as foraging or resting, that affects the health or life cycle of an individual or individuals of a species. This could include: – Avoidance of the area where vibration is being generated – Startle response	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Rare	Minor	Low	Rare	Minor	Low
Noise generation	Changes to behaviour, such as foraging or resting, that affects the health or life cycle of an individual or individuals of a species. This could include: – Avoidance of the area where noise is being generated Startle response	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species in the marine environment.	Rare	Minor	Low	Rare	Minor	Low

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Mobilisation of sediment	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Rare	Minor	Low	Rare	Minor	Low
	Reduced visibility in the marine environment that reduces or restricts foraging to the extent that it affects the health or life cycle of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
Mobilisation of contaminants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Minor	Low	Unlikely	Minor	Low
Mobilisation of gross pollutants	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
	Mortality or injury of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Changes to soil chemistry	Degradation of foraging resources (for example, seagrass), to the extent that it affects the health or life cycle of an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
	Mortality or injury of an individual or individuals of a species within the marine environment.	Unlikely	Minor	Low	Unlikely	Minor	Low
Dust generation	Degradation of foraging resources (for example, samphires), to the extent that it affects an individual or individuals of a species.	Unlikely	Minor	Low	Unlikely	Minor	Low
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–

<table>
<tr><th rowspan="2">Impact factor</th><th rowspan="2">Potential risk</th><th colspan="3">Unmitigated risk rating</th><th colspan="3">Mitigated risk rating</th></tr>
<tr><th>Likelihood</th><th>Consequence</th><th>Risk rating</th><th>Likelihood</th><th>Consequence</th><th>Risk rating</th></tr>
<tr><td rowspan="8">Clearing of vegetation</td><td colspan="2">Reduction in habitat for the Protected Matter that affects an individual or individuals of a species.
Approximate areas of habitat that would be likely to be cleared are included below.</td><td rowspan="7">Highly Likely</td><td rowspan="7">Moderate</td><td rowspan="7">High</td><td rowspan="7">Highly Likely</td><td rowspan="7">Moderate</td><td rowspan="7">High</td></tr>
<tr><td>Habitat type</td><td>Area (ha)</td></tr>
<tr><td>Low open shrubland</td><td>24.33</td></tr>
<tr><td>Constructed wetland</td><td>2.54</td></tr>
<tr><td>Tidal flat</td><td>2.58</td></tr>
<tr><td>Seagrass meadows</td><td>3.49</td></tr>
<tr><td>Total area</td><td>32.94</td></tr>
<tr><td colspan="2">Mortality or injury of an individual or individuals of a species.</td><td>Possible</td><td>Material</td><td>High</td><td>Possible</td><td>Material</td><td>High</td></tr>
<tr><td rowspan="2">Light generation</td><td colspan="2">Increased potential for species predation that affects an individual or individuals of a species.</td><td>Unlikely</td><td>Minor</td><td>Low</td><td>Rare</td><td>Minor</td><td>Low</td></tr>
<tr><td colspan="2">Changes to behaviour, such as foraging or resting, or disorientation, that affects the health or life cycle of an individual or individuals of a species.</td><td>Unlikely</td><td>Minor</td><td>Low</td><td>Rare</td><td>Minor</td><td>Low</td></tr>
<tr><td>Changes to landscape and visual amenity</td><td colspan="2">Not likely to impact this Protected Matter.</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Interaction with a heritage place or heritage values</td><td colspan="2">Not likely to impact this Protected Matter.</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Increased demand for resources and facilities</td><td colspan="2">Not likely to impact this Protected Matter.</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Hydrological changes</td><td colspan="2">Degradation of foraging resources (for example, seagrass), to the extent that it affects an individual or individuals of a species.
The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.</td><td>Rare</td><td>Minor</td><td>Low</td><td>Rare</td><td>Minor</td><td>Low</td></tr>
</table>

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Geomorphological changes	Reduction in habitat for the Protected Matter that affects an individual or individuals of a species. *Approximately 2.58 ha of shoreline containing tidal flat habitat would be likely to be removed.*	Unlikely	Minor	Low	Unlikely	Minor	Low
	Degradation of foraging resources (for example, seagrass), to the extent that it affects an individual or individuals of a species. *The seagrass habitats within the Strategic Assessment Area are much less than one percent of the seagrass habitat in Gulf St Vincent.*	Rare	Minor	Low	Rare	Minor	Low
Radiation	Mortality or injury of an individual or individuals of a species.	Rare	Minor	Low	Rare	Minor	Low
People and communities							
Vibration	Nuisance vibration during construction that affects residents.	Likely	Moderate	High	Possible	Minor	Medium
	Nuisance vibration during operation that affects residents.	Possible	Moderate	Medium	Rare	Minor	Low
Noise generation	Nuisance noise during construction that affects residents.	Likely	Moderate	High	Possible	Minor	Medium
	Nuisance noise during operation that affects residents.	Possible	Moderate	Medium	Rare	Minor	Low
Mobilisation of sediment	Reduced amenity for recreational users of Port Adelaide River.	Possible	Minor	Medium	Unlikely	Minor	Low
Mobilisation of contaminants	Reduced amenity for recreational users of Port Adelaide River.	Possible	Minor	Medium	Unlikely	Minor	Low
Mobilisation of gross pollutants	Reduced amenity for recreational users of Port Adelaide River.	Possible	Minor	Medium	Rare	Minor	Low
Changes to soil chemistry	Reduced amenity for recreational users of Port Adelaide River.	Possible	Minor	Medium	Unlikely	Minor	Low
Dust generation	Nuisance dust produced during construction that affects residents.	Likely	Moderate	High	Rare	Moderate	Low
Odour	Odour produced during construction or operation that affects residents.	Unlikely	Minor	Low	Unlikely	Minor	Low
Clearing of vegetation	Not likely to impact this Protected Matter.	–	–	–	–	–	–

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Light generation	Light spill that affects residents.	Possible	Minor	Medium	Unlikely	Minor	Low
Changes to landscape and visual amenity	Reduced visual amenity for residents.	Likely	Minor	Medium	Likely	Negligible	Low
Interaction with a heritage place or heritage values	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Increased demand for resources and facilities	Increased road transport demand that causes congestion and affects residents.	Highly likely	Moderate	High	Likely	Moderate	High
Hydrological changes	Reduced amenity for recreational users of Port Adelaide River.	Possible	Minor	Medium	Unlikely	Minor	Low
Geomorphological changes	Reduced amenity for recreational users of Port Adelaide River.	Possible	Minor	Medium	Unlikely	Minor	Low
Radiation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Heritage							
Vibration	Accelerated degradation of the *Excelsior* shipwreck in Mutton Cove	Possible	Negligible	Low	Possible	Negligible	Low
Noise generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Mobilisation of sediment	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Mobilisation of contaminants	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Mobilisation of gross pollutants	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Changes to soil chemistry	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Dust generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Odour	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Clearing of vegetation	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Light generation	Not likely to impact this Protected Matter.	–	–	–	–	–	–

Impact factor	Potential risk	Unmitigated risk rating			Mitigated risk rating		
		Likelihood	Consequence	Risk rating	Likelihood	Consequence	Risk rating
Changes to landscape and visual amenity	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Interaction with a heritage place or heritage values	Accelerated degradation of the *Excelsior* shipwreck in Mutton Cove	Possible	Negligible	Low	Possible	Negligible	Low
	Interaction with a documented Aboriginal heritage place.	Rare	Moderate	Low	Rare	Moderate	Low
Increased demand for resources and facilities	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Hydrological changes	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Geomorphological changes	Not likely to impact this Protected Matter.	–	–	–	–	–	–
Radiation	Not likely to impact this Protected Matter.	–	–	–	–	–	–

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